Shridevi Institute of Engineering and Technology, Tumkur-06

I Semester: CIE I Internal Assessment Test:14/01/2023

22PHYS12-Physics for CSE Stream

Time: 90 Minutes **Max. Marks: 40**

Note: 1. ***Answer any Two full Questions.***

2. ***Physical constants*****, Velocity of light, $c = 3 \times 10^8$ m/s,**
Planck's constant, $h = 6.63 \times 10^{-34}$ JS, Mass of electron, $m_n = 1.674 \times 10^{-27}$ kg,
Charge of electron, $e = 1.602 \times 10^{-19}$ C, Mass of proton, $m_p = 1.673 \times 10^{-27}$ kg

1	a.	Using the Schrodinger time independent wave equation, Obtain energy values and normalized wave function with respect to a particle in a one dimensional potential well of infinite height.	**(CO2 08 Marks)**
	b.	State Heisenberg's Uncertainty Principle. Show that electron cannot exist inside the nucleus.	**(CO2 08 Marks)**
	c.	Evaluate the de-Broglie wavelength of Helium Nucleus accelerated through a potential difference of 500 V	**(CO2 04 Marks)**
		OR	
2	a.	State principle of complementarity and explain.	**(CO2 08 Marks)**
	b.	What is wave function? Set up time independent one dimensional Schrodinger wave equation.	**(CO2 08 Marks)**
	c.	Estimate the potential difference through which a proton is needed to be accelerated so that its de-Broglie wavelength equal to 1 Å.	**(CO2 04 Marks)**

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3 a. Describe different types of optical fiber with neat diagram. **(CO1 08 Marks)**

b. What is attenuation? Explain the factors contributing to the fiber loss **(CO1 08 Marks)**

c. The refractive indices of core and clad are 1.50 and 1.48 respectively in an optical fiber. Find the numerical aperture and angle of acceptance. **(CO1 04 Marks)**

OR

4 a. Define fractional Index change (Δ). Derive the expression for Numerical aperture and acceptance angle of an optical fiber. **(CO1 08 Marks)**

b. Discuss point to point optical fiber communication system with a neat block diagram. **(CO1 08 Marks)**

c. Find the attenuation in an optical fiber of length 500m when a light signal power 100mW emerges out of the fiber with a power 90mW. **(CO1 04 Marks)**

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SHRIDEVI EDUCATION

Shridevi Institute of Engineering and Technology, Tumkur-06

I Semester: CIE I Internal Assessment Test:14/01/2023

22PHYS12-Physics for CSE Stream

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Q. NO		Marks
1.a	Using the Schrodinger time independent wave equation, Obtain energy values and normalized wave function with respect to a particle in a one dimensional potential well of infinite height. Ans: According to de-Broglie, wave length associated with a particle $$\lambda = \frac{h}{mv} \rightarrow (1)$$ The wave function describing the de-Broglie wave considered travelling in positive x-direction can be written in complex notation as $$\Psi = Ae^{i(kx-wt)} \rightarrow (2)$$ The time independent part in Eqn. (2) can be represented as a wave function $$\psi = Ae^{ikx} \rightarrow (3)$$ Hence Eqn. (2) becomes, $$\Psi = \psi e^{-iwt} \rightarrow (4)$$ Differentiate Eqn.(4) twice w. r. to x, we get $$\frac{d^2\Psi}{dx^2} = e^{-iwt}\frac{d^2\psi}{dx^2} \rightarrow (5)$$ Again Differentiate Eqn.(4) twice w. r. to t, we get $$\frac{d^2\Psi}{dt^2} = -\omega^2 e^{-iwt}\psi \rightarrow (6)$$ We have the equation for a travelling wave $$\frac{d^2y}{dx^2} = \frac{1}{v^2}\frac{d^2y}{dt^2}$$ We can write the wave equation for de-Broglie wave for the motion of a free particle as $$\frac{d^2\Psi}{dx^2} = \frac{1}{v^2}\frac{d^2\Psi}{dt^2} \rightarrow (7)$$ The above equation represents waves propagating along x-axis with a velocity v and	08

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	Ψ is the displacement at the instant t. Substitute Eqn. (5) and (6) in Eqn. (7), we get $$e^{-i\omega t}\frac{d^2\psi}{dx^2}=\frac{1}{v^2}(-\omega^2 e^{-i\omega t}\psi)$$ $$\frac{d^2\psi}{dx^2}=-\frac{\omega^2}{v^2}\psi$$ But $\omega = 2\pi\gamma$ and $v=\gamma\lambda$ Substitute the values of ω and v, we get $$\frac{d^2\psi}{dx^2}=-\frac{4\pi^2}{\lambda^2}\psi$$ $$\frac{1}{\lambda^2}=-\frac{1}{4\pi^2\psi}\frac{d^2\psi}{dx^2}\rightarrow(8)$$ For a particle of mass m moving with a velocity v $$K.E=\frac{p^2}{}\rightarrow(9)$$ $$K.E=\frac{h^2m}{2m}\frac{1}{\lambda^2}\rightarrow(10)$$ Substitute for $\frac{1}{\lambda^2}$ from Eqn. (8), then Eqn. (10) becomes $$K.E=-\frac{h^2}{8\pi^2m}\frac{1}{\psi}\frac{d^2\psi}{dx^2}\rightarrow(11)$$ And potential energy = V Then the total energy E of the particle is $$E=K.E+P.E$$ $$E=-\frac{h^2}{8\pi^2m}\frac{1}{\psi}\frac{d^2\psi}{dx^2}+V\rightarrow(12)$$ $$\boxed{\frac{d^2\psi}{dx^2}+\frac{8\pi^2m}{h^2}(E-V)\psi=0\rightarrow(13)}$$ This is the time-independent Schrödinger's equation in one dimension.	
1.b	State Heisenberg's Uncertainty Principle. Show that electron cannot exist inside the nucleus. Ans: In any simultaneous determination of the position and momentum of a particle, the product of the corresponding uncertainties inherently present in the measurement is greater than or equal to (h/4π).	

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$$\Delta x \Delta p \geq \frac{h}{4\pi}$$

Non-existence of electron in the atomic nucleus 08

According to Heisenberg's uncertainty principle

$$\Delta x \Delta p \geq \frac{h}{4\pi}$$

$$\Delta p \geq \frac{h}{4\pi \Delta x} \rightarrow (4)$$

The radius of a typical atomic nucleus to be about 5.0×10^{-15} m. If an electron is to exist inside the nucleus, then the uncertainty in its position Δx must not exceed this value.

$$\Delta x \leq 5 \times 10^{-15} m$$

$\therefore$ Using this in Eqn. (4), we get

$$\Delta p \geq \frac{h}{4\pi \Delta x}$$

$$\Delta p \geq \frac{6.626 \times 10^{-34}}{4 \times 3.142 \times 5 \times 10^{-15}}$$

$$\Delta p \geq 1.1 \times 10^{-20} kgms^{-1}$$

The momentum of the electron must at least be equal to uncertainty in the momentum

$$p \geq 1.1 \times 10^{-20} kgms^{-1} \rightarrow (5)$$

Use Eqn. (5) in Eqn. (3), so the energy of the electron

$$E^2 \geq p^2 c^2 + m_0^2 c^4$$

$$E^2 \geq (1.1 \times 10^{-20})^2 (3 \times 10^8)^2 + (9.1 \times 10^{-31})^2 (3 \times 10^8)^4$$

$$E^2 \geq 1.09 \times 10^{-23} \qquad E \geq 3.3 \times 10^{-12} J$$

$$E \geq \frac{3.3 \times 10^{-12}}{1.602 \times 10^{-19}} eV$$

$$\boxed{E \geq 20.6 MeV}$$

In order that the electron exists inside the nucleus its energy must be greater then or equal to 20.6 MeV but experimental data shows that during β-decay, the kinetic

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	energy of β-particles is of the order of 3 to 4 MeV. This Clearly shows that electrons do not exist inside the nucleus.	
1.c	Evaluate the de-Broglie wavelength of Helium Nucleus accelerated through a potential difference of 500 V Ans: $\lambda = \frac{h}{\sqrt{2mev}}$ $= 1.28\ pm.$	04
2.a	State principle of complimentarily and explain. Ans: Bohr stated as in a situation where the wave aspect of a system is revealed ,its particle aspect is concealed and in a situation where the particle aspect is revealed its wave aspect is concealed. Revealing both simultaneously is impossible the wave and particle aspects are complementary Explanation : if an experiment is designed to measure the particle nature of the matter during this experiment errors of measurement of both position and the time coordinates must be zero and hence the matter are completely unknown Similarly. if an experiment is designed for measuring the wave nature of the particle then error in the measurement of the energy and the momentum will be zero whereas the position and the time coordinates of the matter will be completely unknown	08
2.b	What is wave function? Set up time independent one dimensional Schrodinger wave equation. Ans: In quantum mechanics it is postulated that there exists a function determined by the physical situation (x, t etc), such function is called wave function. According to de-Broglie, wave length associated with a particle $\lambda = \frac{h}{mv} \rightarrow (1)$ The wave function describing the de-Broglie wave considered travelling in positive x-direction can be written in complex notation as $\Psi = Ae^{i(kx-\omega t)} \rightarrow (2)$ The time independent part in Eqn. (2) can be represented as a wave function $\psi = Ae^{ikx} \rightarrow (3)$ Hence Eqn. (2) becomes, $\Psi = \psi e^{-i\omega t} \rightarrow (4)$ Differentiate Eqn.(4) twice w. r. to x, we get $\frac{d^2\Psi}{dx^2} = e^{-i\omega t}\frac{d^2\psi}{dx^2} \rightarrow (5)$ Again Differentiate Eqn.(4) twice w. r. to t, we get	08

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$$\frac{d^2\Psi}{dt^2} = -\omega^2 e^{-i\omega t}\psi \rightarrow (6)$$

We have the equation for a travelling wave

$$\frac{d^2y}{dx^2} = \frac{1}{v^2}\frac{d^2y}{dt^2}$$

We can write the wave equation for de-Broglie wave for the motion of a free particle as

$$\frac{d^2\Psi}{dx^2} = \frac{1}{v^2}\frac{d^2\Psi}{dt^2} \rightarrow (7)$$

The above equation represents waves propagating along x-axis with a velocity v and Ψ is the displacement at the instant t.

Substitute Eqn. (5) and (6) in Eqn. (7), we get

$$e^{-i\omega t}\frac{d^2\psi}{dx^2} = \frac{1}{v^2}(-\omega^2 e^{-i\omega t}\psi)$$

$$\frac{d^2\psi}{dx^2} = -\frac{\omega^2}{v^2}\psi$$

But $\omega = 2\pi\gamma$ and $v = \gamma\lambda$

Substitute the values of ω and v, we get

$$\frac{d^2\psi}{dx^2} = -\frac{4\pi^2}{\lambda^2}\psi$$

$$\frac{1}{\lambda^2} = -\frac{1}{4\pi^2\psi}\frac{d^2\psi}{dx^2} \rightarrow (8)$$

For a particle of mass m moving with a velocity v

$$K.E = \frac{p^2}{} \rightarrow (9)$$

$$K.E = \frac{h^2 m}{2m\lambda^2} \rightarrow (10)$$

Substitute for $\frac{1}{\lambda^2}$ from Eqn. (8), then Eqn. (10) becomes

$$K.E = -\frac{h^2}{8\pi^2 m}\frac{1}{\psi}\frac{d^2\psi}{dx^2} \rightarrow (11)$$

And potential energy = V

Then the total energy E of the particle is

$$E = K.E + P.E$$

$$E = -\frac{h^2}{8\pi^2 m}\frac{1}{\psi}\frac{d^2\psi}{dx^2} + V \rightarrow (12)$$

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	$$\frac{d^2\psi}{dx^2}+\frac{8\pi^2 m}{h^2}(E-V)\psi=0 \rightarrow (13)$$ This is the time-independent Schrödinger's equation in one dimension.	
2.c	Estimate the potential difeerence through which a proton is needed to be accelerated so that its de-Broglie wavelength equal to 1 Å. $\lambda = \frac{h}{\sqrt{2meV}}$ $V = \frac{h^2}{2me\lambda^2} = 0.082\,V$	04
3.a	Describe different types of optical fiber with neat diagram **ANS: Types of optical fibers** Based on the refractive index profile and mode of propagation, There are three types of optical fibers, In any optical fiber the whole material of the cladding has uniform refractive index value. but refractive index of core material may either remain constant or subjected to variation in a particular way. The curve which represent the variation of refractive index with respect to the radial distance from the axis of the fiber is called the refractive index profile 1. Single mode step index fiber 2. multimode Step index fiber 3. Graded index multimode fiber	08
3.b	Signal attenuation in optical fibers • Attenuation is the loss of optical power suffered by the optical signal as it propagates through a fiber also called as the fiber loss. • There are three mechanisms through which attenuation takes place. Attenuation can be caused by three mechanisms. 1.Scattering 2.Absorption 3.Radiation losses	08
3.c	The refractive indices of core and clad are 1.50 and 1.48 respectively in an optical fiber. Find the numerical aperture and angle of acceptance. Ans :- $n_1 = 1.50$, $n_2 = 1.48$ $\theta_0 = ?$ $NA = ?$ $NA = \sqrt{n_1^2 - n_2^2}$ $\theta_0 = \sin^{-1}(NA)$ $= \sqrt{(1.50^2 - 1.48^2)}$ $= \sin^{-1}(0.24)$ $= 0.24$ $= 14.01$	04
4.a	Define fractional Index change (Δ). Derive the expression for Numerical	

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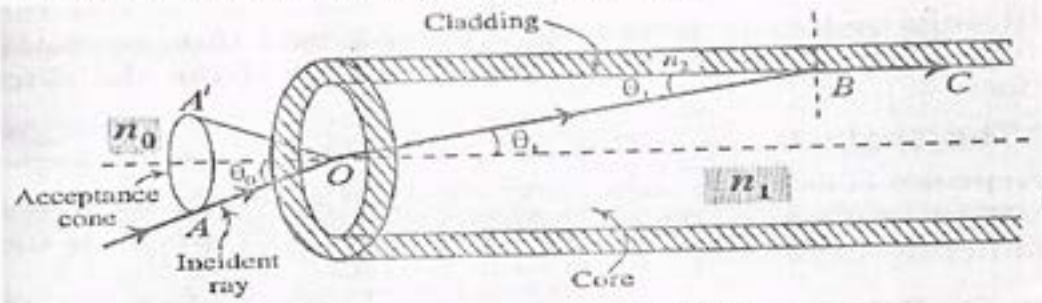
aperture and acceptance angle of an optical fiber.

Ans: The ratio of refractive index difference between core and cladding to the refractive index of core is called refractive index profile



ACCEPTANCE CONE

08

$$\sin\theta_0 = \frac{n_1}{n_0}\sin\theta_1 \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Applying Snell's law at B, The angle of indices is $90 - \theta_1$ The angle of refraction is 90^0

$$n1 \sin(90\text{-}\theta1) = n_2 \sin 90$$

$$n_1 \cos\theta_1 = n_2$$

$$\cos\theta_1 = \frac{n_2}{n_1} \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

From expression (1)

$$sin\theta_0 = \frac{n_1}{n_0}\sin\theta_1$$

$$sin\theta_0 = \frac{n_1}{n_0}\sqrt{1 - cos^2\theta_1}$$

Substituting for cos θ_1 from (2) we get

$$sin\theta_0 = \frac{n_1}{n_0}\sqrt{1 - \left(\frac{n_2}{n_1}\right)^2}$$

$$sin\theta_0 = \frac{n_1}{n_0}\sqrt{\frac{n_1^2 - n_2^2}{n_1^2}}$$

$$sin\theta_0 = \frac{\sqrt{n_1^2 - n_2^2}}{n_0}$$

If the surrounding medium is air, then $n_0 = 1$

$$sin\theta_0 = \sqrt{n_1^2 - n_2^2} \ldots\ldots\ldots\ldots (3)$$

Where $sin\theta_0$ is called Numerical aperture

$$N.A = \sqrt{n_1^2 - n_2^2}$$

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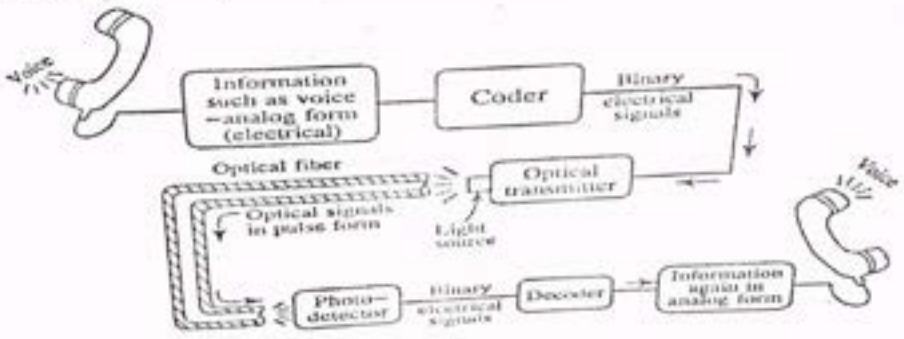
4.b	With the help of block diagram, explain the basics of point to point communication system .mention any two advantage of optical communication system Ans: Explanation of point to point communication  	08
4.c	Find the attenuation in an optical fiber of length 500m when a light signal power 100mW emerges out of the fiber with a power 90mW Ans: $P_{in} = 100mW = 100 \times 10^{-3} W$ $\alpha = ?$ $P_{out} = 90mW = 90 \times 10^{-3} W$ $L = 0.5kg.$ $\alpha = -\frac{10}{L} \log_{10}\left[\frac{P_{out}}{P_{in}}\right]$ $= \frac{-10}{0.5} \log_{10}\left[\frac{90}{100}\right]$ $= 0.915 \ dB/kg.$	04

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22PHYC12-Physics for CV Stream

Time: 90 Minutes **Max. Marks: 40**

Note: 1. ***Answer any Two full Questions.***

2. ***Physical constants*****, Velocity of light, c = 3 x 10^8 m/s,**

1	a.	What if Free and Forced Oscillation? Obtain the expression for Amplitude and Phase of vibration in case of forced vibration.	**(CO1 08 Marks)**
	b.	With a neat diagram explain the construction and working of Reddy shock tube.	**(CO1 08 Marks)**
	c.	A mass of 0.5 Kg cause an extension of 0.03 m in a spring and the system in set for oscillations. Find the force constant, angular frequency and time period.	**(CO1 04 Marks)**

OR

2	a.	Define SHM. Mention the characteristics and examples of SHM. Derive the differential equation of motion for it using Hook's law.	**(CO1 08 Marks)**
	b.	What is Force Constant? Obtain expression for effective spring constant and Time period for two springs connected in series and parallel.	**(CO1 08 Marks)**
	c.	In a Reddy shock tube experiment, the time taken to travel between the two sensors is 195 μs. if the distance between the two sensors is 100 mm. calculate the mach number. Assume speed of sound as 340 m/s.	**(CO1 04 Marks)**

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22PHYC12-Physics for CV Stream

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b. What is attenuation? Explain the factors contributing to the fiber loss **(CO4 08 Marks)**

c. The refractive indices of core and clad are 1.50 and 1.48 respectively in an optical fiber. Find the numerical aperture and angle of acceptance. **(CO4 04 Marks)**

OR

4 a. Define fractional Index change (Δ). Derive the expression for Numerical aperture and acceptance angle of an optical fiber. **(CO4 08 Marks)**

b. Explain the construction and working of displacement sensor and temperature sensor. **(CO4 08 Marks)**

c. Find the attenuation in an optical fiber of length 500m when a light signal power 100mW emerges out of the fiber with a power 90mW. **(CO4 04 Marks)**

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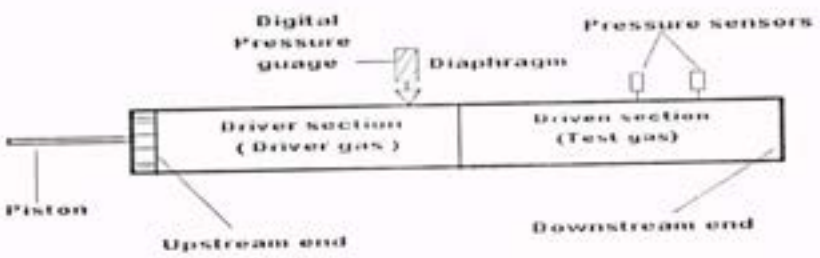
I Semester: CIE I Internal Assessment Test:14/01/2023
22PHYS12-Physics for CIV Stream
SHEME OF EVALUATION

1.a	What if Free and Forced Oscillation? Obtain the expression for Amplitude and Phase of vibration in case of forced vibration Ans : "The oscillatory body oscillates with undiminished amplitude with its own natural frequency of vibrations for infinite length of time under the action of restoring force, until an external force affects its motion" are called free oscillations It is a steady state sustained vibrations of a body vibrating in a resistive medium under the action of external periodic force which acts independently of the restoring force." Consider a body of mass "m" executing vibrations in a damping medium under the application of external periodic force. F sin p t, Resultant force = $-r\frac{dx}{dt} - kx + F\sin pt$ Resultant force = $m\frac{d^2x}{dt^2}$ $\frac{d^2x}{dt^2} + r\,m\frac{dx}{dt} + k\,m\,x = Fm\sin pt$ $x = a\sin(pt-\alpha)$ $\frac{d^2x}{dt^2} = -p^2 a\sin(pt-\alpha)$ $$a = \frac{F/m}{\sqrt{4b^2p^2 + (w^2-p^2)^2}}$$ $$a = tan^{-1}\left[\frac{2bp}{w^2-p^2}\right]$$ this is the equation for phase of forced oscillations	08
1.b	With a neat diagram explain the construction and working of Reddy shock tube. Ans:  	08

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	Reddy tube consists of a cylindrical stainless steel tube of about 30mm diameter & of length nearly 1m. It is divided into two sections one is **driver section** & the other is **driven section** separated by a thick aluminum or Mylar or paper diaphragm of thickness 0.1mm. Far end of driver tube is fitted with a piston & the far end of driven tube is close	
1.c	A mass of 0.5 Kg cause an extension of 0.03 m in a spring and the system in set for oscillations. Find the force constant, angular frequency and time period. Ans: Data:- $-0.03m$, $m = 0.5kg$ To find: K, ω, & T $F = mg = 0.5 \times 9.8\ N$ $F_x = -4.9N$ $f = \frac{\omega}{2\pi}$ $k = \frac{-F_x}{x} = \frac{-4.9}{-0.03} = 163.3\ N/m$ $\omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{163.3}{0.5}} = 18.1$ $= \frac{18.1}{2\pi} = 2.87$ $T = 1/f = 0.358$	04
2.a	Define SHM. Mention the characteristics and examples of SHM. Derive the Ans: differential equation of motion for it using Hook's law. **Simple Harmonic Motion (SHM)**: The motion of a body is said to be SHM if the (restoring force) acceleration is directly proportional to the displacement and acts in a direction opposite to that of motion from the equilibrium position". **Characteristics of SHM:** It is a particular type of periodic motion There is a constant restoring force continuously acting on the body **Examples of SHM:** A pendulum set for oscillation Excited tuning fork. Consider a body of mass "m" executing SHM. Let "x" be the displacement of the body under the action of restoring force. For an oscillating body, from Hooke's law $F = -kx$ $F = ma = m\frac{d^2x}{dt^2}$ $\frac{d^2x}{dt^2} + \omega^2 x = 0$ $x = a\sin\omega$	08
2.b	What is Force Constant? Obtain expression for effective spring constant and Time period for two springs connected in series and parallel Ans:Force constant is a measure of stiffness of the material. In case of spring it represents the amount of force required to stretch the spring by unit length. The springs with larger value of force constant will be stiffer. It is also called spring constant (or) stiffness factor. Consider the spring "S1" with force constant "k1" suspended by mass "m" and displaced through "x1" under the action of restoring force. Therefore, from Hooke's law, $F = -k_1 x_1$ The displacement for series combination is x = x1+x2	08

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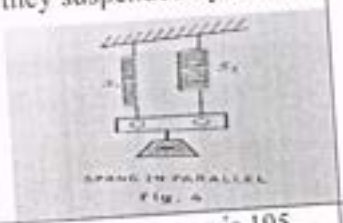
	$$k_s = \frac{k_1 k_2}{k_1 + k_2}$$ Consider two springs S_1 and S_2 with spring constants k_1 and k_2 respectively. Let x_1 and x_2 be displacement (extension) of the individual springs when they suspended by a mass "m". Hence, $F_1 = -k_1 x_1$ $k_p = k_1 + k_2$ 	
2.c	In a Reddy shock tube experiment the time taken to travel between the two sensors is 195 μs if the distance between the two sensors is 100mm. calculate the mach number assume speed of as 340m/s Ans: $M = \frac{V}{a}$ But $V = \frac{x}{t} = \frac{100 \times 10^{-3}}{195 \times 10^{-6}} = 512.8$ m/s $M = \frac{512.8}{340} = 1.50$	04
3.a	Describe different types of optical fiber with neat diagram **Ans: Types of optical fibers** Based on the refractive index profile and mode of propagation, There are three types of optical fibers, In any optical fiber the whole material of the cladding has uniform refractive index value. but refractive index of core material may either remain constant or subjected to variation in a particular way. The curve which represent the variation of refractive index with respect to the radial distance from the axis of the fiber is called the refractive index profile 1. Single mode step index fiber 2. multimode Step index fiber 3. Graded index multimode fiber	08
3.b	Signal attenuation in optical fibers Ans: • Attenuation is the loss of optical power suffered by the optical signal as it propagates through a fiber also called as the fiber loss. • There are three mechanisms through which attenuation takes place. Attenuation can be caused by three mechanisms. 1.Scattering 2.Absorption 3.Radiation losses	08
3.c	The refractive indices of core and clad are 1.50 and 1.48 respectively in an optical fiber. Find the numerical aperture and angle of acceptance. Ans: $n_1 = 1.50$, $n_2 = 1.48$ $NA = \sqrt{n_1^2 - n_2^2}$ $= \sqrt{1.50^2 - 1.48^2}$ $= 0.244$ $\theta = \sin^{-1}(NA)$ $= \sin^{-1}(0.244)$ $= 14.1^\circ$	04

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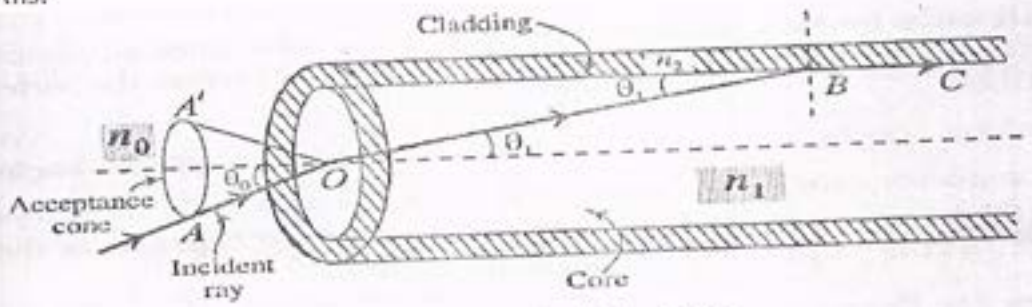
4.a Define fractional Index change (Δ). Derive the expression for Numerical aperture and acceptance angle of an optical fiber.

Ans:



ACCEPTANCE CONE

08

$$\sin\theta_0 = \frac{n_1}{n_0}\sin\theta_1 \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Applying Snell's law at B, The angle of indices is $90 - \theta_1$ The angle of refraction is 90^0

$$n1 \sin(90\text{-}\theta1) = n_2 \sin 90$$

$$n_1 \cos\theta_1 = n_2$$

$$\cos\theta_1 = \frac{n_2}{n_1} \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

From expression (1)

$$sin\theta_0 = \frac{n_1}{n_0}\sin\theta_1$$

$$sin\theta_0 = \frac{n_1}{n_0}\sqrt{1 - cos^2\theta_1}$$

Substituting for cos θ_1 from (2) we get

$$sin\theta_0 = \frac{n_1}{n_0}\sqrt{1 - \left(\frac{n_2}{n_1}\right)^2}$$

$$sin\theta_0 = \frac{n_1}{n_0}\sqrt{\frac{n_1^2 - n_2^2}{n_1^2}}$$

$$sin\theta_0 = \frac{\sqrt{n_1^2 - n_2^2}}{n_0}$$

If the surrounding medium is air, then $n_0 = 1$

$$sin\theta_0 = \sqrt{n_1^2 - n_2^2} \ldots\ldots\ldots\ldots (3)$$

Where $sin\theta_0$ is called Numerical aperture

$$N.A = \sqrt{n_1^2 - n_2^2}$$

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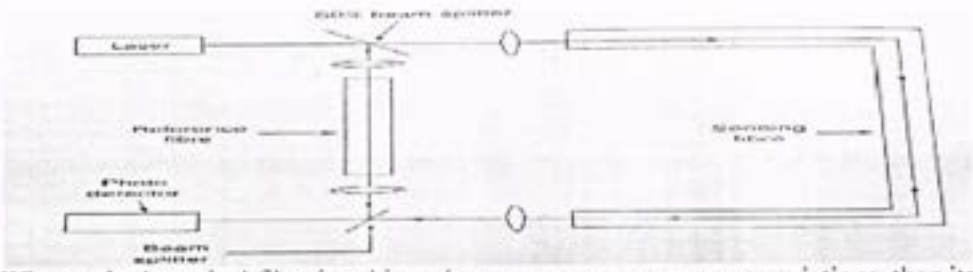
4.b	Explain the constriction and working of displacement sensors and temperature sensors Ans:  When a single optical fiber is subjected to temperature or pressure variations, then its length and refractive index changes. This causes change in phase of light at the end of the fiber. The change in phase of light is proportional to the magnitude of the change in temperature or pressure. The phase changes can be measured by an interferometer method as shown in fig. The light from the laser source splits into two beams approximately equal in amplitude by a 50% beam splitter. One beam is passed through sensing fiber, which is subjected to temperature variations and the other beam through reference fiber, which is not subjected to any changes and is used for comparison. Light from these two fiber is superimposed using another beam splitter. Interference of these two waves gives fringes. The intensity of the fringe depends in the phase relation between two wavesIf the wave are in phase, then the intensity is maximum. this happens when the sensing fiber is not disturbed..The intensity is minimum if the waves are out of phase due to $\frac{\lambda}{2}$ change in the length of the sensing fiber.	08
4.c	Find the attenuation in an optical fiber of length 500m when a light signal power 100mW emerges out of the fiber with a power 90mW Ans:- $L = 500\,m = 0.5\,km$, $P_{in} = 100 \times 10^{-3}\,W$ $P_{out} = 90 \times 10^{-3}\,W$ $\alpha = \frac{-10}{L} \log_{10}\left[\frac{P_{out}}{P_{in}}\right]$ $\alpha = \frac{-10}{L} \log_{10}\left[\frac{90}{100}\right]$ $\alpha = 0.915\ dB/km$	04

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Shridevi Institute of Engineering and Technology, Tumkur-06

I Semester: CIE II Internal Assessment Test:25/02/2023

BPHYS102-Applied Physics for CSE Stream

An ISO 9001:2015 Certified Institution

Time: 90 Minutes **Max. Marks: 40**

Note: 1. ***Answer any Two full Questions.***

2. ***Physical constants*****, Velocity of light, $c = 3 \times 10^8$ m/s,**
Planck's constant, $h = 6.63 \times 10^{-34}$ JS, Mass of electron, $m_n = 1.674 \times 10^{-27}$ kg,
Charge of electron, $e = 1.602 \times 10^{-19}$ C, Mass of proton, $m_p = 1.673 \times 10^{-27}$ kg

1	a.	Enumerate the failures of classical free electron theory and assumptions of quantum free electron theory of metals.	**(CO3 08 Marks)**
	b.	Explain BCS theory of superconductivity.	**(CO3 07 Marks)**
	c.	Calculate the probability of occupation of an energy level 0.2 eV above Fermi level at temperature 27°C.	**(CO3 05 Marks)**

OR

2	a.	Define Fermi Factor and discuss the variation of Fermi factor with temperature and energy.	**(CO3 07 Marks)**
	b.	Give the qualitative explanation of DC SQUID and RF SQUID with the help of a neat sketch.	**(CO3 08 Marks)**
	c.	A superconducting tin has a critical temperature of 3.7 K at zero magnetic field and a critical field of 0.0306 Tesla at 0 K. Find the critical field at 2 K	**(CO3 05 Marks)**

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3 a. Define LASER and discuss the interaction of radiation with matter. **(CO1 07 Marks)**

b. Illustrate the constriction and working of semiconductor LASER with a neat sketch and energy level diagram also mention application. **(CO1 08 Marks)**

c. A LASER source has a power output of 10^{-3} W. Calculate the number of photons emitted per second given the wavelength of LASER 692.8 nm. **(CO1 05 Marks)**

OR

4 a. Discuss the application of LASER in bar code scanner and LASER cooling. **(CO1 08 Marks)**

b. Explain the requisites of laser system. **(CO1 07 Marks)**

c. In a laser system when the energy difference between two energy levels is 2×10^{-19} J the average power output of a LASER beam is found to be 4mW.calculate number of photons emitted per second. **(CO1 05 Marks)**

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Question No.	BPHYS102 - Applied Physics for CSE Stream CIE II Internal Assessment Test 25/02/23	Marks
1. a)	1. The energy values of the conduction electrons are quantized. The allowed energy values are realized in terms of a set of energy levels. 2. The distribution of electrons in the various allowed energy levels occurs as per. pauli's Exclusion principle. 3. The electrons travel with a constant potential inside the metal but confined within it's boundaries. 4. The attraction between the electrons and the repulsion between the electrons themselves are ignored. — 4 failures of classical free electrons theory. * Specific heat (C_v) * Temperature dependence of electrical conductivity. * Dependence of electrical conductivity on electron concentration. — 4	08
1. b)	BCS Theory of Superconductivity. The Bcs theory is based upon the formation of cooper pairs. cooper pair is a bound pair of electrons formed by the interaction between the electrons with	

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opposite spin and momenta in a phonon field

07

— 7

1. c) Given data:-

The energy $(E - E_F)$ above the fermi level $= 0.2eV$

$$0.2 \times 1.602 \times 10^{-19} = 3.204 \times 10^{-20}$$

$T = 27^\circ C \Rightarrow 27 + 273$

We have eulection

05

$$f(E) = \frac{1}{e^{\left(\frac{E-E_F}{KT}\right)} + 1} = \frac{1}{e^{\frac{3.204 \times 10^{-20}}{1.38 \times 10^{-23} \times 300}} + 1}$$

$$f(E) = 0.00043$$

2. a) Fermi factor: is the probability of occupation of a given energy state for a material in thermal equilibrium.

$$f(E) = \frac{1}{e^{\left(\frac{E-E_F}{KT}\right)} + 1} \longleftarrow (1)$$

Case: 1, Probability of occupation for

$E < E_F$ at $T = 0K$, ——— (2)

$f(E) = 1$ for $E < E_F$

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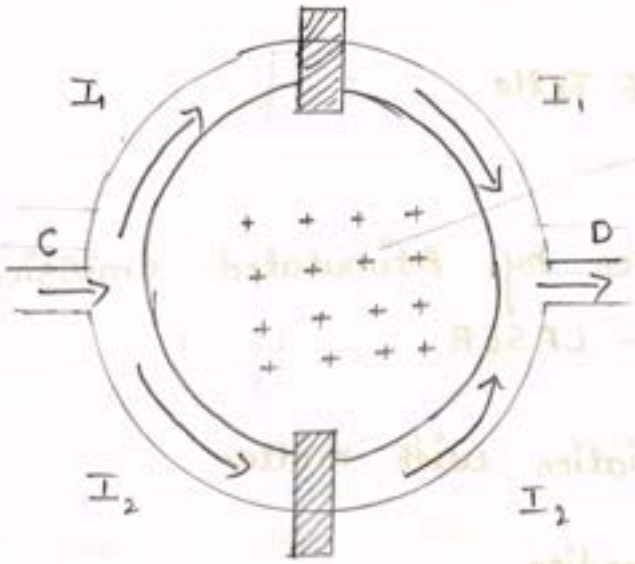
Case : 2. Probability of occupation for $E > E_F$

$\therefore f(E) = 0$ for $E < E_F$ — 2

Case : 3. Probability of occupation $E = E_F$ at T-ok. 07

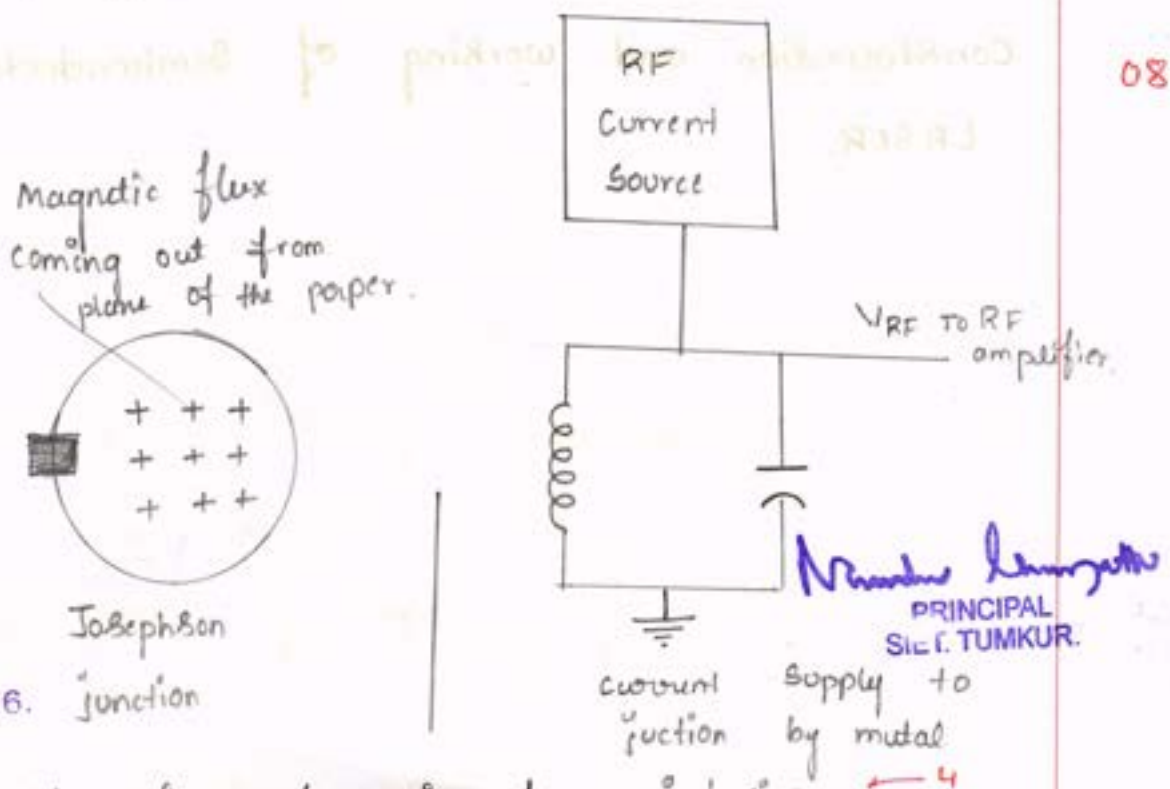
$f(E) = 1/2$ or 0.5 for $E = E_F$ — 2

2.b) DC Squid.



Construction and working of DC Squid. — 4

RF. Squid. 08



construction and working of RF Squid — 4

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2.c

Given data:-

$H_0 = 0.0306$ Tesla $\quad T_c = 3.7K \quad$ & $T = 2K$.

$H_c = ?$

We have relation :-

$$H_c = H_0 \left[1 - \frac{T^2}{T_c^2}\right]$$

$$H_c = 0.0306 \left[1 - \frac{(2)^2}{(3.7)^2}\right]$$

$$H_c = 0.0216 \text{ Tesla}$$

05

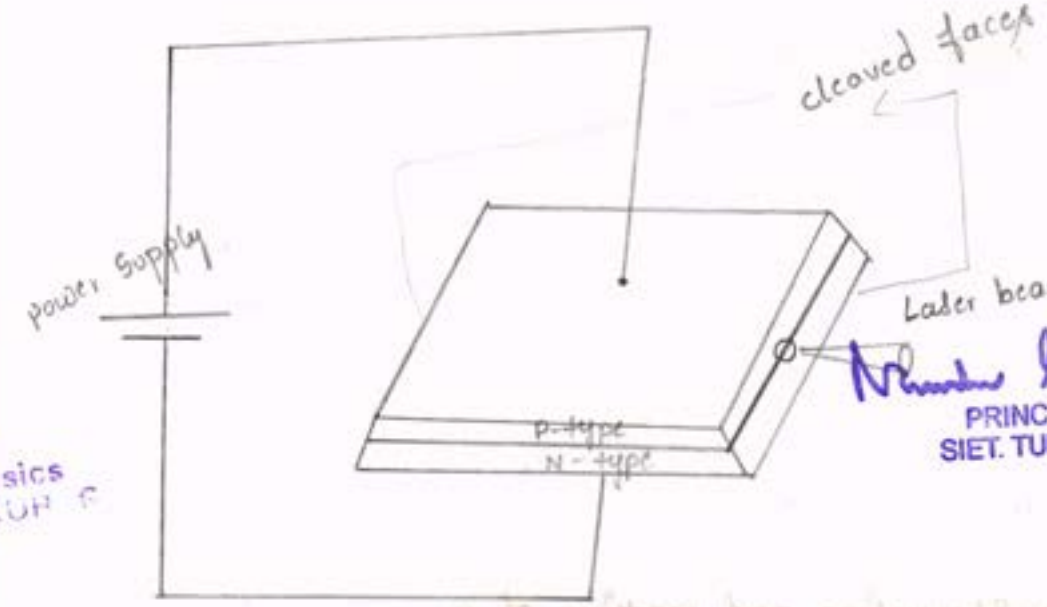
3.a) Light amplification by Stimulated emission of radiation — LASER. — 1

Interaction of radiation with matter.

* Induced absorption — 2
* Spontaneous emission — 2
* Stimulated emission. — 2

07

3.b) Construction and working of Semiconductor LASER.



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3.c. Given data :-

$P_{out} = 1 \times 10^{-3}$ W, $\lambda = 692.8 \times 10^{-9}$ m

Solution :-

$N \times \Delta E = P_{out}$.

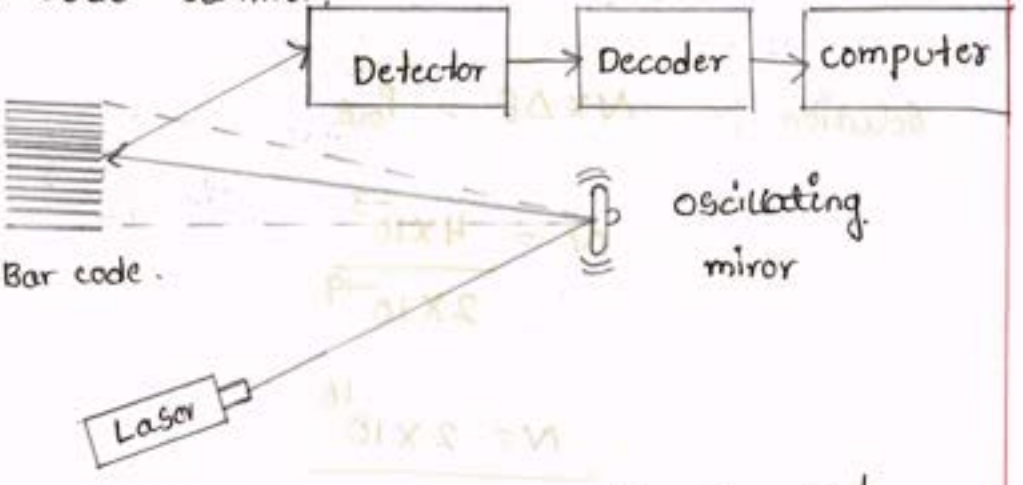
$$\Delta E = \frac{hc}{\lambda} = \frac{(6.6 \times 10^{-34})(3 \times 10^{8})}{692.8 \times 10^{-9}}$$

$$= 2.857 \times 10^{-19}$$

$$N = \frac{P_{out}}{\Delta E} = \frac{1 \times 10^{-3}}{2.857 \times 10^{-19}} = 3.498 \times 10^{15}$$

05

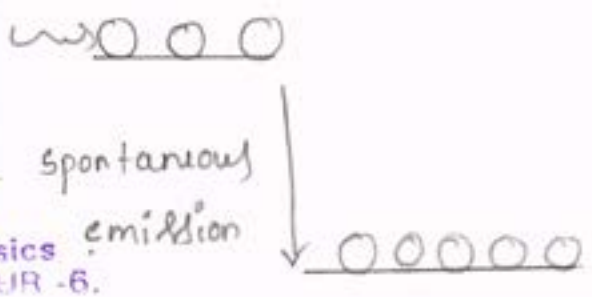
4.a. Bar code Scanner.



Construction and working of Bar code — 4

Working of Laser cooling. — 4

08



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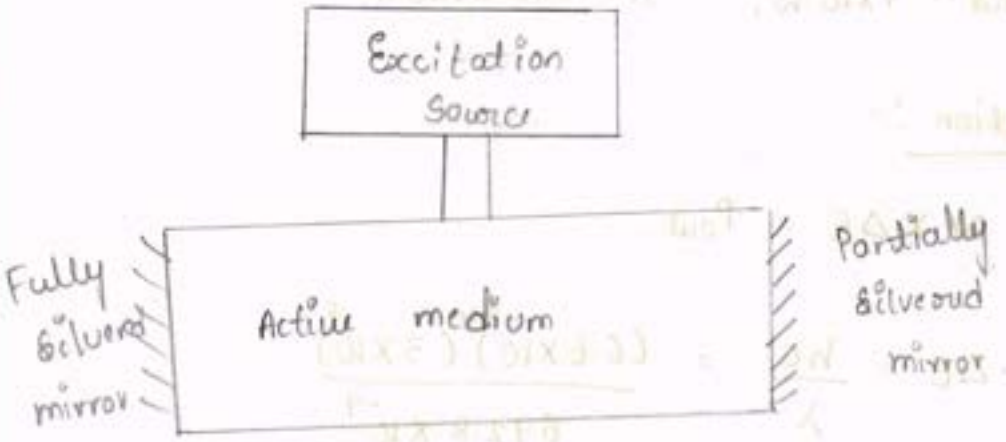
4.b, Requisites of Laser System.



07

* Excitation Source
* Active medium
* Laser (or) optical resonant cavity. —7

4. c) Given data :- $\Delta E = 2X10^{-19}$ $P_{out} = 4X10^{-3}$ W

Solution :- $N \times \Delta E = P_{out}$

$$N = \frac{4X10^{-3}}{2X10^{-19}}$$

$$N = 2X10^{16}$$

05

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SHRIDEVI EDUCATION

Shridevi Institute of Engineering and Technology, Tumkur-06

I Semester: CIE II Internal Assessment Test:14/01/2023

BPHYC102-Applied Physics for CV Stream

An ISO 9001:2015 Certified Institution

Time: 90 Minutes **Max. Marks: 40**

Note: 1. ***Answer any Two full Questions.***

2. ***Physical constants*****, Velocity of light, c = 3 x 10^8 m/s,**

1	a.	Define Poisson's ration and derive the relation between Young's Modulus, Rigidity Modulus and Poisson's ratio.	**(CO1 09 Marks)**
	b.	Define a Beam and explain the types of beams.	**(CO1 06 Marks)**
	c.	Consider a steel wire of radius 0.13 mm and length 2m. If the wire is rigidly fixed at one and loaded at the other with a mass of 1.5 kg the extension observed is 2 mm. Calculate the Young's Modulus of the material of the wire.	**(CO1 05 Marks)**

OR

2	a.	Define Bending Moment and derive an expression for bending moment with the help of a neat sketch.	**(CO1 09 Marks)**
	b.	Mention the types of engineering materials and describe the failures in engineering materials.	**(CO1 06 Marks)**
	c.	Calculate the force required to produce an extension of 1 mm in wire made of material with Young's Modulus 100 Gpa and of length 1 m and diameter 1 mm.	**(CO1 05 Marks)**

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3 a. Define LASER and discuss the interaction of radiation with matter. **(CO3 07 Marks)**

b. Illustrate the constriction and working of semiconductor LASER with a neat sketch and energy level diagram also mention application. **(CO3 08 Marks)**

c. A LASER source has a power output of 10^{-3} W. Calculate the number of photons emitted per second given the wavelength of LASER 692.8 nm. **(CO3 05 Marks)**

OR

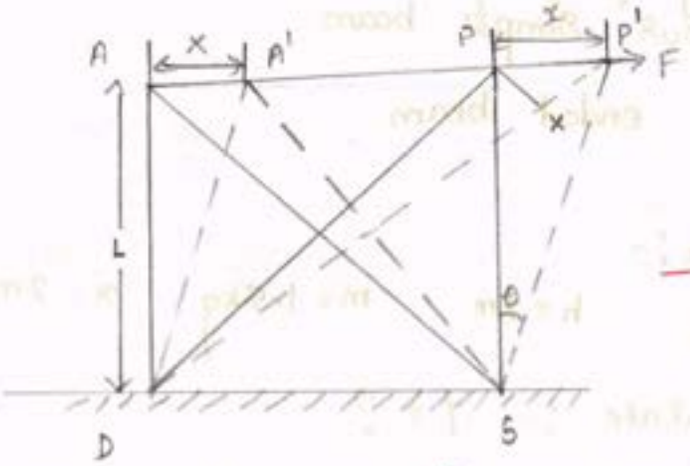
4 a. Discuss constriction and working of LASER range finder and its application in defense. **(CO3 08 Marks)**

b. Explain the requisites of laser system. **(CO3 07 Marks)**

c. In a laser system when the energy difference between two energy levels is 2×10^{-19} J the average power output of a LASER beam is found to be 4mW.calculate number of photons emitted per second. **(CO3 05 Marks)**

Question NO	BPHYC102 - Applied Physics for CV Stream 1-Sem ; CIE II Internal Assessment Test 14/01/23	Marks

1.a) Poisson's Ratio (σ) :- Within the elastic limits of a body the ratio of a body the lateral strain to the longitudinal strain is a constant is called poisson's ratio — 2



— 2

09

Total Extension along $DP = DP.T(\alpha+\beta)$

$P'x = DP.T(\alpha+\beta)$ — (1)

$$n = \frac{1/\alpha}{2(1+\sigma)}$$ — 1

$= 1/\alpha$

$$Y = \frac{1}{\text{Strain along DP/unit Stress}}$$ — 1

$$n = \frac{Y}{2(1+\sigma)}$$ — 1

$Y = 2n(1+\sigma)$ — 1

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1.b) Beams are the structural element that primarily resists loads applied laterally to the beams axis. — 2

Types of Beams:

* cantilever
* simply supported
* Overhanging
* continuous simple beam
* fixed ended beam.

} 4

06

1.c) Given data :-

$\delta = 0.13\,mm$ $\quad h = 2m$ $\quad m = 1.5\,kg$ $\quad x = 2mm$

To calculate :- $Y = ?$

$$Y = \frac{FL}{ax}$$

$F = mg = 1.5 \times 9.8 = 14.7\,N$

$a = \pi r^2 = (3.142)(0.13 \times 10^{-3})^2$

$a = 5.309 \times 10^{-8}\,m^2$

$$Y = \frac{14.7 \times 2}{5.309 \times 10^{-8} \times 2 \times 10^{-3}} = 2.76 \times 10^{11}\ N/m^2$$

05

2.a) Bending moment : consider a uniform beam made up of large number of parallel equidistant planes above and below the neutral axis after the bending of forms the arcs of a circle with radius of curvature R above the neutral planes an elongation strain and below compressive strain acted. — 2

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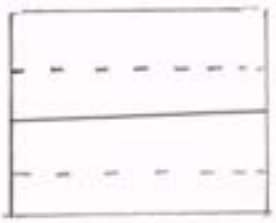

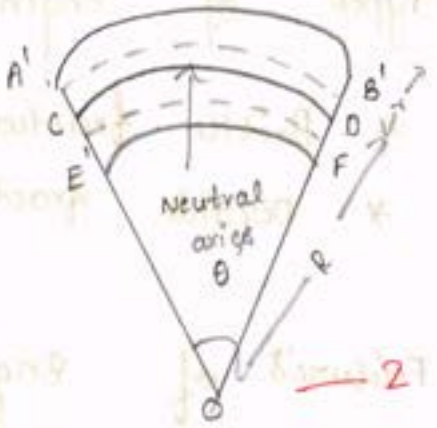

— 2

Let R be the radius of the circle to which the neutral surface forms a Pose.

$CD = R\theta$ — 1

Successive layers are separated by a distance r then

$A'B' = (R+r)\theta$ — 1

09

Young's modulus $Y = \frac{\text{Longitudinal Stress}}{\text{Linear Strain}}$

Longitudinal Stress $= Y\left(\frac{r}{R}\right)$

$\text{Stress} = \frac{F}{a}$ — 1

Moment of the force acting on the entire beam $= \frac{Y}{R} \Sigma ar^2$ — 1

Bending moment $= \frac{Y}{R} I_g$ — 1

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2.b) Types of engineering materials

* Brittle fracture
* Ductile fracture

4

Failure's of Engineering material.

* Effect of stress concentration
* The influence of size factor
* Influence of surface processing state
* The impact of loading experience
* Influence of Inclusions
* Effect of heat treatment.
* Influence of chemical composition.

2

06

Given data :- $x = 1mm$, $Y = 100\ GPa$ (aparent) $L = 1m$

2.c) $d = 1mm$ $F = ?$

05

we have :- $Y = \frac{FL}{ax}$ $F = \frac{Yax}{L}$

$a = \pi r^2$ $r = \frac{d}{2} = \frac{1 \times 10^{-3}}{2} = 0.5 \times 10^{-3} m$

$a = 7.855 \times 10^{-7} m^2$

$F = 78.55N.$

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3.a Light amplification by stimulated emission of radiation - LASER — 1

Interation of radiation with matter

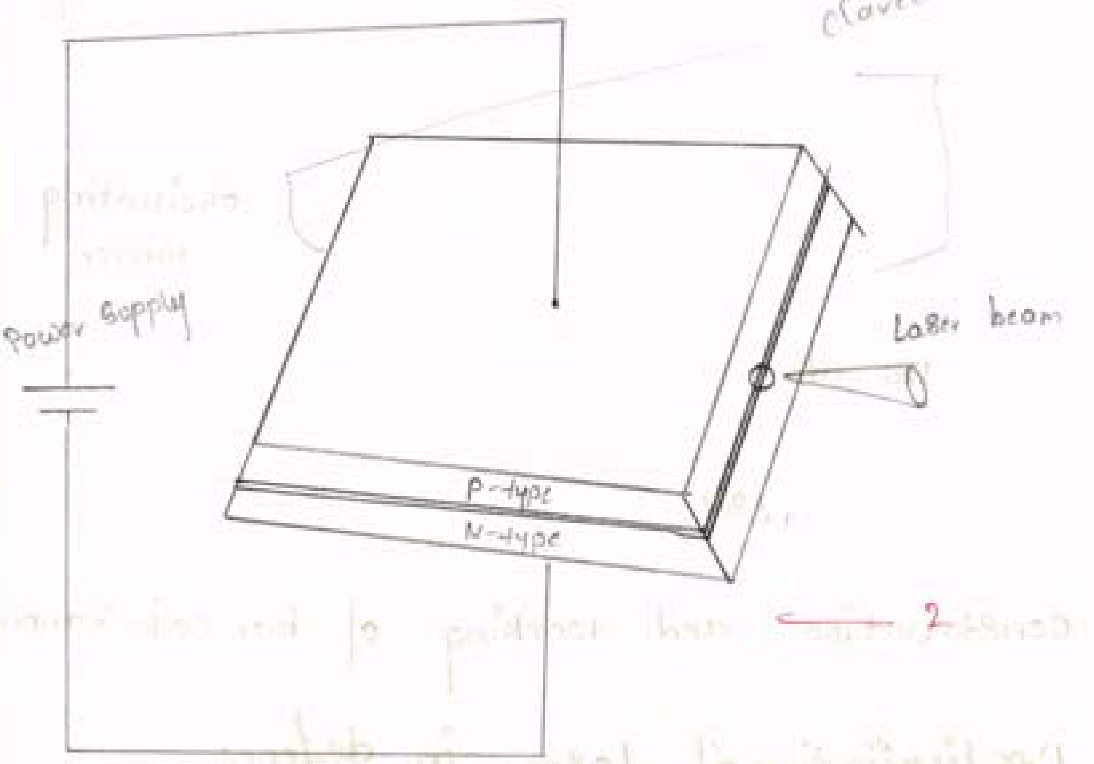
* Induced absorption
* Spontaneous emission
* Stimulated emission

} 6

07

3.b. Constowction and working of Semiconductor LASER. — 6

08



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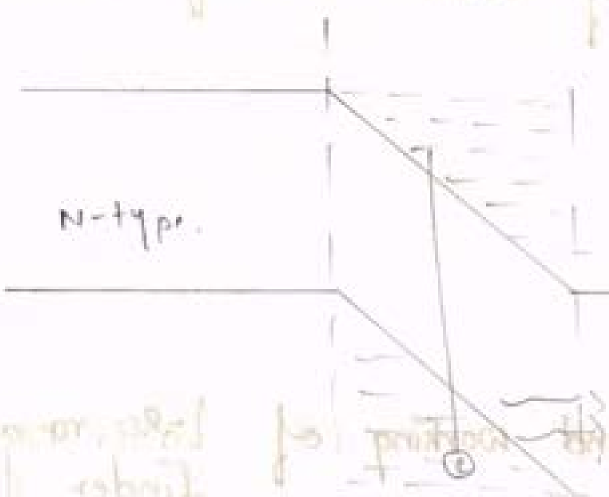


3.c.

Given data: $P_{out} = 1 \times 10^{-3} W$, $\lambda = 692 \times 10^{-9} m$

Solution :- $N \times \Delta E = P_{out}$

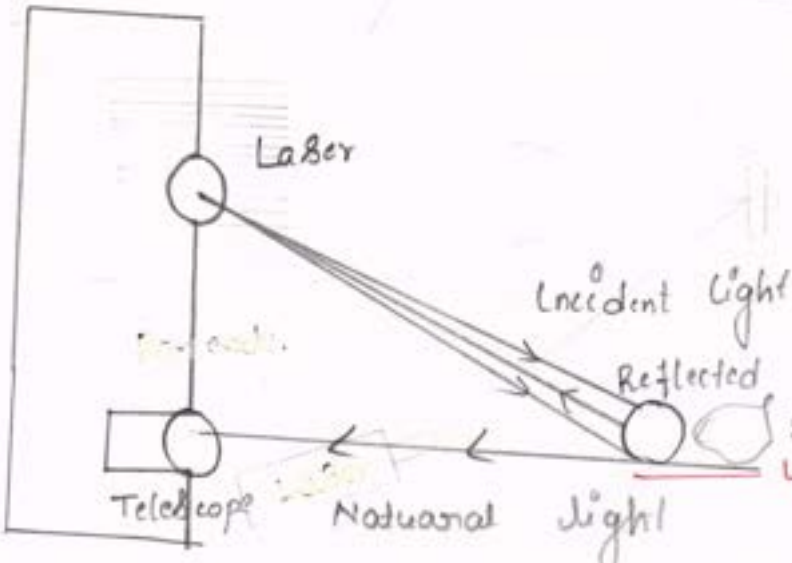
$$\Delta E = \frac{hc}{\lambda} = \frac{(6.6 \times 10^{-34})(3 \times 10^{8})}{692 \times 10^{-9}} = 2.857 \times 10^{-19}$$

$$N = \frac{P_{out}}{\Delta E} = \frac{1 \times 10^{-3}}{2.857 \times 10^{-19}} = 3.498 \times 10^{15}$$

05

4. a)

Laser range finder in defense :-



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4

Applications of Laser in defence.

— 4

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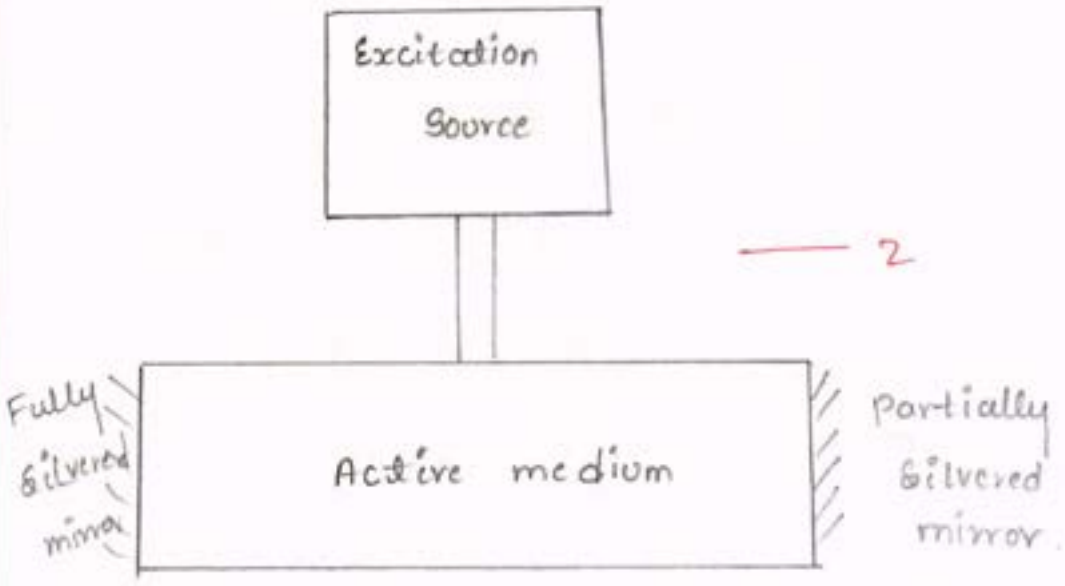
Construction and working of Laser range finder.

4.b) Requisites of Laser System.



2

07

* Excitation Source
* Active medium
* Laser @ optical resonant cavity.

5

4.c) Given data :-

$\Delta E = 2 \times 10^{-19}$, $P_{out} = 4 \times 10^{-3}$ W

To find out :- $N = ?$

$N \times \Delta E = P_{out}$

05

$$N = \frac{P_{out}}{\Delta E} = \frac{4 \times 10^{-3}}{2 \times 10^{-19}} = \underline{2 \times 10^{16}}$$

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Shridevi Institute of Engineering and Technology, Tumkur-06

I Semester: CIE III Internal Assessment Test:27/03/2023

BPHYS102- Applied Physics for CSE Stream

Time: 3 Hours **Max.Marks: 100**

Note: 1. ***Answer any five full Questions choosing ONE full question from each module***

2. Physical constants: Planck's constant h = 6.626 x 10^{-34} JS, Mass of electron m = 9.11 x 10^{-31}kg, Boltzmann constant K = 1.38 x 10^{-23} J/K, Avogadro number charge e = 1.602 x10^{-19}C and velocity of Light C = 3 x 10^{8} m/S.

Module -1

1	a.	Obtain the expression for Energy Density using Einstein's A and B coefficients and thus conclude on B12=B21.	**(CO1 08 Marks)**
	b.	Define LASER and Discuss the interaction of radiation with matter.	**(CO1 07 Marks)**
	c.	Given the Numerical Aperture 0.30 and RI of core 1.49 Calculate the critical angle for the core-cladding interface.	**(CO1 05 Marks)**

Or

2	a.	Illustrate the construction and working of Semiconductor LASER with a neat sketch and energy level diagram also mention its applications.	**(CO1 08 Marks)**
	b.	Discuss the types of optical fibers based on Modes of Propagation and RI profile.	**(CO1 07 Marks)**
	c.	Obtain the attenuation co-efficient of the given fiber of length 1500 m given the input and output power 100 mW and 70 mW.	**(CO1 05Marks)**

Module - 2

3	a.	Explain the Wave function with mathematical form and Discuss the physical significance of a wave function.	**(CO2 08 Marks)**
	b.	Set up time independent one dimensional schrodinger wave equation.	**(CO2 08 Marks)**
	c.	Calculate the energy of the first three states for an electron in one dimensional potential well of width 0.1 nm.	**(CO2 04 Marks)**

Or

4	a.	State Heisenberg's Uncertainty Principle. Show that electron cannot exist inside the nucleus.	**(CO2 08 Marks)**
	b.	Obtain energy values and normalized wave function with respect to a particle in a one dimensional potential well of infinite height.	**(CO2 08 Marks)**
	c.	A particle of mass 0.5 MeV/c^2 has a kinetic energy 100 eV. Find the de-Broglie wavelength. (c is the velocity of light).	**(CO2 04 Marks)**

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Module-3

5 a. Elucidate the differences between classical and quantum computing. **(CO2 07 Marks)**

b. Describe the working of controlled-Z gate mentioning its matrix representation and truth-table. **(CO2 08 Marks)**

c. Using matrix multiplication show that on applying Hadamard gate twice a $|0\rangle$ results in its original state. **(CO2 05 Marks)**

Or

6 a. Explain the representation of qubit using Bloch Sphere. **(CO2 07 Marks)**

b. State the Pauli matrices and apply Pauli matrices on the states $|0\rangle$ and $|1\rangle$. **(CO2 08 Marks)**

c. A Linear Operator 'X' operates such that $X|0\rangle = |1\rangle$ and $X|1\rangle = |0\rangle$. Find the matrix representation of 'X'. **(CO2 05 Marks)**

Module- 4

7 a. Enumerate the failures of classical free electro theory and assumptions of quantum free electron theory of metals. **(CO3 08 Marks)**

b. Discuss BCS theory of superconductivity. **(CO3 07 Marks)**

c. Find the temperature at which there is 1% probability that a state with energy 0.5 eV above the Fermi energy is occupied. **(CO3 05 Marks)**

Or

8 a. Define Fermi factor & Discuss the variation of Fermi factor with Temperature and effect on occupancy of energy levels. **(CO3 07 Marks)**

b. Explain DC and AC Josephson effects. **(CO3 08 Marks)**

c. A superconducting tin has a critical temperature of 3.7 K at zero magnetic field and a critical field of 0.0306 Tesla at 0 K. Find the critical field at 2 K. **(CO3 05 Marks)**

Module-5

9 a. Discuss timing in Linear motion, Uniform motion, slow in and slow out. **(CO4 07 Marks)**

b. Discuss modeling the probability for proton decay. **(CO4 08 Marks)**

c. The number of particles emitted per second by a random radioactive source has a Poisson's distribution with $\lambda = 4$. Calculate the probability of $P(X = 0)$ and $P(X = 1)$. **(CO4 05 Marks)**

Or

10 a. Describe Jumping and parts of jump. **(CO4 07 Marks)**

b. Illustrate the odd rule and odd rule multipliers with a suitable example. **(CO4 08 Marks)**

c. A slowing-in object in an animation has a first frame distance 0.5m and the first slow in frame 0.35m. Calculate the base distance and the number of frames in sequence. **(CO4 05 Marks)**

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Question No

CIE III Internal Assessment Test.

BPHYS102 - Applied Physics for CSE stream

Marks

1.a) Expression for Energy density using Einstein's A and B co-efficients

Rate of absorption $= B_{12} N_1 U_\nu$ ——— (1)

Rate of Stimulated emission $= B_{21} N_2 U_\nu$ ——— (1)

Rate of Spontaneous emission $= A_{21} N_2$ ——— 1

At thermal equilibrium :-

Rate of absorption = Stimulated emission + Spontaneous emission ——— 1

$$U_\nu = \frac{A_{21}}{B_{21}} \left[\frac{1}{\frac{B_{12} N_1}{B_{21} N_2} - 1} \right] \quad \text{——— 1} \qquad 08$$

Acc Boltzmann's law $\frac{N_2}{N_1} = e^{-\frac{(E_2 - E_1)}{KT}}$

$$\frac{N_1}{N_2} = e^{\frac{h\nu}{KT}} \quad \text{——— 1}$$

Acc Planck's law ——— 1

$$U_\nu = \frac{8\pi h\nu^3}{c^3} \left[\frac{1}{e^{\frac{h\nu}{KT}} - 1} \right]$$

$B_{12} = B_{21}$ ——— 1

$$U_\nu = \frac{A}{B} \left[\frac{1}{e^{\frac{h\nu}{KT}} - 1} \right]$$

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1.b. LASER :- Light amplification by stimulated emission of radiation. — 1

Interaction of radiation with matter. — 2

* Induced absorption — 2
* Spontaneous emission — 2
* Stimulated emission — 2

07

1.c. Given data :- $NA = 0.30$

$N_1 = 1.49$.

To find out = $\theta_c = ?$

Solution :- $NA = \sqrt{N_1^2 - N_2^2}$

$NA^2 = N_1^2 - N_2^2$

$N_2^2 = N_1^2 - NA^2$

$N_2 = \sqrt{(1.49)^2 - (0.30)^2}$

$N_2 = 1.45$.

$\theta_c = \sin^{-1} \frac{N_2}{N_1}$

$\theta_c = \sin^{-1} \left[\frac{1.45}{1.49} \right]$

$\theta_c = 76.69^0$

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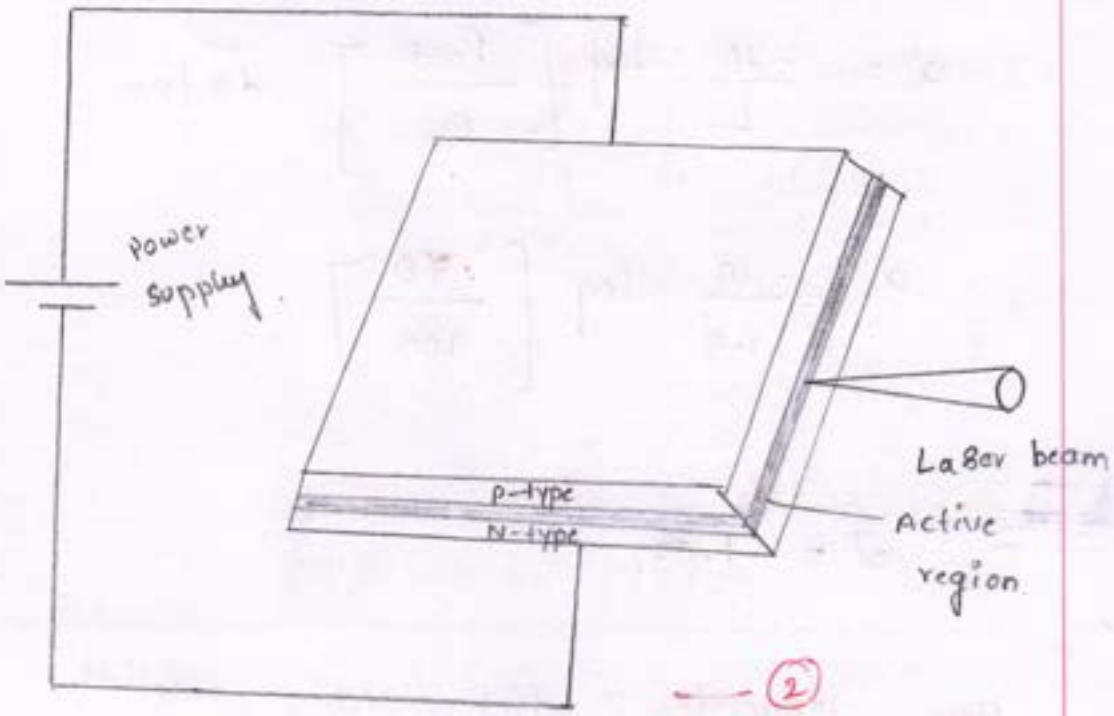
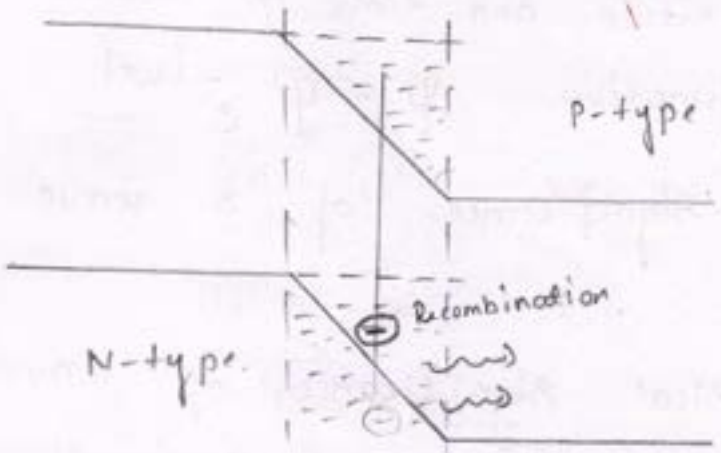
2.a) **Semiconductor LASER:-**



— (2)



— (1)

08.

Construction and working of Semiconductor Laser & application. — (5)

2.b) Types of optical fiber

* Single mode step index OF
* multimode step index OF
* Graded index multimode OF

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2.c. Given data :-

$L = 1500m$ $P_{out} = 70\ mW$ $P_{in} = 100\ mW$

$$\alpha = \frac{-10}{L} \log\left[\frac{P_{out}}{P_{in}}\right] \quad dB/km$$

$$\alpha = \frac{-10}{1.5} \log\left[\frac{70}{100}\right]$$ 05.

$$\alpha = 1.032$$

3.a). Any function which vary with both position and time is called wave function, $\psi = \psi e^{-i\omega t}$ — (2)

Physical significance of a wave function

The Physical significance of wave function ψ could be realized through it's probabilistic nature which is well decipated in quantum mechanics in terms of probability density — 3. 08.

$$|\psi|^2 = \psi^* \psi$$ — 1

$$\int_0^{\tau} |\psi|^2 \, d\tau = 1.$$ — 1

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3.b. $\lambda = \frac{h}{mv}$ — 1

$\psi = A e^{i(kx - \omega t)}$ — 1

$\frac{d^2\psi}{dt^2} = -\omega^2 e^{-i\omega t} \psi$ — 1

$\frac{d^2\psi}{dt^2} = -\omega^2 e^{-i\omega t} \psi$ — 1

08

$\frac{d^2\psi}{dx^2} = \frac{1}{v^2} \frac{d^2\psi}{dt^2}$ — 1

$\frac{1}{\lambda^2} = -\frac{1}{4\pi^2\psi} \frac{d^2\psi}{dx^2}$ — 1

$KE = -\frac{h^2}{8\pi^2 m\psi} \frac{d^2\psi}{dx^2}$ — 1

$\frac{d^2\psi}{dx^2} + \frac{8\pi^2 m}{h^2}(E - V)\psi = 0.$ — 1

3.c

Given

$E_1 = ?$

$E_2 = ?$

$E_3 = ?$

$a = 0.1\,nm$

$a = 0.1 \times 10^{-9}\,m$

$h = 6.626 \times 10^{-34}\,Js$

$m = 9.1 \times 10^{-31}\,kg$

$E_n = \frac{n^2 h^2}{8ma^2}$

For E_1, $n = 1$

$E_1 = \frac{h^2}{8ma^2} = \frac{(6.626 \times 10^{-34})^2}{8 \times 9.1 \times 10^{-31} \times (0.1 \times 10^{-9})^2}$ 04

$E_1 = 6.024 \times 10^{-18}\,J$

For E_2, $n = 2$, $E_2 = n^2 E_1$

$= 4E_1 = 24.09 \times 10^{-17}\,J$

For E_3, $n = 3$ $E_3 = n^2 E_1 = 9E_1$

$= 5.421 \times 10^{-17}\,J$

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4.a) In any simultaneous determination of the position and momentum of a particle the product of the corresponding uncertainties inherently present in the measurement is greater than or equal to $(h/4\pi)$ —— 1

$$\Delta x \, \Delta P \geq \frac{h}{4\pi} \quad \text{—— 1}$$

Non existance of electron in the atomic Nucleus.

$$\Delta x \, \Delta p \geq \frac{h}{4\pi} \quad \text{—— 1}$$

08

$$\Delta P \geq \frac{h}{4\pi \Delta x}$$

$$\Delta x \leq 5 \times 10^{-15} \text{ m} \quad \text{—— 1}$$

$$\Delta P = 1.1 \times 10^{-20} \text{ kg m s}^{-1} \quad \text{—— 1}$$

$$P \geq 1.1 \times 10^{-20} \text{ kg m s}^{-1}$$

$$E^2 \geq p^2c^2 + m_0^2c^2 \quad \text{—— 1}$$

$$E^2 \geq (1.1 \times 10^{-20})^2 (3 \times 10^8)^2 +$$

$$(9.1 \times 10^{-31})^2 (3 \times 10^8)^2 \quad \text{—— 1}$$

$$E \geq 20.6 \text{ Mev.} \quad \text{—— 1}$$

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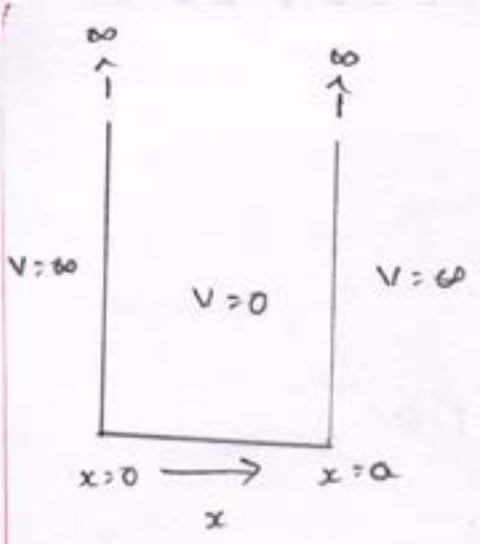
4.b)



—1

Inside the well ($V = 0$) time independent Schrodinger equation is given by

$$\frac{d^2\psi}{dx^2} + \frac{8\pi^2 m}{h^2} E\psi = 0$$ —1

$$k^2 = \frac{8\pi^2 m}{h^2} E$$

$$\psi = C\cos kx + D \sin kx$$

$$k = \frac{n\pi}{a}$$

$$\psi_n = D \sin \frac{n\pi}{a} x$$ —1

$$E = \frac{k^2 h^2}{8\pi^2 m}$$

$$E_n = \frac{n^2 h^2}{8ma^2}$$ —1

08

$$E_{\text{zero point}} = \frac{h^2}{8ma^2}$$ —1

Normalization of wave function.

$$\int_0^a |\psi_n|^2 \, dx = 1$$ —1

$$\psi_n = D \sin \frac{n\pi}{a} x$$

$$\sin(2n\pi) = 0$$

$$D = \sqrt{\frac{2}{a}}$$ —1

$$\psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi}{a} x$$ —1

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4.c) $$\lambda = \frac{h}{\sqrt{2mE}}$$

$$= \frac{6.626 \times 10^{-34}}{\sqrt{2 \times 8.9 \times 10^{-3} \times 10^{-17} \times 1.602}}$$

$$= 1.24 \times 10^{-24}$$

5.a) difference between classical and Quantum computing.

Classical computing	Quantum computing
1. Used by large scale, multipurpose and devices.	1. circuit behavier is defined by Quantum mechanics.
2. Information is stored in bits	2. Information is based on Quantum bits
3. There is a No of possible states either 0 or 1.	3. Used by high speed. quantum mechanics based computer.

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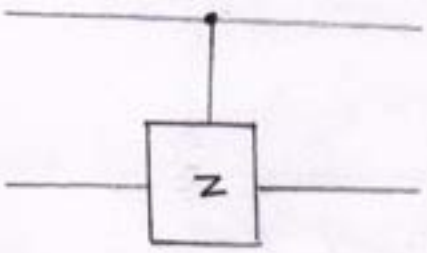
5.b. Controlled Z Gate.

$$U_2 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

08



Input	output
$\|00\rangle$	$\|00\rangle$
$\|01\rangle$	$\|01\rangle$
$\|10\rangle$	$\|10\rangle$
$\|11\rangle$	$-\|11\rangle$

5.C To show that $HH\,|0\rangle = |0\rangle$

$$HH = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}\frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} = \frac{1}{2}\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I$$

05

$$I\,|0\rangle = |0\rangle$$

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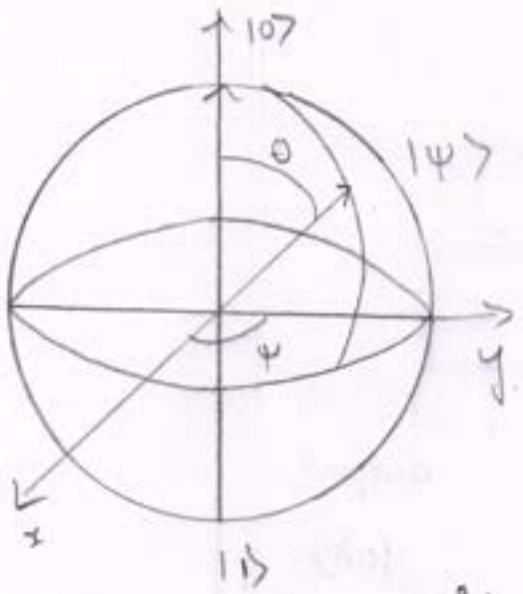
6.a Representation of Qubits by Bloch Sphere.

The pure State Space qubits (two level Quantum mechanics System) can be visualized using an imaginary sphere called Bloch Sphere



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$$|\psi\rangle = \cos\frac{\theta}{2}|0\rangle + e^{i\phi}\sin\frac{\theta}{2}|1\rangle$$

$$\left|\cos\frac{\theta}{2}\right|^2 + \left|\sin\frac{\theta}{2}\right|^2 = 1$$

6.b. Pauli matrices are 2X2 matrices, which are very much useful in the study of quantum computing and Quantum information.

Pauli matrices are given by

$$\sigma_0 = I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\sigma_1 = \sigma_2 = X = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

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$$\sigma_2 = \sigma_y = Y = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}$$

$$\sigma_3 = \sigma_z = Z = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

Pauli matrix σ_0 operating on $|0\rangle$ and $|1\rangle$ state

$$\sigma_0 = \sigma_0 |1\rangle = |0\rangle$$

Pauli matrix $\sigma_x = \sigma_1$ operating $|0\rangle$ and $|1\rangle$ state

$$\sigma_x = \sigma_x |1\rangle = |0\rangle$$

Pauli matrix $\sigma_y = \sigma_2$ operating on $|0\rangle$ and $|1\rangle$ state

$$\sigma_y = \sigma_y |0\rangle = -i|0\rangle$$

Pauli matrix $\sigma_z = \sigma_3$ operating on $|0\rangle$ and $|1\rangle$ state

$$\sigma_z = \sigma_z |0\rangle = -|1\rangle$$

G.C.

$$X = \begin{bmatrix} x_{11} & x_{12} \\ x_{21} & x_{22} \end{bmatrix} \quad |0\rangle = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad |1\rangle = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

Given $X|0\rangle = |1\rangle$

$$X = \begin{bmatrix} x_{11} & x_{12} \\ x_{21} & x_{22} \end{bmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

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Multiplying the matrices on LHS and equating with the matrix on RHS we get

$$X_{11} = 0 \qquad X_{21} = 1$$

Given $X|1\rangle = 1$ 05

$$X = \begin{bmatrix} X_{11} & X_{12} \\ X_{21} & X_{22} \end{bmatrix} \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$\therefore X = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$$

7.a) failure of classical free electron theory

1. Specific heat
2. Temperature dependence of electrical conductivity.
3. Dependence of electrical conductivity on electron concentration.

— 4

Assumption of Quantum free electron theory 08

1. The energy values of the condution electron are quantized.
2. Distribution of electron as per pauli's Exclusion principle.
3. The electron travelled in cont potential
4. Repulsion blw e^- and Ion and repulsion themselfs.

— 4

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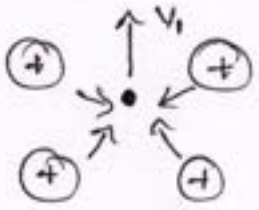
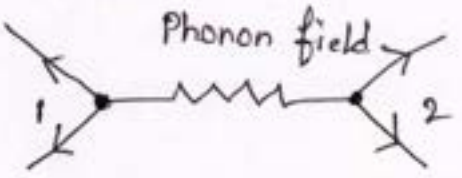
7.b) BCS Theory :-

* The BCS theory is based upon the formation of cooper pairs cooper pair is a bound pair of electrons formed by the interaction between the eletron with opposite spin and momento in a phonon field.





* During the flow of current in a superconduction it experiences an attractive force because of the opposite charge polarity between electron and the ion core the positive ion core will be displaced from it's position which is called lattice distortion. Now an other electron which comes near that place will also interact with the distorted lattice. They Process is called eletron eletron interaction via the phonon field

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7.c. $$f(E) = \frac{1}{e^{\left(\frac{E-E_F}{KT}\right)} + 1}$$

$$0.01 = \frac{1}{e^{\frac{8.01\times10^{-20}}{1.38\times10^{-23}\times T}} + 1}$$

$$T = 1263.17$$

8.a Fermi factor is the probability of occupation of a given energy state for a material in thermal equilibrium $f(E) = \frac{1}{e^{\left(\frac{E-E_f}{KT}\right)} + 1}$

Case -(i) $E < E_F$ $T = 0K$ $f(E) = 1$

case (ii) $E > E_F$ $T = 0K$ $f(E) = 0$

case (iii) $E = E_F$ $T = 0K$ $f(E) = 0.5$ or $\frac{1}{2}$

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8.b) DC and AC Josephson effects

DC Josephson effect.

* It is the phenomenon of flow of super current through the junction even in the absence of external emf. if the voltage across the junction is measured it gives zero.

$$I_s = I_c \sin \phi_c$$

AC Josephson effects.

* When DC voltage is applied across the Josephson junction it leads to the development oscillating current in other words an alternating emf of high fouquency established across the junction This effect is called AC Josephson effect.

$$I_s = I_c \sin(\phi_0)$$

$$\Delta\phi = 2\pi t \left(\frac{2eV}{h}\right)$$

$$\gamma = 2eV/h$$

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8.c. Given

$H_c = ?$

$H_o = 0.0306$

$T = 2K$

$T_c = 3.7K$

$$H_c = H_o \left(1 - \frac{T^2}{T_c^2}\right)$$

$$H_c = 0.0306 \left(1 - \frac{(2)^2}{(3.7)^2}\right)$$

$$H_c = 0.0306 \times 0.707$$

$$\boxed{H_c = 0.0216}$$

9. a). Linear motion ~~timing~~ of refers to motion in a straight line always in the same direction.

Uniform motion :- When uniform motion occurs the net force on the object is zero. Net force is the total of all forces there might be several force acting on object.

Slow in and slow out :-

Slow in - The object is slowing down. often in preparation for stopping

Slow out - The object speeding often from the still position.

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9.b The Experimental Search for Proton decay was undertaken because of the implications of the grand unification Theories.

$$N = N_0 e^{-\lambda t}$$

$$e^{-\lambda t} = 1 - \lambda t \quad \text{thus} \quad N \approx N_0 (1 - \lambda t)$$

$$N - N_0 = N_0 \lambda t = (7.5 \times 10^{33})(10^{-33})(1 \text{ year}) = 7.5$$

$$P(k) = \frac{\lambda^k e^{-\lambda}}{k!} \qquad p(k) = \frac{3^0 e^{-3}}{0!} = 0.05.$$

9.c Given data:-

$\lambda = 4$, $P(x=0)$, $P(x=1)$

Solution:-

$$P(k) = \frac{\lambda^k e^{-\lambda}}{k!}$$

$$P(x=0) = \frac{4^0 e^{-4}}{0!} = 0.018$$

$$P(x=1) = \frac{4^1 e^{-4}}{1!} = 0.073$$

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10. a) Jamping and parts of jump.

A jump is an action where the characters entire body is in the air, and both the character's feet leave the ground at the same time. A jump action includes a takeoff, free movement through the air, and a landing.

Parts of Jump.

* Crouch
* Takeoff.
* In the air
* Landing.

10. b. The odd Rule :- When acceleration is constant, one can use the odd Rule to time the frames. with this method one calculate the distance the object moves between frames using a simple pattern of odd numbers.

	Multiply by base distance to get distance b/w	
Frame #	Consecutive frames	First frame and this frame.
1	n/a	0
2	1	1
3	3	4
4	5	9
5	7	16
6	9	25

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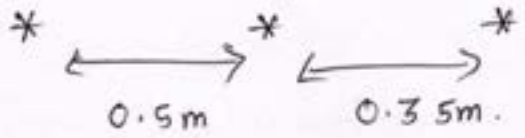
10.c

Given data :-

first frame distance 0.5m

Slow in frame 0.35m.



Base distance $= \frac{0.5 - 0.35}{2} = 0.07m$

~~No of frame in sequence~~ $= \frac{0.5}{0.07} = 7$

~~7 frames.~~

To find out which odd Number it coooresponds to $\frac{0.5}{0.07} = 7$

∴

Frame #	Consecutive frame multiplier	Distance from previous frame.
1	7	0.5 m
2	5	0.35 m
3	3	0.21 m
4	1	0.07 m

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Shridevi Institute of Engineering and Technology, Tumkur-06

I Semester: CIE III Internal Assessment Test:27/03/2023

BPHYC102- Applied Physics for CV Stream

Time: 3 Hours **Max.Marks: 100**

Note: 1. ***Answer any five full Questions choosing ONE full question from each module***

2. Physical constants: Planck's constant h = 6.626 x 10^{-34} JS, Mass of electron m = 9.11 x 10^{-31}kg, Boltzmann constant K = 1.38 x 10^{-23} J/K, Avogadro number charge e = 1.602 x10^{-19}C and velocity of Light C = 3 x 10^{8} m/S.

Module -1

1	a.	Define SHM. Mention the characteristics and examples of SHM. Derive the differential equation of motion for it using Hook's law.	**(CO1 07 Marks)**
	b.	With a neat diagram explain the construction and working of Reddy shock tube.	**(CO1 08 Marks)**
	c.	Given the damping constant of the medium 0.1 kg s^{-1} calculate the amplitude of the oscillations at resonance given the mass attached to the spring-mass oscillator 50 x 10^{-3} kg, the amplitude of the applied periodic force 1N and the period of oscillations 1 second.	**(CO1 05 Marks)**

Or

2	a.	Define Stiffness factor of a spring and hence derive expressions for the effective spring constant of springs in series and parallel combinations.	**(CO1 07 Marks)**
	b.	What are damped oscillations? Give the theory of damped oscillation	**(CO1 08 Marks)**
	c.	An object travels a distance of 1km in 2s. Given the speed of sound in air 340 ms-1 calculate the mach number.	**(CO1 05 Marks)**

Module - 2

3	a.	Define Bending Moment and derive an expression for bending moment with the help of a neat sketch.	**(CO1 09 Marks)**
	b.	Define a Beam and classify the types of beams.	**(CO1 06 Marks)**
	c.	Calculate the force required to produce an extension of 1 mm in wire made of material with Young's Modulus 100 Gpa and of length 1 m and diameter 1 mm.	**(CO1 05 Marks)**

Or

4	a.	Define Poisson's ration and derive the relation between Young's Modulus, Rigidity Modulus and Poisson's ratio.	**(CO1 09 Marks)**
	b.	Discuss the brittle and ductile fractures.	**(CO1 06 Marks)**
	c.	Consider a steel wire of radius 0.13 mm and length 2m. If the wire is rigidly fixed at one and loaded at the other with a mass of 1.5 kg the extension observed is 2 mm. Calculate the Young's Modulus of the material of the wire.	**(CO1 05 Marks)**

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Module-3

5	a.	Define Photometry and explain photometric quantities.	**(CO2 07 Marks)**
	b.	Discuss the factors affecting acoustics of buildings and remedial measures.	**(CO2 08 Marks)**
	c.	For an empty assembly hall of size 20 x15 x 10 cubic meter with absorption coefficient 0.106. Calculate reverberation time.	**(CO2 05 Marks)**

Or

6	a.	Define reverberation and reverberation time and hence derive Sabines Formula.	**(CO2 09 Marks)**
	b.	Elucidate the Impact of Noise in Multi-storied buildings.	**(CO2 06 Marks)**
	c.	A hall of volume 5500 m^3 is found to have a reverberation time of 2.3 sec. The sound absorbing surface of the hall has an area of 750 m^2. Calculate the average absorption coefficient.	**(CO2 05 Marks)**

Module- 4

7	a.	Define attenuation in fiber with the expression for attenuation coefficient and describe the various fiber losses.	**(CO3 08 Marks)**
	b.	Give brief description of application of LASER in Road Profiling, Bridge Deflection and Speed Checker.	**(CO3 07 Marks)**
	c.	Calculate the Numerical aperture and acceptance angle for an optical fiber of RI of core 1.5 and RI of cladding 1.45 placed in water of RI 1.33.	**(CO3 05 Marks)**

Or

8	a.	Define Numerical Aperture and hence derive an expression for numerical aperture in terms of the RIs of core, cladding and the Surrounding.	**(CO3 08 Marks)**
	b.	Discuss the construction and working of laser in LASER range finder and its application in defense.	**(CO3 07Marks)**
	c.	Calculate the number of photons emitted per second for a LASER with power output 10mW given the wave length of fiber 690 nanometer.	**(CO3 05Marks)**

Module-5

9	a.	Discuss the classification of Earthquakes.	**(CO4 08Marks)**
	b.	Define Landslide and describe the causes for landslides.	**(CO4 07Marks)**
	c.	Calculate the intensity of earthquake of magnitude 6.5 assuming the base intensity as I_0	**(CO4 05Marks)**

Or

10	a.	Discuss the Engineering structures to withstand earthquakes and Tsunami waves.	**(CO4 08Marks)**
	b.	Enumerate the the causes and adverse effects of tsunami waves.	**(CO4 07Marks)**
	c.	The intensity of one earthquake is 100 times the intensity of the other. If the magnitude of the first earthquake is 8.9 estimate the magnitude of the other.	**(CO4 07Marks)**

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Question No	I Sem. CIE III Internal Assessment 27/03/23 BPHYC102 - Applied Physics for CV Stream	Marks

1. a) SHM: It is defined as a motion in which the accelaration of the body is directly propotional to it's displacement from a fixed point and is always directed towards the fixed point. — 2

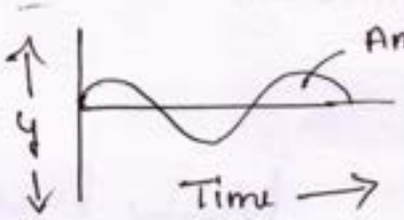
Characteristics:

* It is a particular types of periodic motion — 1.
* The oscillating system must have inertia which in turn means mass. — 1

Example:

* Excited tuning fork. — 1
* A shock absorber after being bumped

Derivation of differential Equation of motion for SHM



$F = -ky$ — 1

$F = m\frac{d^2y}{dt^2}$

$\frac{d^2y}{dt^2} + \frac{k}{m}y$

$y = a\sin\omega t.$ — 1

07

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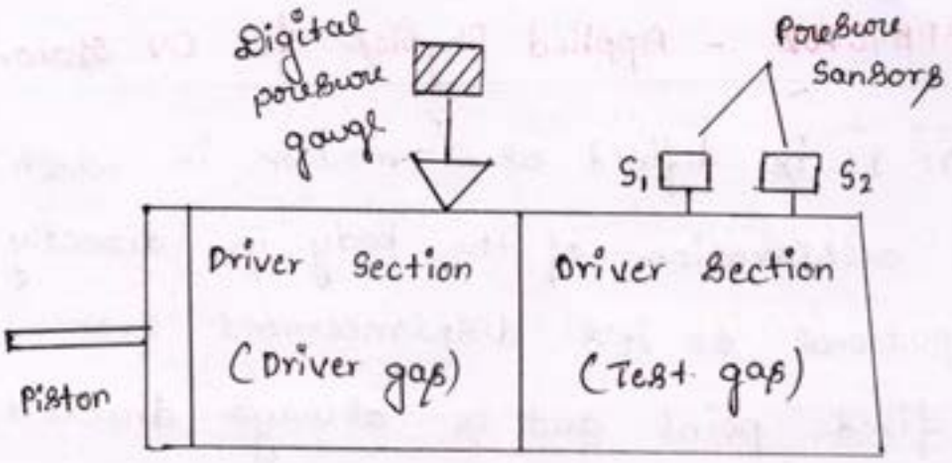
1.b) Reddy Shock Tube :



— 2

Construction and working of Shock tube.

— 6

08

1.c)

$$a_{max} = \frac{F/m}{2bw}$$

$$b = \frac{r}{2m} = \frac{2 \times \pi}{2 \times 50 \times 10^{-3}} = 1$$

$$\omega = \frac{2\pi}{T} = \frac{2 \times \pi}{1} = 6.283$$

$$a_{max} = \frac{1/50 \times 10^{3}}{2 \times 1 \times 6.283} = 1.591$$

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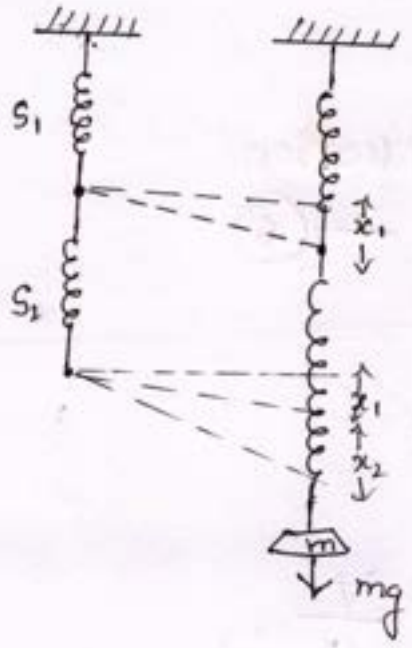
2. a) Force constant (represent) is defined as. it is the magnitude of the applied force that produces unit Extention (or compression) in the spring while it is loaded within the elastic limit.

force constant for series combination.



$$F = -k_1 x_1$$

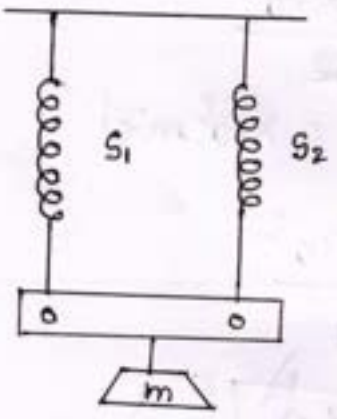
$$x_1 = \frac{-mg}{k_1}$$

$$x_2 = \frac{-mg}{k_2}$$

$$\frac{1}{k_s} = \frac{1}{k_1} + \frac{1}{k_2}$$

$$k_s = \frac{k_1 k_2}{k_1 + k_2}$$

Force constant for parallel combination :-



$$F_p = -k_p x$$

$$F_p = F_1 + F_2$$

$$F_p = -k_1 x_1 - k_2 x_2$$

$$F_p = -(k_1 + k_2) x$$

$$k_p = k_1 + k_2$$

$$T = 2\pi \sqrt{\frac{m}{k_p}}$$

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2.b) The motio Executed by a body Subjected to the combined action of both the restoring and resistive forces and the motion always gets terminated with the body coming to a rest at the Equilibrium position in a finite interval of time This is called damped oscillat -ion — (2)

Theory of damped oscillation. — (6)

08

2.c. Given

$x = 1\text{km} = 1 \times 10^3 \text{m}$

$t = 2\text{s}$

$a = 340 \text{ m/sec}$

$\mu = ?$

$$\mu = \frac{V}{a}$$

But $V = \frac{x}{t}$

$$= \frac{1 \times 10^3}{2}$$

$$V = 0.5 \times 10^3 \text{ ms}^{-1}$$

$$\mu = \frac{0.5 \times 10^3}{340}$$

$$\boxed{\mu = 1.470}$$

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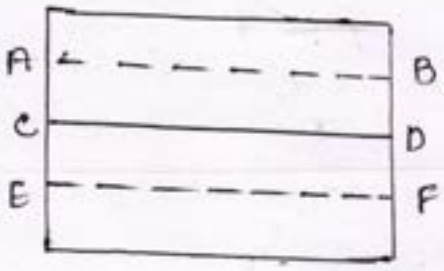
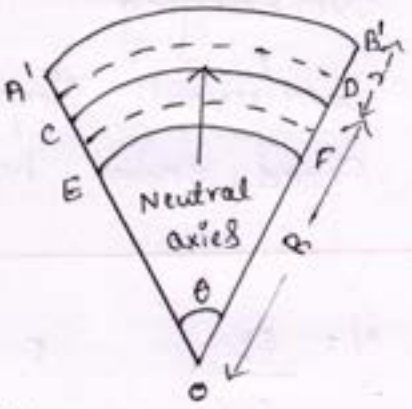
3.a. a uniform beam made up of large number of parallel equidistant planes above and below the neutral axies after the bending it forms the arcs of a circle with radius of curvature R above the neutral planes an elongation strain and below compressive strain acted.





change in length $= A'B' - AB$

$A'B' = (R+r)\theta$

young's modulus $Y = \frac{\text{Longitudinal Stress}}{\text{Linear Strain}}$

$$\text{Stress} = F/a$$

$$F = \frac{Yar}{R}$$

Moment of this force about the neutral axis.

$= F \times$ it's distance from neutral axis.

$$= \frac{\Sigma Yar^2}{R}$$

Bending moment $= \frac{Y}{R} I_g$.

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3.b) Beams are the structural element that primarily resists loads applied laterally to the beams axis. — 2

Types of Beams :

* Cantilever
* Simply supported.
* Overhanging
* Continuous simple
* Fixed ended beams. — 7

09

3.c $Y = \frac{FL}{ax}$ $\quad F = \frac{Yax}{L}$

$a = \pi r^2$ $\quad r = d/2$

$a = \pi \times (0.5 \times 10^{-3})^2 = 7.85 \times 10^{-7}$

$$F = \frac{(100 \times 10^9)(7.85 \times 10^{-7})(1 \times 10^{-3})}{1}$$

$= 78.53$ N.

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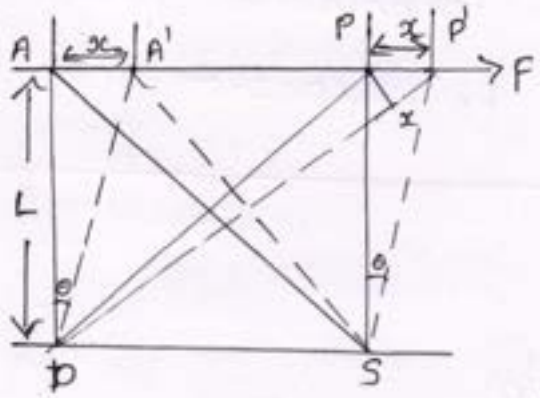
4. a) Poisson's Ratio: Within the elastic limits of a body the ratio of lateral strain to the longitudinal strain is a constant is called poisson's ratio. — 2

Relation between Y, n, and σ.



— 2

09

∴ Total Extension along DP = DP. T (α+β)

∴ P'x = DP. T (α + β) — 1

$$2(\alpha+\beta) = \frac{x}{TL}$$

$$n = \frac{1/\alpha}{2(1+\sigma)}$$ — 1

$$Y = \frac{\text{Stress}}{\text{Longitudinal Strain}} = 1/\alpha$$ — 1

$$n = \frac{Y}{2(1+\sigma)}$$ — 1

$$Y = 2n(1+\sigma)$$ —

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4.b. Explination of brittle fractures — 3

Brittle fracture is the sudden and rapid metal failure in which the material shows little or no plastic strain.

06

Explination of Ductile fractures — 3

Ductile fracture is the material failure that exhibits substantial plastic defor - mation prior to fracture.

4.c. Given

$r = 0.13\,mm = 0.13 \times 10^{-3}\,m$

$c = 2\,m$

$M = 1.5\,kg$

$x = 2\,mm \Rightarrow 2 \times 10^{-3}\,m$

$y = ?$

We have relation

$$y = \frac{F/L}{ax}$$

but $a = \pi r^2$

$a = 3.142 \times (0.13 \times 10^{-3})^2$

$a = 5.309 \times 10^{-8}\,m^2$

$F = mg = 1.5 \times 9.8$

$F = 14.7\,N$

$$y = \frac{F/l}{ax} = \frac{14.7 \times 2}{5.309 \times 10^{-8} \times 2 \times 10^{-3}}$$

$$y = 2.766 \times 10^{11}\,N/m^2$$

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5.a Photometry is the subfield of radiometry

Photometry is the measurement of light it measuring visible light electromagnetic radiation

Explination of photometric quantities

Luminous flux

Luminous intensity

Illuminance

Luminance.

5.b. Factors Affecting the acoustics and remedial measures

* Reverberation
* Adequate loudness
* Focusing due to walls and ceilings
* Absence of echoes
* Freedom from resonance.
* Echelon effect
* Extraneous noise and Sound insulation.

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5.a

Given

$V = 20 \times 15 \times 10 = 3000\ m^3$

$a = 0.106$

$T = ?$

$$T = \frac{0.167V}{a \cdot b}$$

where $b = 2(lw + lh + hw)$

$= 2(20 \times 15 + 20 \times 10 + 10 \times 15)$

$b = 1300 m^2$

$$T = \frac{0.167V}{a \cdot b} = \frac{0.167 \times 3000}{0.106 \times 1300}$$

$T = 3.63$ Sec

6.a.

The reverberation is the prolonged reflection of the sound from the walls, floor, and ceiling of a room. it is also defined as the presistence of audible sound after the source has stopped to emit the sound.

The time of reverberation is also defined as the time taken for the sound to fall below the minimum auditability measured from the instant when the source stopped sounding.

$$\frac{Em}{E} = 10^6 \qquad t = T$$

$$\frac{cA}{4V} \cdot T = 2.3026 \times 6$$

$$T = \frac{0.165V}{A} = \frac{0.165V}{\Sigma as}$$

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6.b lags of privacy.

* exposhare to laad noise can create a damage to hearing.

* Regular exposure load noise associated with cardiovascular problems like high blood pressure.

6.c.

$$T = \frac{1.67V}{S \cdot a}$$

$$a = \frac{1.67V}{T \cdot S}$$

$$= \frac{(1.67)(5500)}{(750)(2.3)}$$

$$= \underline{0.532}$$

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7.a) The power loss suffered by the optical single when they are propagate through the optical fiber.

$$\alpha = -\frac{10}{L} \log_{10} \frac{P_{out}}{P_{in}}$$

* Absorption loss
* Scattering loss
* Radiation loss.

7.b) Explination of Road profiling

Bridge Deflection

Speed checker

7.c)

$$NA = \frac{\sqrt{n_1^2 - n_2^2}}{n_0} = \frac{\sqrt{(1.5)^2 - (1.45)^2}}{1.33}$$

$$= 0.288$$

$$\theta = \sin^{-1}(NA)$$

$$\theta = \sin^{-1}(0.288)$$

$$\theta = 16.73^\circ$$

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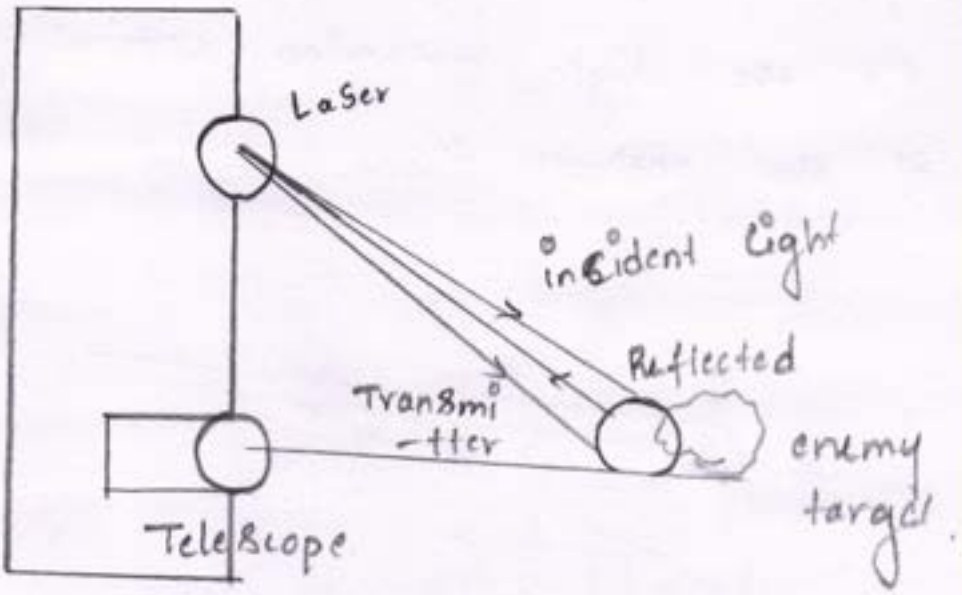
8.b) Laser range finder



Construction and working of laser range finder.

applications of lasers in defence.

* Laser range finder
* Designating bombs

8.c

$$\Delta E = E_2 - E_1 = \frac{hc}{\lambda}$$

$$= \frac{(6.63 \times 10^{-34})(3 \times 10^{8})}{690 \times 10^{-9}}$$

$$= 2.88 \times 10^{-19}$$

$$N = \frac{P_{out}}{\Delta E} = \frac{10 \times 10^{-3}}{2.88 \times 10^{-19}} = 3.42 \times 10^{16}$$

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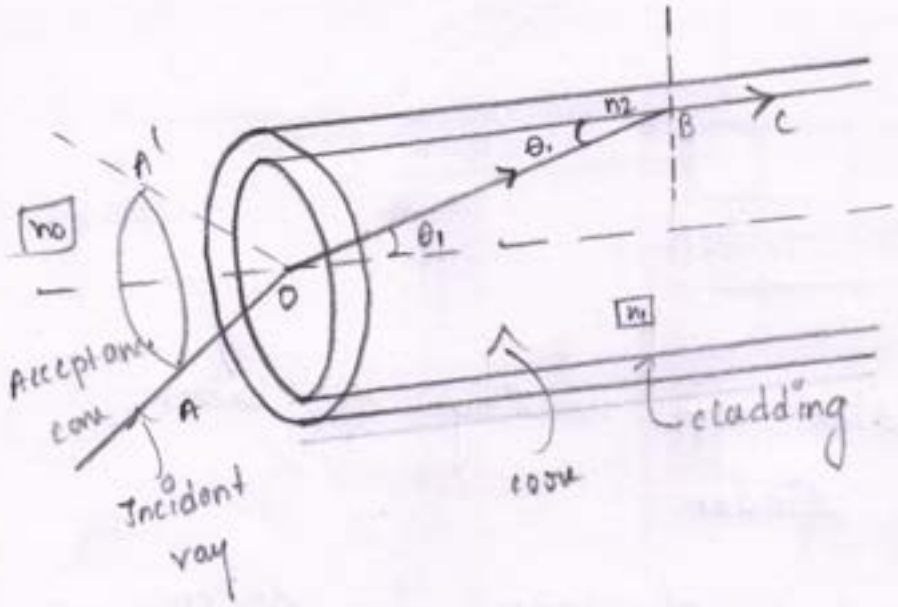
8.a) Numarical aperture indicates the ability of the optical fiber to accept light. i.e. the light gathering capabality of the optical fiber.



Snell's law at O

$$n_0 \sin\theta_0 = n_1 \sin\theta_1$$

Snell's law at B

$$n_1 \sin(90 - \theta_1) = n_2 \sin 90$$

$$\cos\theta_1 = \frac{n_2}{n_1}$$

$$\sin\theta_0 = \frac{n_1}{n_0}\sqrt{1 - \cos^2\theta_1}$$

$$\sin\theta_0 = \sqrt{n_1^2 - n_2^2}$$

$\sin\theta_0 < NA$

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9.a. Classification of Earthquakes

9.a) * Tectonic
* Volcanic
* Explosion
* Collapse.

9.b) A landslide is the movement of rock. earth or debris down a sloped section of land landslides are caused by rain. earthquakes volcanoes. or other factor that make the slope unstable.

Causes of landslide :-

* caused by heavy rain
* caused by earthquake.
* Caused by deforestation.

9.c) $M_1 = \log_{10}\left(\frac{I_1}{I_0}\right)$ $M_2 = \log_{10}\left(I_2/I_0\right)$

$M = \log\left(\frac{I}{I_0}\right)$

6.8
$e = I/I_0$

$I = 897.8\, I_0$

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10.a) * Through the development and installation of enomous building shock absorbers sliding walls, and Teflon pads. These structures are able to help Japanese buildings withstand the immense stress and strains imposed on them during violent events like earthquick and Tsunami

Some more Engineering structures to withstand earthquakes and Tsunami waves

---

10.b) Causes of Tsunami wave

* Earthquake
* Underwater Explosion
* Volcanic eruption
* Land Slide
* meteorite impact.

effect of Tsumami wave

* loss of life and property
* Roadblocks
* The natural beauty of the area damaged.

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10.c)

$$m_1 \log_{10}\left[\frac{I_1}{I_0}\right) \qquad m_2 = \log_{10}\left(\frac{I_2}{I_0}\right)$$

$$m_1 - m_2 = \log_{10}\left(\frac{I_1}{I_2}\right)$$

$$8.9 - m_2 = \log(100)$$

$$6.9 = m_2$$

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Shridevi Institute of Engineering and Technology, Tumakuru
II Semester: CIE I Internal Assessment Test: 08 /07/2023
BPHYS202 – Applied Physics for CSE Stream
Section: D & E

Time: 60 Minutes Max Marks: 40

Note: 1.Answer any two full Questions
2 M:Marks, L:Bloom's Level, C:Course Outcome.
3. Planck's constant h = 6.626 x 10^{-34} JS, c = 3 x 10^{8} m/s, e = 1.602 x10^{-19}C

			M	L	C
1	a.	State Heisenberg's Uncertainty Principle. Show that electron cannot exist inside the nucleus.	7	L2	CO4
	b.	Obtain energy values and normalized wave function with respect to a particle in a one dimensional potential well of infinite height.	8	L2	CO4
	c.	Compute the deBroglie wavelength for a neutron moving with one tenth part of velocity of light. Given the mass of the neutron is 1.674 x 10^{-27} kg.	5	L3	CO4
		OR			
2	a.	What is wave function? Set up time independent one dimensional Schrödinger wave equation.	9	L2	CO4
	b.	State de-Broglie Hypothesis. Derivation of expression for de-Broglie wavelength of accelerated electron	6	L2	CO4
	c.	An electron has a speed of 100 m/s. The inherent uncertainity in its measurement is 0.005%. Calculate the corresponding uncertainity in the measurement of the position. Given mass of electron is 9.1 x 10^{-31} kg.	5	L3	CO4

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II Semester: CIE I Internal Assessment Test: 08 /07/2023
BPHYS202 – Applied Physics for CSE Stream
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			M	L	C
1	a.	State Heisenberg's Uncertainty Principle. Show that electron cannot exist inside the nucleus.	7	L2	CO4
	b.	Obtain energy values and normalized wave function with respect to a particle in a one dimensional potential well of infinite height.	8	L2	CO4
	c.	Compute the deBroglie wavelength for a neutron moving with one tenth part of velocity of light. Given the mass of the neutron is 1.674 x 10^{-27} kg.	5	L3	CO4
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	c.	An electron has a speed of 100 m/s. The inherent uncertainity in its measurement is 0.005%. Calculate the corresponding uncertainity in the measurement of the position. Given mass of electron is 9.1 x 10^{-31} kg.	5	L3	CO4

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3	a.	Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein's co-efficient.	9	L2	CO2
	b.	Discuss the requisites of the laser system.	6	L2	CO2
	c.	A particle of mass 0.5 MeV/c^2 has a kinetic energy 100 eV. Find the de-Broglie wavelength. (c is the velocity of light).	5	L3	CO2

OR

4	a.	Explain the construction and working of a semiconductor laser.	9	L2	CO2
	b.	Discuss the working of LASER barcode reader.	6	L2	CO2
	c.	An electron is bound in a one dimensional potential well of width 1Å, but if infinite wall height. Find its energy values in the ground state, and also in the first excited states.	5	L3	CO2

3	a.	Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein's co-efficient.	9	L2	CO2
	b.	Discuss the requisites of the laser system.	6	L2	CO2
	c.	A particle of mass 0.5 MeV/c^2 has a kinetic energy 100 eV. Find the de-Broglie wavelength. (c is the velocity of light).	5	L3	CO2

OR

4	a.	Explain the construction and working of a semiconductor laser.	9	L2	CO2
	b.	Discuss the working of LASER barcode reader.	6	L2	CO2
	c.	An electron is bound in a one dimensional potential well of width 1Å, but if infinite wall height. Find its energy values in the ground state, and also in the first excited states.	5	L3	CO2

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Q. No. | Scheme & Solution | Marks

II Sem : CIE I Internal Assessment

BPHYS202 : Applied Physics for CSE Stream

1 a Statement — (2)

$\Delta x \Delta p \geq \frac{h}{4\pi}$ — (1)

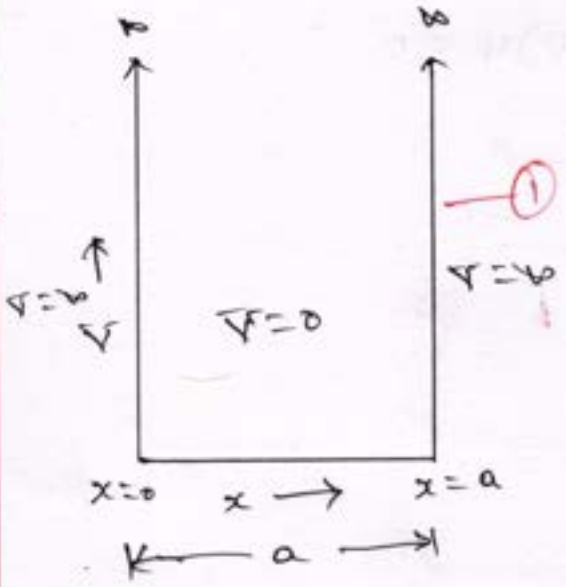
$\Delta p \geq 5.272 \times 10^{-21}$ kg m/s — (1)

$E = \frac{p^2}{2m} = \frac{(5.272 \times 10^{-21})^2}{(2 \times 9.11 \times 10^{-31})}$ — (2)

$E = 95$ MeV — (1)

7M

b



(1)

$\frac{d^2\psi}{dx^2} + \frac{8\pi^2 m}{h^2} E\psi = 0$ — (1)

$\psi = C\cos kx + D\sin kx$ — (1)

$C = 0$

$k = \frac{n\pi}{a}$ — (1)

$\psi_n = D \sin \frac{n\pi}{a} x$ — (1)

$E_n = \frac{n^2 h^2}{8ma^2}$ — (1)

$\int_0^a D^2 \sin^2 \frac{n\pi}{a} x \, dx = 1$

$D = \sqrt{\frac{2}{a}}$ — (2)

$\psi_n = \sqrt{\frac{2}{a}} \sin \frac{n\pi}{a} x$

8M

c $v = \frac{1}{10} c = \frac{1}{10} \times 3 \times 10^8 = 3 \times 10^7$ m/sec — (1)

$\lambda = \frac{h}{mv} = \frac{6.626 \times 10^{-34}}{(1.674 \times 10^{-27} \times 3 \times 10^7)}$ — (3)

$\lambda = 1.314 \times 10^{-14}$ — (1)

5M

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2 a Definition ——— (1)

$\lambda = \frac{h}{mv}$ ——— (1) $\quad \psi = A \cdot e^{i(kx-\omega t)}$ ——— (1)

$\frac{d^2\psi}{dx^2} = e^{-i\omega t} \frac{d^2\psi}{dx^2}$, $\frac{d^2\psi}{dt^2} = -\omega^2 e^{-i\omega t} \psi$ ——— 2

9 M

$\frac{d^2\psi}{dx^2} = \frac{1}{v^2} \frac{d^2\psi}{dt^2}$ ——— (1)

$\frac{1}{\lambda^2} = -\frac{1}{4\pi^2\psi} \frac{d^2\psi}{dx^2}$ ——— (1), $K.E = \frac{h^2}{2m} \frac{1}{\lambda^2}$ ——— (1)

$P.E = V$, $E = K.E + P.E$

} ——— (1)

$\frac{d^2\psi}{dx^2} + \frac{8\pi^2 m}{h^2}(E-V)\psi = 0$

b Statement ——— (1)

$e\phi = \frac{1}{2} mv^2$ ——— (1)

$p = \sqrt{2mev}$ ——— (1)

6 M

$\lambda = \frac{h}{p}$ ——— (1)

$\lambda = \frac{h}{\sqrt{2mev}}$ ——— (1)

$\lambda = \frac{1.226}{\sqrt{V}} nm$ ——— (1)

c $\Delta x \geq \frac{h}{4\pi \Delta p}$ ——— (1)

But $\Delta v = 100 \times \frac{0.005}{100} = 0.005$ ——— (1)

5 M

$\Delta p = m\Delta v = 9.11 \times 10^{-31} \times 0.005 = 4.55 \times 10^{-33}$ ——— (1)

$\Delta x = \frac{(6.626 \times 10^{-34})}{(4 \times 3.142 \times 4.55 \times 10^{-33})}$ ——— (1)

$\Delta x = 11.5 \times 10^{-3} m$ ——— (1)

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3 a

Rate of absorption $= B_{12} N_1 U_\nu$ — (1)

Rate of Spontaneous emission $= A_{21} N_2$ — (1)

Rate of stimulated emission $= B_{21} N_2 U_\nu$ — (1)

$$B_{12} N_1 U_\nu = A_{21} N_2 + B_{21} N_2 U_\nu \quad \text{— (1)}$$

$$U_\nu = \frac{A_{21} N_2}{(B_{12} N_1 - B_{21} N_2)}$$

$$U_\nu = \frac{A_{21}}{B_{21}} \left[\frac{1}{\frac{B_{12} N_1}{B_{21} N_2} - 1} \right] \quad \text{— (1)}$$

9M

$$\frac{N_1}{N_2} = e^{\frac{h\nu}{KT}} \quad \text{— (1)}$$

$$U_\nu = \frac{8\pi h\nu^3}{c^3} \left[\frac{1}{e^{\frac{h\nu}{KT}} - 1} \right] \quad \text{— (1)}$$

$$\frac{A_{21}}{B_{21}} = \frac{8\pi h\nu^3}{c^3}, \quad \frac{B_{12}}{B_{21}} = 1 \text{ (or) } B_{12} = B_{21} \quad \text{— (1)}$$

$$U_\nu = \frac{A}{B} \left[\frac{1}{e^{\frac{h\nu}{KT}} - 1} \right] \quad \text{— (1)}$$

b) Explaination with diagram of

Energy source, pumping process — (2)

Active medium — (2)

Laser cavity — (2)

6M

c

$$\lambda = \frac{h}{\sqrt{2mE}} \quad \text{— (1)}$$

$$m = 0.5 \text{ MeV}/c^2 = \frac{0.5 \times 10^6 \times 1.602 \times 10^{-19}}{(3 \times 10^8)^2} \quad \text{— (2)}$$

$$E = 100 \text{ eV} = 100 \times 1.602 \times 10^{-19} \quad \text{— (1)}$$

$$\lambda = 1.24 \text{ Å} \quad \text{— (1)}$$

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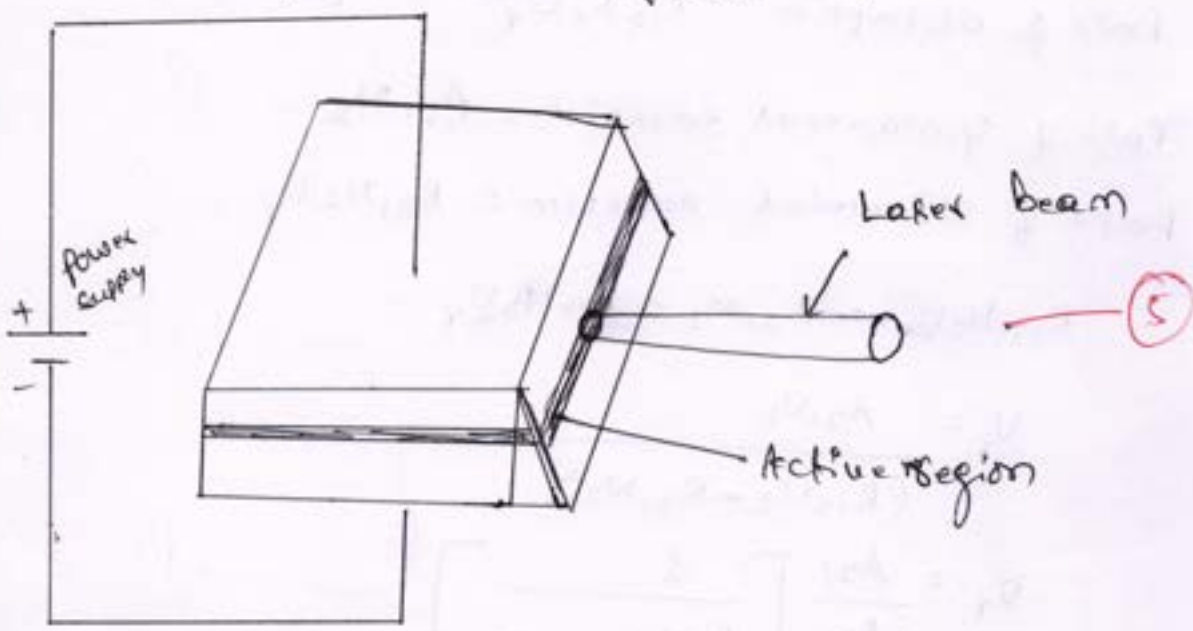
4 a) Construction and Explanation

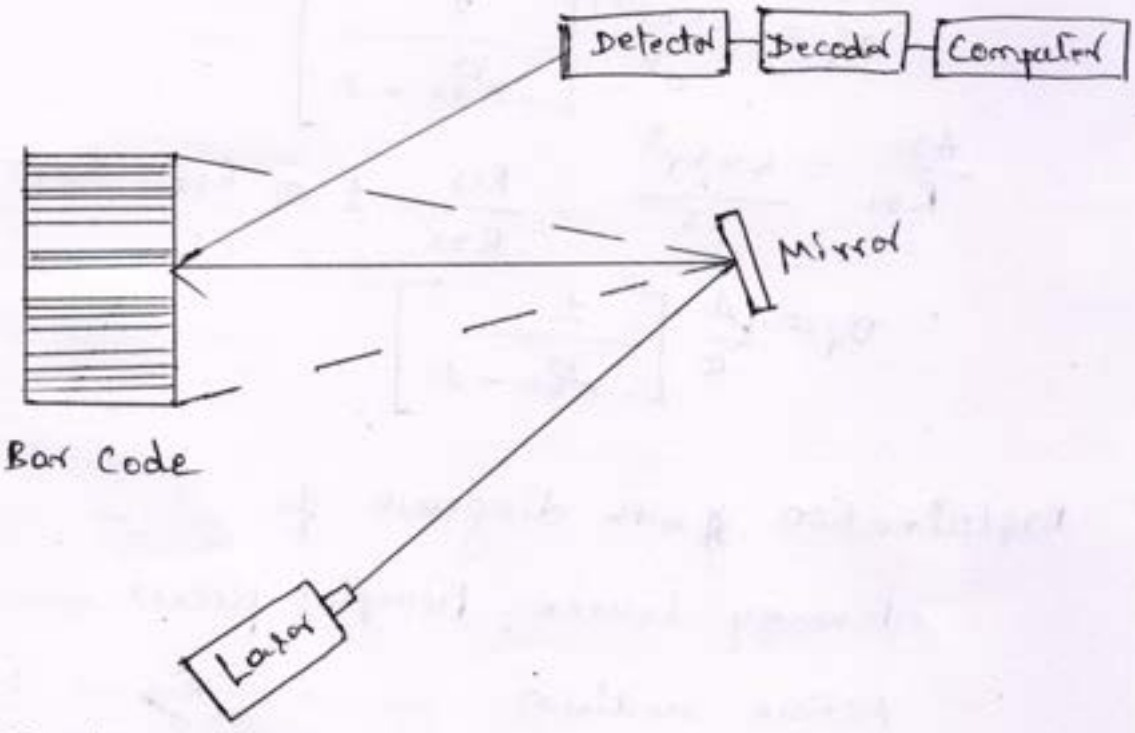


(5)

9M

working with energy level diagram (4)

b)



6M

Explanation

c)

$$E_n = \frac{n^2 h^2}{8ma^2}$$

$E_1 = 37.6\ eV$

$E_2 = 4 \times E_1 = 4 \times 37.6 = 150.4\ eV$

5M

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Shridevi Institute of Engineering and Technology, Tumakuru
II Semester: CIE I Internal Assessment Test:08 /07/2023
BPHYE202 – Applied Physics for EEE Stream
Section: F

Time: 60 Minutes Max Marks: 40

Note: 1.Answer any five full Questions choosing ONE full question from each module
2 M:Marks, L:Bloom's level, C:Course outcome.
3. Planck's constant h = 6.626 x 10^{-34} JS, K = 1.38 x 10^{-23} J/K, e = 1.602 x10^{-19}C

			M	L	C
1	a.	Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein's co-efficient.	9	L2	CO4
	b.	Discuss the requisites and the condition for a laser system.	6	L2	CO4
	c.	Find the attenuation in an optical fiber of length 500m when a light signal power 100mW emerges out of the fiber with a power 90mW.	5	L3	CO4
		OR			
2	a.	Mention three modes of vibrations in CO_2 molecule and Explain constriction and working of CO_2 laser (carbon dioxide laser) with the Help of necessary diagram.	9	L2	CO4
	b.	Describe different types of optical fiber with neat diagram.	6	L2	CO4
	c.	The refractive indices of core and cladding are 1.50 and 1.48 respectively in an optical fiber. Find the numerical aperture and angle of acceptance.	5	L3	CO4

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Shridevi Institute of Engineering and Technology, Tumakuru
II Semester: CIE I Internal Assessment Test:08 /07/2023
BPHYE202 – Applied Physics for EEE Stream
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3	a.	Define Fermi factor & Discuss the variation of Fermi factor with Temperature and effect on occupancy of energy levels.	9	L2	CO2
	b.	Explain Polar and Non Polar dielectrics.	6	L2	CO2
	c.	Calculate the probability of an electron occupying an energy level 0.02ev above the Fermi level at 200k and 400k in a material.	5	L3	CO2
		OR			
4	a.	Mention assumtiom of quantum free electron theory.	9	L2	CO2
	b.	What is polarization and explain types of polarization.	6	L2	CO2
	c.	Find the temperature at which there is 1% probability that a state with an energy 0.5ev above Fermi energy is occupied.	5	L3	CO2

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Question Number	CIE I Internal Assessment Test BPHYE202 – Applied Physics for EEE Stream	Marks

1. a) Expression for Energy density of radiation under equilibrium condition in terms of Einstein co-efficients.

Rate of absorption = $B_{12} N_1 U_\nu$

Rate of Spontaneous emission = $A_{21} N_2$

Rate of Stimulated emission = $B_{21} N_2 U_\nu$

At thermal equilibrium,

Rate of absorption = Rate of Spontaneous emission + Rate of stimulated emission. 09

$$B_{12} N_1 U_\nu = A_{21} N_2 + B_{21} N_2 U_\nu$$

$$U_\nu = \frac{A_{21}}{B_{21}} \left[\frac{1}{\left(\frac{B_{12} N_1}{B_{21} N_2} \right) - 1} \right]$$

Boltzmann's law $\frac{N_1}{N_2} = e^{h\nu/kT}$

Planck's law $U_\nu = \frac{8\pi h\nu^3}{c^3} \left[\frac{1}{e^{\left(\frac{h\nu}{kT}\right)} - 1} \right]$

$$U_\nu = \frac{A}{B} \left[\frac{1}{e^{\frac{h\nu}{kT}} - 1} \right]$$

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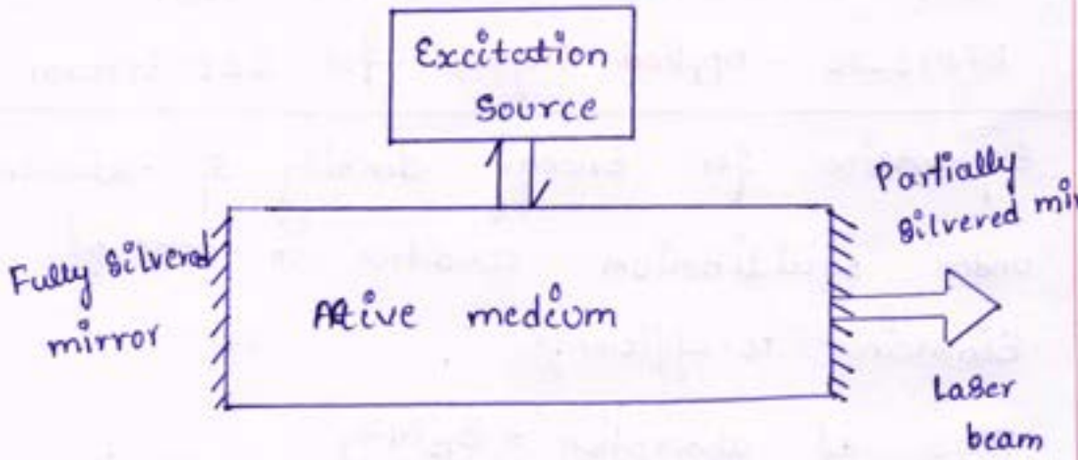
1.b)



06

Explination of * Excitation Source
* Active medium * Laser cavity

1.c) Given data :-

$L = 500m$, $P_{in} = 100mW$ $P_{out} = 90mW$

$L = 0.5Km$ $P_{in} = 100 \times 10^{-3}$ $P_{out} = 90 \times 10^{-3}$

To find out :-

Attenuation $\Rightarrow \alpha = ?$

05

Solution :-

$$\alpha = -\frac{10}{L} \log_{10}\left[\frac{P_{out}}{P_{in}}\right]$$

$$\alpha = \frac{-10}{0.5} \log_{10}\left[\frac{90 \times 10^{-3}}{100 \times 10^{-3}}\right]$$

$$\boxed{\alpha = 0.915 \ dB/Km}$$

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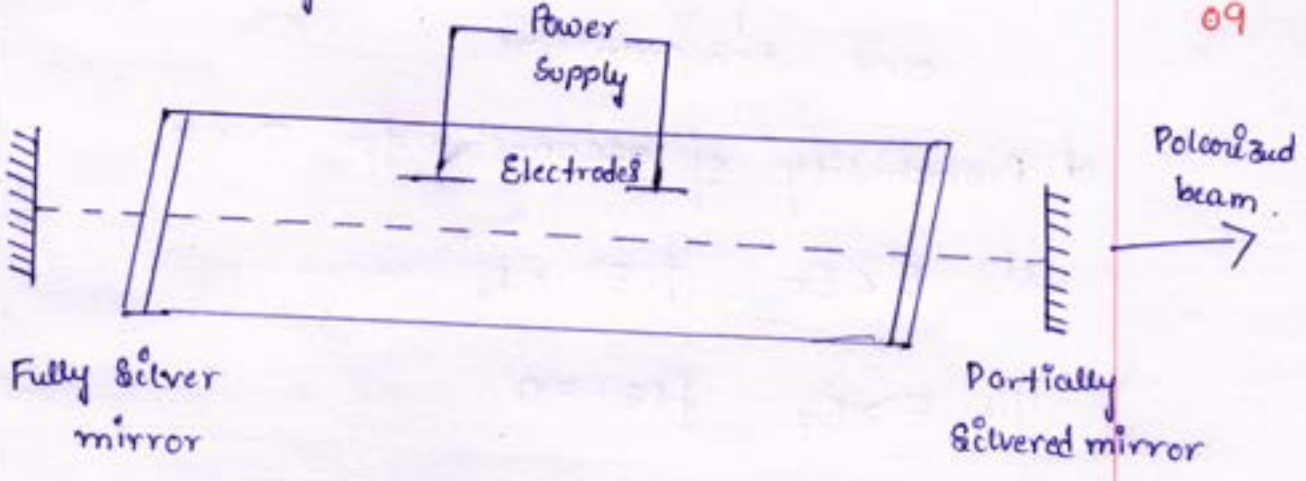
2. a) Vibrational modes of CO_2 molecules

(1) Symmetric stretching mode

(2) Asymmetric Streching mode

(3) Bending mode.

09



Construction and working of CO_2 Laser.

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2. b) Types of optical fiber

* Single mode Step index optical fiber
* Multi mode Step index optical fiber
* Graded index multi mode optical fiber

06

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2. c) Given data :-

$n_1 = 1.50$, $n_2 = 1.48$

To find :- $NA = ?$, $\theta_0 = ?$

Solution :- $NA = \frac{\sqrt{n_1^2 - n_2^2}}{n_0}$ $\quad n_0 = 1$

05

$NA = \sqrt{(1.50)^2 - (1.48)^2}$

$\boxed{NA = 0.244}$

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$\theta_0 = \sin^{-1} NA$

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$\theta_0 = \sin(0.244) = \boxed{14.12^\circ}$

3. a) Fermi Factor :-

The probability of occupation of various energy states by electron at T=0K.

Dependence of Fermi factor on Energy and temperature.

(*) Probability of occupation for T=0K.

(i) $E < E_F$ $f(E) = 1$

(ii) $E > E_F$ $f(E) = 0$

(iii) $E = E_F$ $f(E) = 1/2$

09

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3. b) Explination of Polar dielectrics & Non polar dielectrics.

Polar dielectrics :- which posses Permanent dipole moment

Non polar dielectrics :- which does not Posses permanent dipole moment.

06

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3. c) Given data :-

$(E - E_F) = 0.02\,eV = 0.02 \times 1.6 \times 10^{-19}\,J$

$T = 200K$ & $400\,K$

To find out = $f(E) = ?$

Solution :- $f(E) = \frac{1}{e^{\frac{E-E_F}{KT}} + 1}$

for $T = 200\,k$.

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$$f(E) = \frac{1}{e^{\frac{0.02 \times 1.6 \times 10^{-19}}{(1.38 \times 10^{-23})(200)}} + 1} = \boxed{0.23}$$

for $T = 400K$.

$$f(E) = \frac{1}{e^{\frac{0.02 \times 1.6 \times 10^{-19}}{1.38 \times 10^{-23} \times 400}} + 1} = \boxed{0.36}$$

4.a) Assumption of Quantum free electron theory

(i) The energy values of conduction electron are quantized.

(ii) The distribution of electrons in the various allowed energy levels occurs according to pauli exclusion principle

(iii) The free electrons travel in a constant potential inside the metal but stay confined within it's boundaries

(iv) The electrostatic forces of repulsion among the free electrons are negligible

09

4.(b) Polarization :-

The displacement of charges in the atoms of the dielectric under the action of an applied field leading to the development of dipole moment is called as polarization.

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Types of Polarization

* Electronic polarization
* Ionic polarization
* Orientational polarization.

4.c) Given data :-

$f(E) = 1\% = 0.01$

$(E - E_f) = 0.5 eV = 0.5 \times 1.6 \times 10^{-19} J$

To find :- $T = ?$

Solution :- $f(E) = \frac{1}{e^{\frac{E-E_F}{KT}} + 1}$ 05

$$0.01 = \frac{1}{e^{\frac{0.5 \times 1.6 \times 10^{-19}}{(1.38 \times 10^{-23})\,T}} + 1}$$

$$0.01 = \frac{1}{e^{\frac{5797}{T}} + 1}$$

$$e^{\frac{5797}{T}} + 1 = \frac{1}{0.01}$$

$$e^{\frac{5797}{T}} = 100 - 1$$

$$e^{\frac{5797}{T}} = 99$$

Take log on BS

$$\log\left[e^{\frac{5797}{T}}\right] = \log 99.$$

$$\frac{5797}{T} = 4.59$$

$$\frac{5797}{4.59} = T$$

$$T = 1261.5 K$$

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Shridevi Institute of Engineering and Technology, Tumakuru
II Semester: CIE II Internal Assessment Test: 14 /08/2023
BPHYS202 – Applied Physics for CSE Stream
Section: D & E

Time: 60 Minutes Max Marks: 40

Note: 1.Answer any two full Questions
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3. Planck's constant h = 6.626 x 10^{-34} JS, c = 3 x 10^{8} m/s, e = 1.602 x10^{-19}C

			M	L	C
1	a.	Obtain an expression for numerical aperture and arrive at the condition for propagation.	9	L2	CO1
	b.	Explain Type I (Soft) and Type II (Hard) superconductors using M-H graphs.	6	L2	CO3
	c.	The ratio of population of two energy levels is 1.059 x 10^{-30}. Find the wavelength of light at 330K.	5	L3	CO1
		OR			
2	a.	Discuss the types of optical fibers based on modes of propagation and RI profile.	9	L2	CO1
	b.	Explain BCS theory of superconductivity.	6	L2	CO3
	c.	Find the attenuation in an optical fiber of length 500m when a light signal power 100mW emerges out of the fiber with a power 90mW.	5	L3	CO1

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3	a.	Enumerate the failures of classical free electron theory and assumptions of quantum free electron theory of metals.	9	L2	CO3
	b.	Give the qualitative explanation of DC SQUID and RF SQUID with the help of a neat sketch.	6	L2	CO3
	c.	Find the temperature at which there is 1% probability that a state with energy 0.5 eV above the fermi energy is occupied.	5	L3	CO3

OR

4	a.	Define Fermi Factor and discuss the variation of Fermi factor with temperature and energy.	9	L2	CO3
	b.	Explain DC and AC Josephson effects.	6	L2	CO3
	c.	Lead has a superconducting transition temperature of 7.26 K. If initial field at 0K is $50\times10^{3}Am^{-1}$, Calculate the critical field at 6 K.	5	L3	CO3

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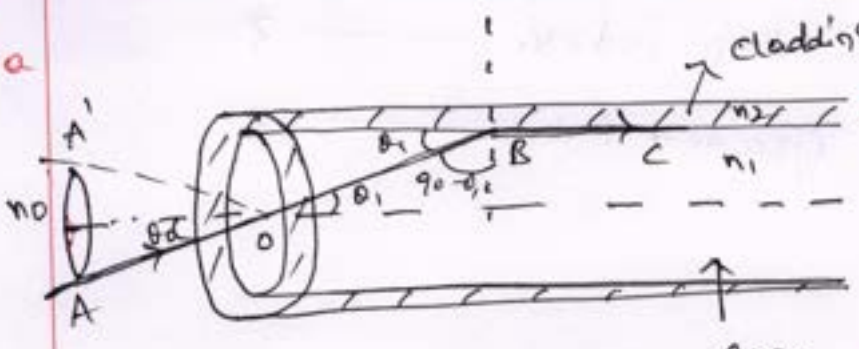
Scheme and Solution

II Sem ; CIE II Internal Assessment

BPHYS202 : Applied physics for CSE Stream

Q.No | Marks

1 a



(2)

$n_0 \sin\theta_0 = n_1 \sin\theta_1$ (1)

$n_1 \sin(90-\theta_1) = n_2 \sin\theta_0$ (1)

9M

$\cot\theta_1 = \frac{n_2}{n_1}$ (1)

up to

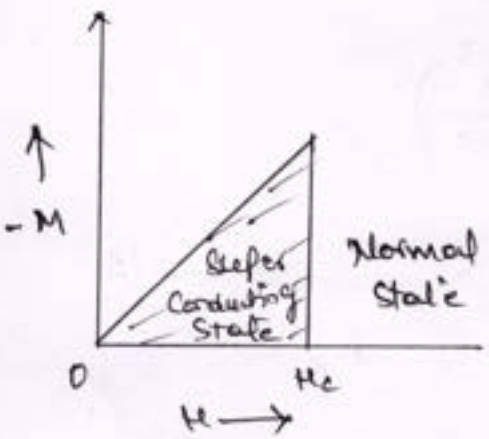
$\sin\theta_0 = \sqrt{n_1^2 - n_2^2}$ (2)

$N.A = \sqrt{n_1^2 - n_2^2}$ (1)

$\sin\theta_i < N.A$ (1)

b

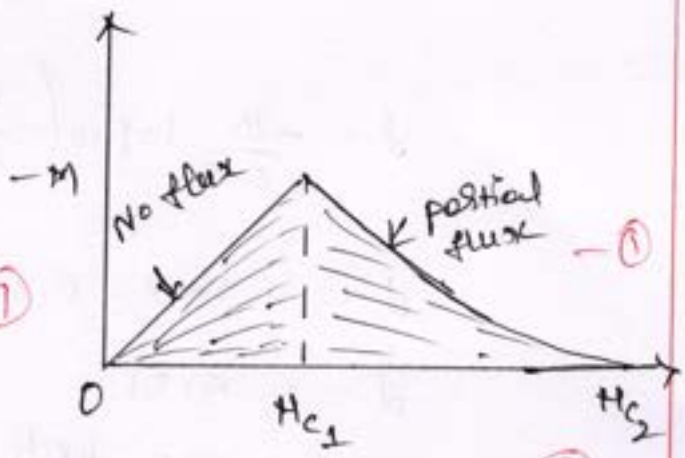
Type-I Superconductor



(1)

Explanation (2)

Type-II Superconductor



(1)

6M

Explanation (2)

c

$\frac{N_2}{N_1} = e^{-\frac{hc}{\lambda KT}}$ (1)

$\ln\left(\frac{N_2}{N_1}\right) = -\frac{hc}{\lambda KT}$ (1)

5M

$\lambda = \frac{-hc}{\ln\left(\frac{N_2}{N_1}\right) KT} = \frac{-6.624\times10^{-34}\times3\times10^{8}}{\ln(1.059\times10^{-30})\times1.38\times10^{-23}\times220}$ (1)

$\lambda = 632.4\,nm$ (1)

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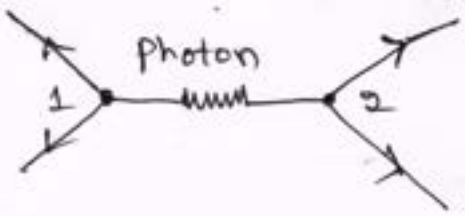
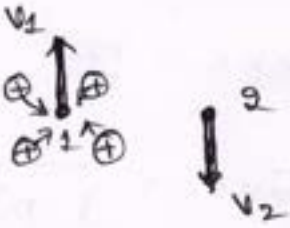
2 a Explanation of three types of optical fibers

1. Single mode Step index ——— (3)
2. Multimode Step index ——— (3)
3. Multimode Graded index ——— (3)

9M

b





——— (2)

Explanation of BCS theory ——— (4)

6M

c

$$\alpha = -\frac{10}{L} \log_{10}\left(\frac{P_{out}}{P_{in}}\right) \quad \text{——— (1)}$$

$$\alpha = \frac{-10}{0.5} \log_{10}\left(\frac{90\times10^{-3}}{100\times10^{-3}}\right) \quad \text{——— (2)}$$

$$\alpha = -20 \times -0.045757 \quad \text{——— (1)}$$

$$\alpha = 0.9151$$

$$\alpha = 0.915 \text{ dB/km} \quad \text{——— (1)}$$

5M

3 a Enumerate

1. Specific heat ——— (3)
2. Temperature dependence of electrical conductivity ——— (2)
3. Electrical conductivity on electron concentration ——— (2)

9M

b. Mention the assumptions of Quantum free Electron Theory ——— (3)

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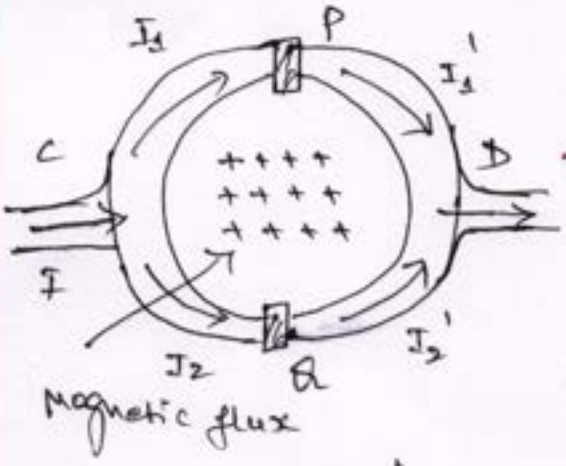
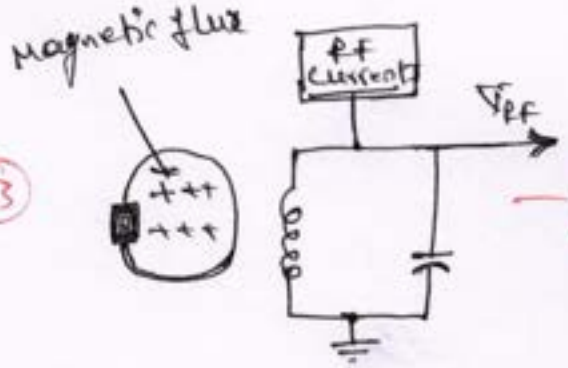
b

Explanation of DC SQUID



3

RF SQUID



3

6M

c

$$f(E) = \frac{1}{e^{\frac{E-E_F}{KT}} + 1}$$ — 1

5M

up to $T = \frac{5804}{\ln(99)}$ — 3

$T = 1263\ K$ — 1

4 a

Definition — 1

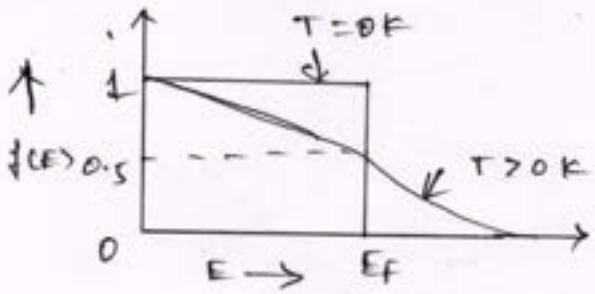
$$f(E) = \frac{1}{e^{\frac{E-E_F}{KT}} + 1}$$ — 1

$E < E_F$ at $T = 0$, $f(E) = 1$ — 2

$E > E_F$ at $T = 0$ $f(E) = 0$ — 2

$E = E_F$ at $T > 0$ $f(E) = 1/2$ — 2

9M



1

b

Explanation of DC Josephson effect — 3

or

Explanation of AC Josephson effect — 3

5M

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c

$$H_c = H_0\left[1 - \left(\frac{T}{T_c}\right)^2\right]$$ — 1

$$H_c = 50 \times 10^3\left[1 - \left(\frac{6}{7.26}\right)^2\right]$$ — 1

$H_c = 18.834 \times 10^3\ A/m$ — 1

5M

Shridevi Institute of Engineering and Technology, Tumakuru
II Semester: CIE II Internal Assessment Test: 14 /08/2023
BPHYE202 – Applied Physics for EEE Stream
Section: F

Time: 60 Minutes Max Marks: 40

Note: 1.Answer any two full Questions
2 M:Marks, L:Bloom's Level, C:Course Outcome.
3. Planck's constant h = 6.626 x 10^{-34} JS, c = 3 x 10^{8} m/s, e = 1.602 x10^{-19}C

			M	L	C
1	a.	Derive Clausius Mossotti equation.	9	L2	CO2
	b.	Explain Meissner effect.	6	L2	CO2
	c.	If NaCl crystal is subjected to an electric field of 1000V/m and the resulting polarization is $4.3 \times 10^{-8}\ C/m^2$ calculate the dielectric constant of NaCl.	5	L3	CO2
		OR			
2	a.	Explain Type I (Soft) and Type II (Hard) superconductors using M-H graphs.	9	L2	CO2
	b.	Explain BCS theory of superconductivity.	6	L2	CO2
	c.	The electronic polarization of krypton gas is $3.45 \times 10^{-40}\ Fm^2$ .if the gas contain $2.7 \times 10^{25}\ m^3$ at NTP, calculate its dielectric constant.	5	L3	CO2

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3	a.	Explain construction and working of Semiconductor laser.	9	L2	CO4
	b.	Derive relation between Fermi energy and Energy gap for an intrinsic semiconductor.	.6	L2	CO4
	c.	For intrinsic gallium arsenide, the room temperature electrical conductivity is $10^{-6}/\Omega m$ the electron and hole motilities are respectively $0.85m^2/Vs$ and $0.04m^2/Vs$. Compute the intrinsic carrier concentration at room temperature.	5	L3	CO4

OR

4	a.	What is Hall Effect? Obtain an Expression for Hall Coefficient.	9	L2	CO4
	b.	Explain construction and working of Photo Diode.	6	L2	CO4
	c.	The Hall coefficient of a material is $-3.68 \times 10^{-5}\ m^3/C$ what is the type of charge carriers ? also calculate the carrier concentration.	5	L3	CO4

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Applied Physics for EEE Stream

19) consider a solid dielectric material on electric constant ε_r. if n is the number of atoms per unit volume Then the dipole moment/unit volume

if $N\mu$ — ①

$\mu = \alpha_e E_i$ — ②

put eqn ② in ①

(3M)

$P = N\alpha_e E_i$

$\therefore E_i = \frac{P}{N\alpha_e}$ — ④

But we know that $P = \varepsilon_0(\varepsilon_r - 1)\vec{E}$

$E = \frac{P}{\varepsilon_0(\varepsilon_r - 1)}$ — ⑤

put equation ④ & ⑤ in P

$\frac{P}{N\alpha_e} = \frac{P}{\varepsilon_0(\varepsilon_r - 1)} + \left(\frac{\gamma}{\varepsilon_0}\right)P$

(3M)

$\frac{1}{N\alpha_e} = \frac{1}{\varepsilon_0}\left(\frac{1}{\varepsilon_r - 1} + \gamma\right)$

when internal field material in field.

we have $\gamma = 1/3$

$\frac{1}{N\alpha_e} = \frac{1}{\varepsilon_0}\left(\frac{1}{\varepsilon_r - 1} + 1/3\right)$

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$$\frac{1}{N\alpha e} = \frac{1}{\varepsilon_0}\left(\frac{3+(\varepsilon_r-1)}{3(\varepsilon_r-1)}\right)$$

$$\frac{\varepsilon_0}{N\alpha e} = \frac{\varepsilon_r+2}{3(\varepsilon_r-1)}$$

re-arranging the above Equation

$$\boxed{\frac{N\alpha e}{3\varepsilon_0} = \frac{\varepsilon_r-1}{\varepsilon_r+2}}$$ (3M)

This is called as clausius mossotti eqn.

(b) when the superconducting material is placed in a magnetic field it allows magnetic lines of force to pass through it. if temperature is above T_c, the temperature is reduced below the critical temperature T_c. then it express all the flux lines completely out of the specimen and exhibits perfect diamagnetism. this is known as meissner effect. since superconductor exhibits perfect diamagnetism below the critical temperature T_c, magnetic flux density inside the material is zero. (6M)

$B = \mu_0(M+H)$

$B=0$ at $T<T_c$, thus we get $M=-H$.

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1c) $E = 1000\ V/m$

$P = 4.3 \times 10^{-8}$

1c) $\varepsilon_r = ?$

$$P = \varepsilon_0(\varepsilon_r - 1)\vec{E}$$

$$\varepsilon_r - 1 = \frac{P}{\varepsilon_0 \times E}$$

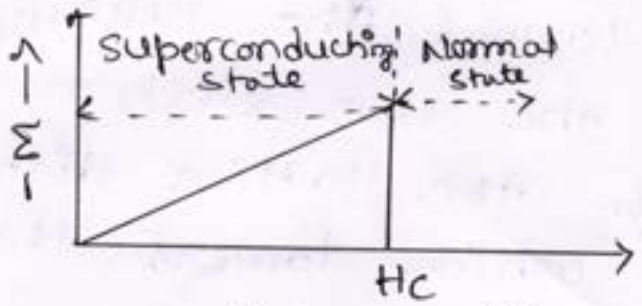
$$\varepsilon_r - 1 = \frac{4.3 \times 10^{-8}}{8.854 \times 10^{-23} \times 1000}$$

$$\boxed{\varepsilon_r = 5.856 \times 10^{29}}$$

(5M)

2a) Type I Superconductor

In the type-I superconductor, as the critical field is reached, the entire specimen enters the normal state. simultaneously the resistivity returns, magnetization vanishes and the field penetrates into the specimen



(4½M)

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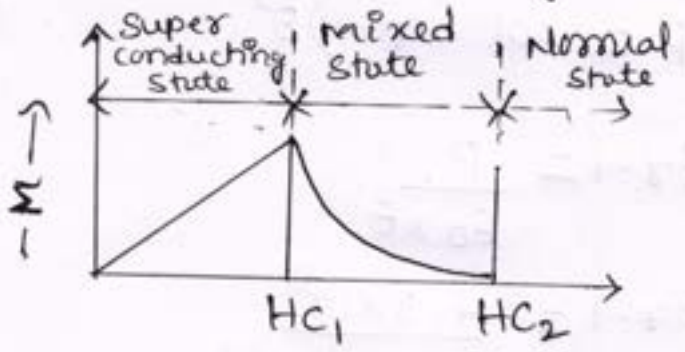
Type - II Superconductor

In the type - II superconductor, the transition from superconducting state to normal state is gradual. For such superconductors, two critical magnetic fields - H_{c1} (lower

critical field, HC_2 (Higher critical field) exist



(4 1/2 M)

2b) BCS theory

Consider an electron approaching a positive ion core and suffer attractive coulomb interaction. due to this attraction ion core is set in motion and thus distorts and lattice. let a second electron come in the way of distorted lattice and interaction blw the two occurs which lowers the energy of (6M) second electron. the two electrons interact indirectly through the lattice distortion (or) phonon field which lowers the energy of the electrons. the above interaction is interpreted as electron-lattice-electron interaction through phonon field. The attractive force may be exceed below the critical temperature which results in the formation of bound pairs of electrons called cooper pairs.

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2c) $P = 3.45 \times 10^{-40}$ $\quad P = \varepsilon_0 (\varepsilon_r - 1) \vec{E}$

$E = 2.7 \times 10^{25}$

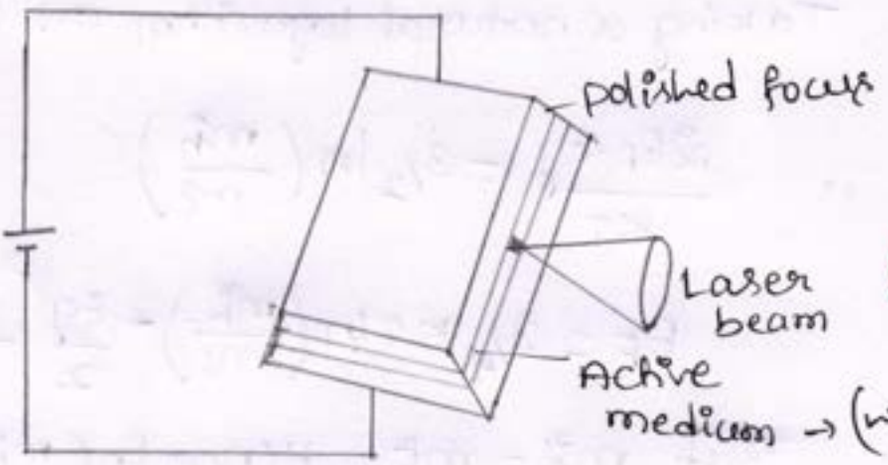
2c) $\varepsilon_r - 1 = \dfrac{P}{\varepsilon_0 \times E}$ (5M)

$$\varepsilon_r - 1 = \frac{3.45 \times 10^{-40}}{8.854 \times 10^{-23} \times 2.7 \times 10^{25}}$$

$$\varepsilon_r - 1 = 1.44 \times 10^{-42}$$

$$\varepsilon_r = 1.$$

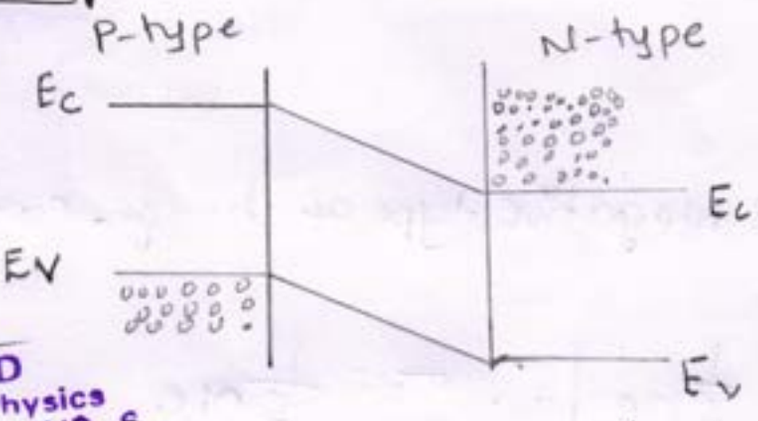
3a) Construction and working of semiconductor LASER



(4M) (with explanation)

* GaAs diode is a single crystal of Ga & As

Working



(5M)

with Neccessary theory.

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3b) For an Intrinsic semiconductor the number of holes/unit volume in valence bond is equal to number of electrons/unit volume in conduction bond.

$$Ne = Nh$$

$$\frac{4\sqrt{2}}{h^3}(\pi m_e^* KT)^{3/2}\, e^{\frac{E_F - E_g}{kt}} = \frac{4\sqrt{2}}{h^3}(\pi m_h^* KT)^{3/2}\, e^{\frac{-E_F}{KT}}$$

$$(m_e^*)^{3/2}\, e^{\frac{E_F - E_g}{KT}} = (m_h^*)^{3/2}\, e^{\frac{E_F}{KT}}$$

$$e^{\frac{2E_F - E_g}{KT}} = \left(\frac{m_h^*}{m_e^*}\right)^{3/2}$$

Taking a natural logarithm on b.s we get

$$\frac{2E_F - E_g}{KT} = 3/2 \ln\left(\frac{m_h^*}{m_e^*}\right) \qquad (6M)$$

$$E_F = 3/4\, KT \ln\left(\frac{m_h^*}{m_e^*}\right) + \frac{E_g}{2} \quad -(1)$$

But $m_e^* = m_h^*$. Hence $\ln\left(\frac{m_h^*}{m_e^*}\right)$ becomes $=0$

$$\therefore \boxed{E_F = 1/2\, E_g}$$

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4c)

$R_H = -3.68 \times 10^{-8}$

$\sigma_i = \frac{1}{\rho} = ?$ * Negative type of charge carriers

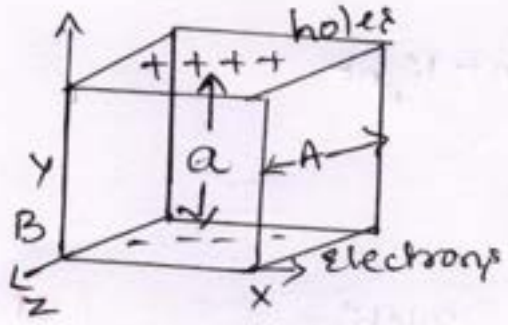
$$R_H = \frac{1}{\rho ne} \quad \because \sigma_i = \frac{1}{\rho}$$

$$\sigma_i = n_i e (\mu_e + \mu_n)$$

$$n_i = \frac{(\mu_e + \mu_n)}{\sigma_i} \Rightarrow \underline{\underline{1.6 \times 10^{23}}} \quad (5M)$$

4a) Hall effect

Hall effect definition — (2M)



$F_L = -BeV$ — ①

$F_H = -eE_H$ — ②

$F_L = F_H$

$-BeV = -eE_H$

$BV = E_H$ — ③

$E_H = \frac{V_H}{d}$

$V_H = E_H d$

$V_H = BVd$

$J = \frac{I}{A}$

$J = \frac{I}{wd}$

$I = neVA$

$J = \frac{neVA}{A}$

$J = \sigma E$

$\sigma E = \frac{I}{wd}$

$V = \frac{I}{wd\sigma} \Rightarrow \sigma = \frac{BI}{V_H w}$ → (5M)

Hall co-efficient:

$E_H \propto JB$

$E_H = R_H JB$

$R_H = \frac{E_H}{JB}$

$R_H = \frac{BV}{EVB}$

$\boxed{R_H = \frac{1}{\sigma}}$ — (2M)

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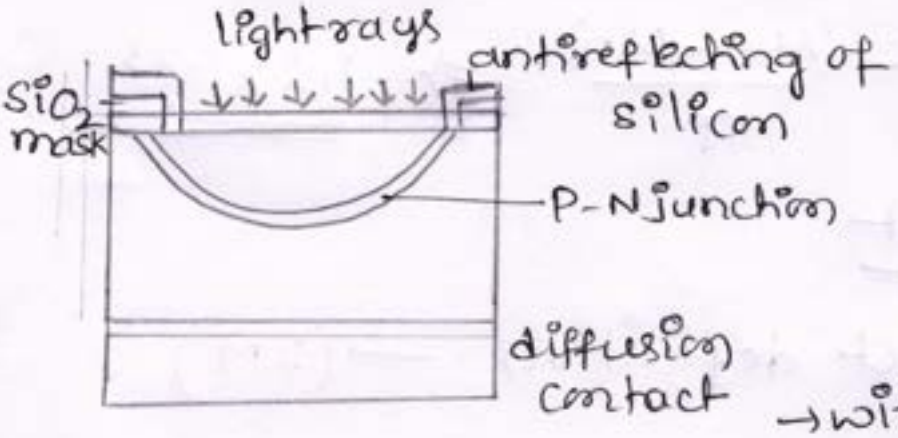
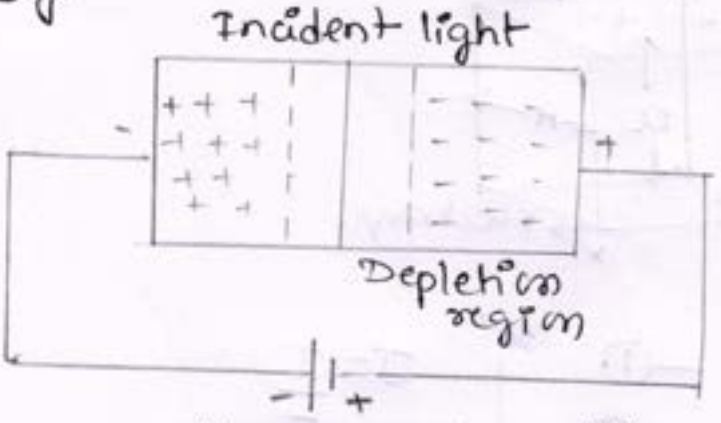
4b) Construction and working of Photodiode



(3M)

→ with explanation

Working



(3M)

→ with Explanation

3c)

$\sigma_i = ?$

$n_i = 10^{6}\ \Omega^{-1}m^{-1}$

$e = 1.6 \times 10^{-19}$

$\mu_e = 0.85\ m^2/V\text{-}s$

$\mu_n = 0.04\ m^2/V\text{-}s$

$\sigma_i = n_i e (\mu_e + \mu_n)$

$\sigma_i = 10^{6}(1.602 \times 10^{-19})$

$(0.85 + 0.04)$

$\sigma_i = 1.425 \times 10^{-25}$

(5M)

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Shridevi Institute of Engineering and Technology, Tumakuru
II Semester: CIE III Internal Assessment Test:08 /09/2023
BPHYE202 – Applied Physics for EEE Stream
Section: F

Time: 120 Minutes | Max Marks: 60

Note: 1. ***Answer any five full Questions choosing ONE full question from each module***
2 M:Marks, L:Bloom's level, C:Course outcome.

		PART - A	M	L	C
1	a.	Mention three modes of vibrations in CO_2molecule and Explain constriction and working of CO_2 laser (carbon dioxide laser) with the help of necessary diagram.	9	L2	CO4
	b.	With neat diagrams explain the different types of optical fibers.	6	L2	CO4
	c.	Find the attenuation in an optical fiber of length 500m when a light signal power 100mW emerges out of the fiber with a power 90mW.	5	L3	CO4
		OR			
2	a.	What is Hall Effect? Obtain an Expression for Hall Coefficient.	9	L2	CO4
	b.	Explain construction and working of Photo Diode with application.	6	L2	CO4
	c.	The hall coefficient of a material is $-3.68 \times 10^{-5}\ m^3/C$. what is the type of charge carrier? Also calculate carrier concentration.	5	L3	CO4
		OR			
3	a.	Define critical temperature? Describe Type-1 and Type-II Superconductor.	9	L2	CO2
	b.	Derive Clausius Mossotti equation.	6	L2	CO2
	c.	Calculate the probability of an electron occupying an energy level 0.02ev above the Fermi level at 200k and 400k in a material.	5	L3	CO2
		PART- B			
4	a.	State de-Broglie Hypothesis. Derivation of expression for de-Broglie wavelength of accelerated electron.	9	L2	CO1
	b.	State Heisenberg's Uncertainty Principle. Show that electron cannot exist inside the nucleus.	6	L2	CO1
	c.	Calculate de-Broglie wavelength associated with an electron with a kinetic energy of 1.5ev.	5	L3	CO1
		OR			
5	a.	What is wave function? Set up time independent one dimensional Schrödinger wave equation.	9	L2	CO1
	b.	State principle of complementarity and explain.	6	L2	CO1
	c.	Calculate de-Broglie wavelength associated with an electron with a kinetic energy of 100ev	5	L3	CO1
		PART- C			
6	a.	Derive an equation for electromagnetic wave in vacuum in terms of electric field using Maxwell's equation.	9	L2	CO3
	b.	Explain the terms gradient of a scalar, divergence and curl of a vector	6	L2	CO3
	c.	Find constant C, such that $\vec{A} = (x + ay)\widehat{a_x} + (y + bz)\widehat{a_y} + (x + az)\widehat{a_z}$ is solenoid.	5	L3	CO3
		OR			
7	a.	What is displacement current? Derive an expression for displacement current.	9	L2	CO3
	b.	State Biot-Savart's law and list four Maxwell's equation in differential form.	6	L2	CO3
	c.	A circular coil of wire consisting 100 turns. Each of radius 8cm carriers a current 0.4A. What is the magnitude of magnetic field at a point 20cm from the wire?	5	L3	CO3

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II semester : CIE III Internal Assessment Test Scheme

BPHYE202 - Applied Physics for EEE Stream

Section F

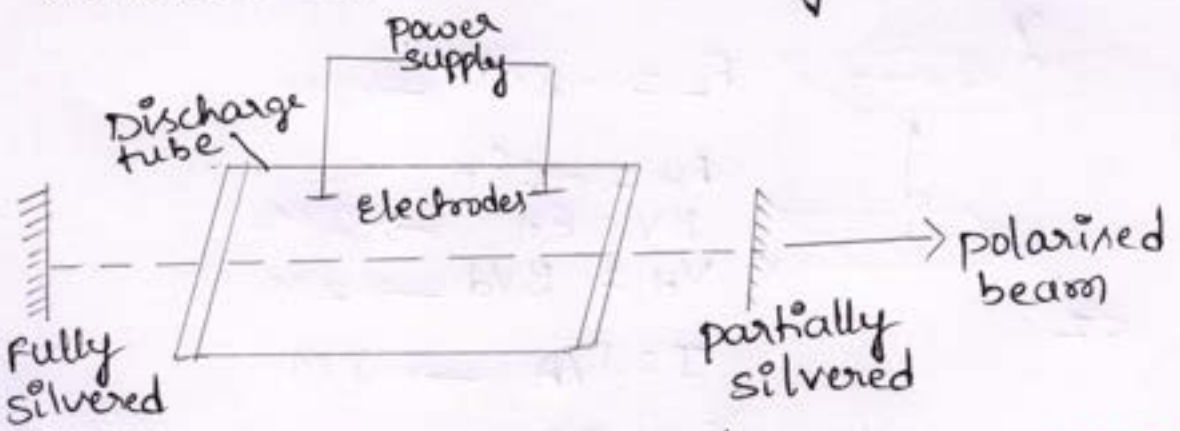
1a) Three modes of vibrations in CO_2 molecule

a) Symmetric stretching mode → 1M

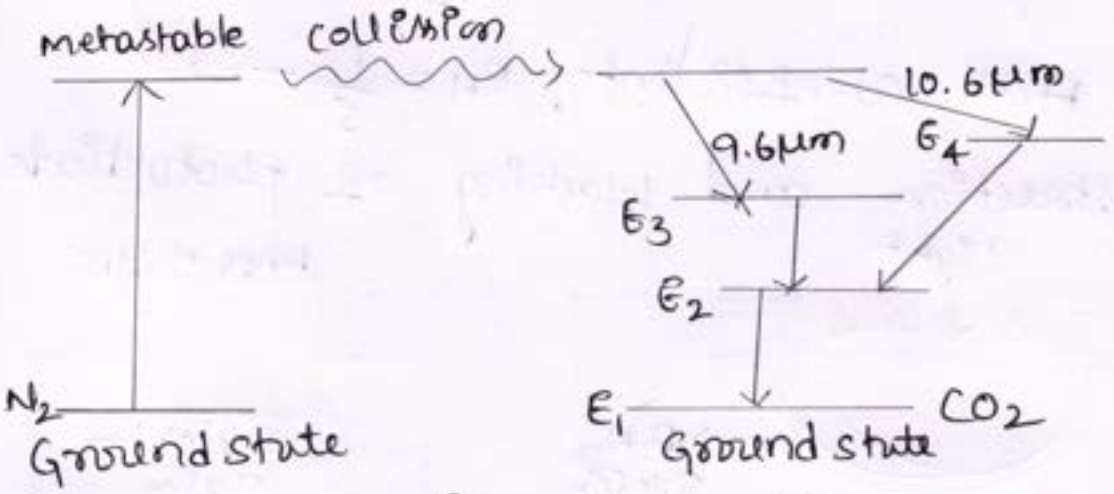
b) Bending mode → 1M

c) Asymmetric stretching mode → 1M

Construction and working of CO_2 laser



with explanation → 3M



with Explanation → 3M

1b) Different types of optical fibers

① single mode step index fiber
② multimode step index fiber
③ Graded index multimode fiber

} with necessary diagram & → 6M Explanation

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1c) Data ⟶ 1M

$\alpha = ?$

$P_{input} = 90mW$

$P_{output} = 100mW$

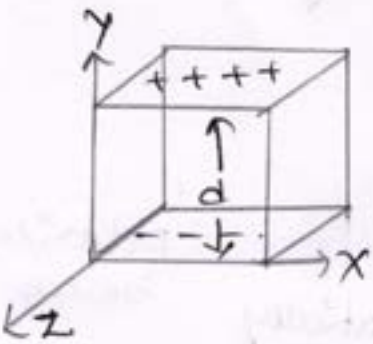
$L = 500m$

Formula. $\alpha = \frac{-10}{L}\log\left(\frac{P_{out}}{P_{input}}\right)$ — 2M

substitution ⟶ 1M

$\alpha = 2.693 \times 10^{-3}$ ⟶ 1M

2a) Hall effect - Definition ⟶ 2M



$F_L = -BeV$ ⟶ 1M

$F_H = -e\mathcal{E}_H$

$BV = \mathcal{E}_H$ ⟶ 1M

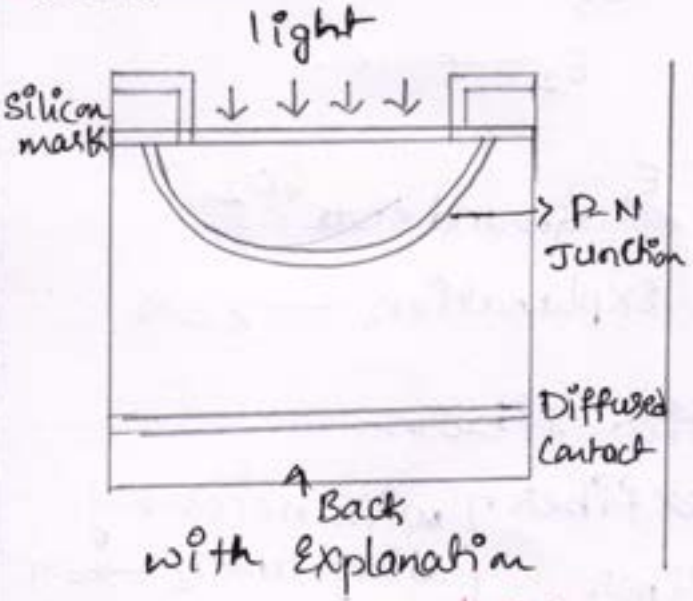
$V_H = BVd$ ⟶ 2M

$J = I/A$ ⟶ 1M

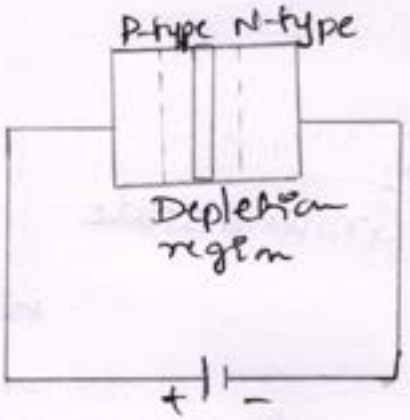
$S = \frac{BI}{V_H W}$ ⟶ 1M

Hall co-efficient, $R_H = \frac{1}{S}$ ⟶ 1M

2b) Construction and working of photodiode



with Explanation ⟶ 3M



with Explanation ⟶ 3M

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2c) Given data, $R_H = -3.68 \times 10^{-5} m^3/C$, $n = ?$ → 1M

Formula $R_H = \frac{1}{ne}$ → 1M

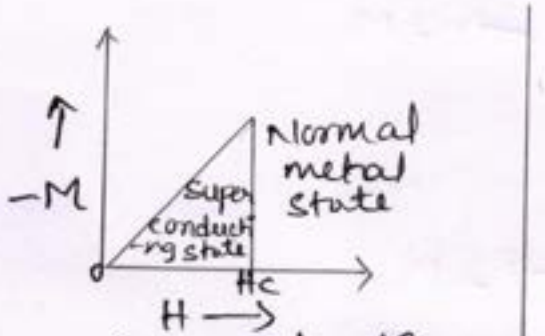
$$n = \frac{1}{R_H e}$$

substituting value and final Answer → 1M

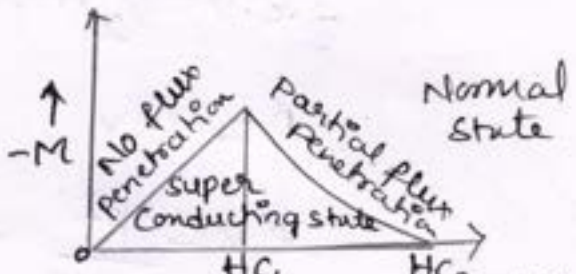
$$n = 1.7 \times 10^{23}/m^3$$ → 1M

* Type of charge carrier is positive → 1M

3a) Definition of critical temperature → 1M



with Explanation → 4M



with Explanation → 4M

3b) clausius mossotti equation

Dipole moment $= N\mu$ — (1)

$\mu = \alpha_e E_i$ — (2) → 1M

$E_i = \frac{P}{N\alpha_e}$ — (3) → 1M

$E = \frac{P}{\varepsilon_0(\varepsilon_r - 1)}$ — (4) → 1M

$\frac{P}{N\alpha_e} = \frac{P}{\varepsilon_0(\varepsilon_r - 1)} + \frac{\gamma}{\varepsilon_0} P$ — (5) → 1M

$\gamma = 1/3$ lorentz field → 1M

$\frac{N\alpha_e}{3\varepsilon_0} = \frac{\varepsilon_r - 1}{\varepsilon_r + 2}$ — (6) → 1M

with explanations.

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3c) Given data, $f(E)=?$. Fermi level i) 200K & ii) 400K → 1M

Formula $f(E) = \frac{1}{e^{\left(\frac{E-E_f}{KT}\right)}+1}$ → 2M

$f(E) = 0.23$ at 200K → 1M

$f(E) = 0.36$ at 400K → 1M

4a) Statement → 2M

Derivation for de-Broglie wavelength

An electron accelerated with V of energy eV

$eV = \frac{1}{2}mv^2$ → 2M

$p = mv$

$eV = \frac{p^2}{2m}$ → 2M

$p = \sqrt{2meV}$ → 1M

$\lambda = \frac{h}{p}$ → 1M

$\lambda = \frac{1}{\sqrt{V}} \frac{h}{\sqrt{2me}}$

$\lambda = \frac{1.226}{\sqrt{V}} nm$ → 1M

4b) Statement → 2M

$\Delta x \cdot \Delta p \geq \frac{h}{4\pi}$ → 2M

$E^2 \geq p^2c^2 + m_0^2c^4$

$E \geq 9.16$ mev → 2M

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4c) Given data, $\lambda = ?$ $E = 1.5 eV$ — 1M

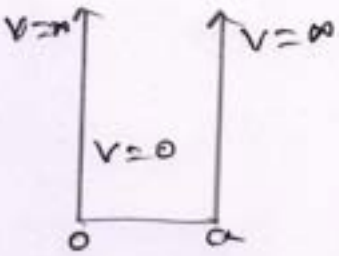
Formula $P = \sqrt{2mE}$ → 1M

$\lambda = \frac{h}{P}$ → 1M and substitution → 1M

$\lambda = 1.002 nm$ → 1M

5a) wavefunction definition → 1M

Time Independent 1D schrodinger equation



$\psi = Ae^{i(kx - \omega t)}$ — (1) → 1M

$\frac{\partial^2 \psi}{\partial x^2} = e^{-i\omega t}(-\omega^2 \psi)$ — (2) → 1M

$E_K = \frac{p^2}{2m}$ — (3) → 2M

$E = \frac{h^2}{8\pi^2 m} \frac{1}{\psi} \frac{d^2\psi}{dx^2} + V$ → 2M

$\frac{\partial^2 \psi}{\partial x^2} + \frac{8\pi^2 m}{h^2}(E - V) = 0$ → 2M

5b) statement → 2M

Explanation of principle of complementarity → 4M

5c) Given data, $\lambda = ?$ $E = 100 eV$ → 2M

$P = \sqrt{2mE}$ → 2M

$\lambda = \frac{h}{P}$ → 1M

$\lambda = 1.22 Å$ → 1M

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6a) $\nabla \cdot \vec{E} = -\frac{\partial B}{\partial t}$ — (1) → 1M

$\nabla \times \vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial t}$ — (2) → 1M

$\nabla \times \nabla \times \vec{E} = -\mu \frac{\partial}{\partial t}(\nabla \times \vec{H})$ — (3) → 2M

$\nabla \cdot \vec{D} = \rho v$ — (4) → 1M

$\nabla \cdot \vec{E} = \frac{\rho v}{\varepsilon}$ — (5) → 1M

$\vec{J} = 0$ → 1M $\rho v = 0$ → 1M

$v = \frac{1}{\sqrt{\mu \varepsilon}}$ → 1M

6b) Gradient

$\nabla V = \hat{i}\frac{\partial V}{\partial x} + \hat{j}\frac{\partial V}{\partial y} + \hat{k}\frac{\partial V}{\partial z}$ → 2M

Scalar $\nabla \cdot \vec{E} = \frac{\partial}{\partial x}E_x + \frac{\partial}{\partial y}E_y + \frac{\partial}{\partial z}E_z$ → 2M

curl $\nabla \times H = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ H_x & H_y & H_z \end{vmatrix}$ → 2M

6c) $\vec{A} = (x+ay)\hat{a}_x + (y+bz)\hat{a}_y + (x+az)\hat{a}_z$ — 1M

$\nabla \cdot \vec{A} = \frac{\partial \vec{A}}{\partial x} \cdot \hat{a}_x + \frac{\partial A}{\partial y}\hat{a}_y + \frac{\partial A}{\partial z}\hat{a}_z$ → 2M

$\nabla \cdot \vec{A} = 0$, $\nabla \cdot \vec{A} = 1+1+c(1)$ → 1M

$1+1+c = 0$

$\boxed{c = -2}$ → 1M

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7a) Definition → 2M

$$I_D = \left(\frac{\partial \vec{D}}{\partial t}\right) A \quad -(1) \rightarrow 1M$$

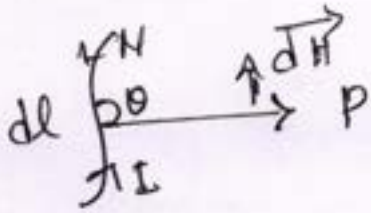
$$D = \varepsilon E \quad -(2) \rightarrow 1M$$

$$E = \frac{V}{d} \quad -(3) \rightarrow 1M$$

$$D = \varepsilon V/d \quad -(4) \rightarrow 2M$$

$$I_D = \frac{S\omega GAV e^{i\omega t}}{d} \rightarrow 2M$$

7b)



and four Maxwell's Equation → 6M

7c) Given data, B = ? → 1M

N = 100

r = 8 × 10⁻² m

I = 0.4 A

d = 20 × 10⁻² m

Formula

$$B = \frac{4\pi nI}{2} \frac{r^2}{(r^2+x^2)^{3/2}} \rightarrow 2M$$

Substituting the values → 1M

$$B = 1.6 \times 10^{-5} T \rightarrow 1M$$

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Shridevi Institute of Engineering and Technology, Tumakuru
II Semester: CIE III Internal Assessment Test:08 /09/2023
BPHYS202 – Applied Physics for CSE Stream
Section: D & E

Time: 120 Minutes | Max Marks: 60

Note: 1. ***Answer any one full Questions from each part***
2 M:Marks, L:Bloom's level, C:Course outcome.

		PART - A	M	L	C
1	a.	State Heisenberg's Uncertainty Principle. Show that electron cannot exist inside the nucleus.	7	L2	CO2
	b.	What is wave function? Set up time independent one dimensional Schrödinger wave equation.	8	L2	CO2
	c.	An electron has a speed of 100 m/s. The inherent uncertainity in its measurement is 0.005%. Calculate the corresponding uncertainity in the measurement of the position. Given mass of electron is 9.1×10^{-31} kg.	5	L3	CO2
		OR			
2	a.	Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein's co-efficient.	8	L2	CO1
	b.	Obtain an expression for numerical aperture and arrive at the condition for propagation.	7	L2	CO1
	c.	The ratio of population of two energy levels is 1.059×10^{-30}. Find the wavelength of light at 330K.	5	L3	CO1
		OR			
3	a.	Enumerate the failures of classical free electron theory and assumptions of quantum free electron theory of metals.	9	L2	CO3
	b.	Explain BCS theory of superconductivity.	6	L2	CO3
	c.	Lead has a superconducting transition temperature of 7.26 K. If initial field at 0K is $50 \times 10^3 Am^{-1}$, Calculate the critical field at 6 K.	5	L3	CO3
		PART- B			
4	a.	Elucidate the differences between classical and quantum computing.	7	L2	CO2
	b.	Describe the working of controlled-Z gate mentioning its matrix representation and truth-table.	8	L2	CO2
	c.	Using matrix multiplication show that on applying Hadamard gate twice a $\|0\rangle$ results in its original state.	5	L3	CO2
		OR			
5	a.	Explain the representation of qubit using Bloch Sphere.	7	L2	CO2
	b.	State the Pauli matrices and apply Pauli matrices on the states $\|0\rangle$ and $\|1\rangle$.	8	L2	CO2
	c.	A Linear Operator 'X' operates such that $X\|0\rangle = \|1\rangle$ and $X\|1\rangle = \|0\rangle$. Find the matrix representation of 'X'.	5	L3	CO2
		PART- C			
6	a.	Discuss timing in Linear motion, Uniform motion, slow in and slow out.	7	L2	CO4
	b.	Illustrate the odd rule and odd rule multipliers with a suitable example.	8	L2	CO4
	c.	The number of particles emitted per second by a random radioactive source has a Poisson's distribution with $\lambda = 4$. Calculate the probability of $P(X = 0)$ and $P(X = 1)$.	5	L3	CO4
		OR			
7	a.	Describe Jumping and parts of jump.	7	L2	CO4
	b.	Discuss modeling the probability for proton decay.	8	L2	CO4
	c.	A slowing-in object in an animation has a first frame distance 0.5m and the first slow in frame 0.35m. Calculate the base distance and the number of frames in sequence.	5	L3	CO4

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Scheme and Solution

II Sem : CIE III Internal Assessment

RPHYS202 : Applied physics for CSE stream

Q.NO		Marks
1 a	Statement — (2)	
	$\Delta x \Delta p \geq \frac{h}{4\pi}$ — (1) $\quad \Delta p \geq 5.272 \times 10^{-31}$ kg m/s — (1)	3M
	$E = \frac{p^2}{2m} = \frac{(5.272 \times 10^{-31})}{(2 \times 9.11 \times 10^{-31})}$ — (2)	
	$E = 95$ MeV — (1)	
b	Definition — (1)	
	$\lambda = \frac{h}{mv}$ $\quad \bar{\psi} = A e^{i(kx - \omega t)}$ — (1)	
	$\frac{d^2\bar{\psi}}{dx^2} = e^{-i\omega t} \frac{d^2\psi}{dx^2}$, $\frac{d^2\bar{\psi}}{dt^2} = -\omega^2 e^{-i\omega t} \psi$ — (1)	8M
	$\frac{d^2\bar{\psi}}{dx^2} = \frac{1}{v^2} \frac{d^2\bar{\psi}}{dt^2}$ — (1)	
	$\frac{1}{\lambda^2} = -\frac{1}{4\pi^2\psi} \frac{d^2\psi}{dx^2}$, $K.E = \frac{h^2}{2m} \frac{1}{\lambda^2}$ — (2)	
	$P.E = V$, $E = K.E + P.E$ — (1)	
	$\frac{d^2\psi}{dx^2} + \frac{8\pi^2 m}{h^2}(E - V)\psi = 0$ — (1)	
c	$\Delta x \geq \frac{h}{4\pi \Delta p}$ — (1)	
	But $\Delta v = 100 \times \frac{0.005}{100} = 0.005$ — (1)	
	$\Delta p = m \Delta v = 9.11 \times 10^{-31} \times 0.005 = 4.55 \times 10^{-33}$ — (1)	5M
	$\Delta x = \frac{(6.626 \times 10^{-34})}{(4 \times 3.142 \times 4.55 \times 10^{-33})}$ — (1)	
	$\Delta x = 11.5 \times 10^{-3}$ m — (1)	

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2

a

Rate of absorption $= B_{12} N_1 U_\gamma$ — (1)

Rate of spontaneous emission $= A_{21} N_2$ — (1)

Rate of stimulated emission $= B_{21} N_2 U_\gamma$ — (1)

$B_{12} N_1 U_\gamma = A_{21} N_2 + B_{21} N_2 U_\gamma$ — (1)

$$U_\gamma = \frac{A_{21}}{B_{21}} \left[\frac{1}{\frac{B_{12} N_1}{B_{21} N_2} - 1} \right]$$ — (1)

8M

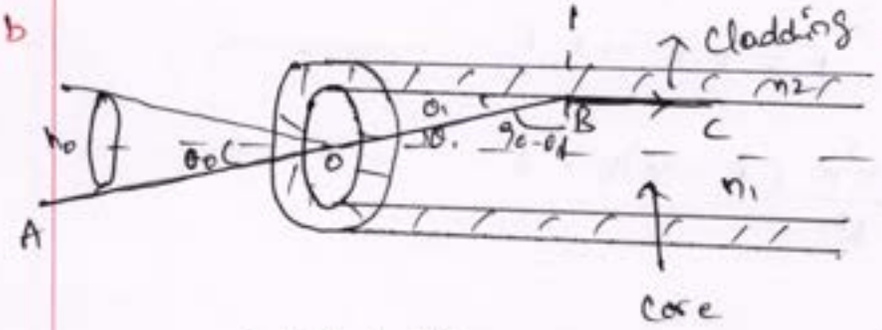
$$\frac{N_1}{N_2} = e^{\frac{h\nu}{KT}}$$

$$U_\gamma = \frac{8\pi h \gamma^3}{c^3} \left[\frac{1}{e^{\frac{h\nu}{KT}} - 1} \right]$$ — (1)

$$\frac{A_{21}}{B_{21}} = \frac{8\pi h \gamma^3}{c^3}, \quad \frac{B_{12}}{B_{21}} = 1 \Rightarrow B_{12} = B_{21}$$ — (1)

$$U_\gamma = \frac{A}{B} \left[\frac{1}{e^{\frac{h\nu}{KT}} - 1} \right]$$ — (1)

b



(2)

$n_0 \sin\theta_0 = n_1 \sin\theta_1$ — (2)

$n_1 \sin(90-\theta_1) = n_2 \sin 90$

7M

$\cot\theta_1 = \frac{n_2}{n_1}$ upto $\sin\theta_0 = \sqrt{n_1^2 - n_2^2}$ — (2)

$N.A = \sqrt{n_1^2 - n_2^2}$, $\sin\theta_0 : \angle N.A$ — (1)

c

$$\frac{N_2}{N_1} = e^{-\frac{hc}{\lambda KT}}$$ — (1)

$$\ln\left(\frac{N_2}{N_1}\right) = -\frac{hc}{\lambda KT}$$ — (1)

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$$\lambda = -\frac{hc}{\ln\left(\frac{N_2}{N_1}\right) KT} = \frac{-6.626 \times 10^{-34}}{\ln(1.059 \times 10^{-30}) \times 1.38 \times 10^{-23} \times 330}$$ — (2)

5M

$\lambda = 632.4$ nm — (1)

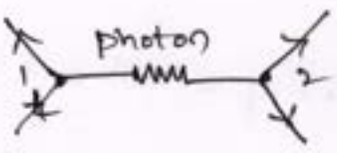
3 a Explanation of

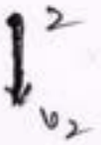
1. Specific heat ——— (2)
2. Temperature dependence of electrical conductivity (2)
3. Electrical conductivity on electron Concentration (2)

and Mention the assumptions of Quantum free Electron Theory ——— (3)

9M

b





——— (2)

Explanation of BCS theory ——— (4)

6M

c $H_c = H_0 \left[1 - \left(\frac{T}{T_c}\right)^2\right]$ ——— (1)

$H_c = 50 \times 10^3 \left[1 - \left(\frac{6}{7.26}\right)^2\right]$ ——— (3)

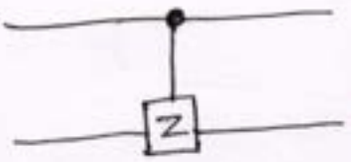
$H_c = 18.834 \times 10^3$ A/m ——— (1)

5M

4 a 7 differences of classical and Quantum computing ——— 7×1

7M

b



——— (2)

$V_2 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$ (2)

Input	output	
$\|00\rangle$	$\|00\rangle$	(2)
$\|01\rangle$	$\|01\rangle$	
$\|10\rangle$	$\|10\rangle$	
$\|11\rangle$	$-\|11\rangle$	

Explanation ——— (2)

8M

c $HH = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}\frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} = \frac{1}{2}\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ ——— (4)

Since $I|0\rangle = |0\rangle$ ——— (1)

5M

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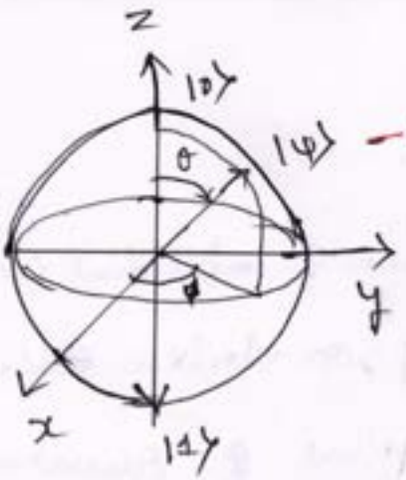

$|\psi\rangle = \cos\frac{\theta}{2}|0\rangle + e^{i\phi}\sin\frac{\theta}{2}|1\rangle$ — (2)

$\left|\cos\frac{\theta}{2}\right|^2 + \left|\sin\frac{\theta}{2}\right|^2 = 1$ — (1)

Explanation — (2)

7M

b

$\sigma_0 = I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ operating on $|0\rangle$ and $|1\rangle$ — (2)

$\sigma_1 = \sigma_x = X = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ operating on $|0\rangle$ and $|1\rangle$ — (2)

$\sigma_2 = \sigma_y = Y = \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$ operating on $|0\rangle$ and $|1\rangle$ — (2)

$\sigma_3 = \sigma_z = Z = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ operating on $|0\rangle$ and $|1\rangle$ — (2)

8M

c

$X = \begin{bmatrix} x_{11} & x_{12} \\ x_{21} & x_{22} \end{bmatrix}\begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ — (1)

— (1)

$x_{11} = 0$ and $x_{21} = 1$

$X = \begin{bmatrix} x_{11} & x_{12} \\ x_{21} & x_{22} \end{bmatrix}\begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ — (1)

— (1)

$x_{12} = 1$ and $x_{22} = 0$

— (1)

$\therefore X = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

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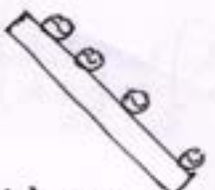
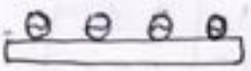


Linear motion — (2)



Uniform motion — (2)

Explanation

Slow in and Slow out — (3)

Explanation

7M

b

Odd Rule

$= ((\text{frame no} - 1) \times 2) - 1$ — (2)

odd Rule Multiplier

$= (\text{Current frame no} - 1)^2$ — (2)

8M

frame no	odd Rule	odd Rule multiplier
0	NA	-
1	1	1
2	3	4
3	5	9
4	7	16
5	9	25
6		

— (4)

c

$$P(x=k) = \frac{\lambda^k e^{-\lambda}}{k!} \quad \lambda = 4$$ — (1)

$$P(x=0) = \frac{4^0 e^{-4}}{0!} = 0.0183$$ — (2)

$$P(x=1) = \frac{4^1 e^{-4}}{1!} = 0.07326$$ — (2)

5M

7a

Explanation of parts of jump

1. Crouch
2. Takeoff
3. In the air
4. Landing

— 7M

7M

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b

$N = N_0 e^{-\lambda t}$ ——— (1)

$\lambda = \frac{1}{t} = 10^{-33}$ /year ——— (1)

$e^{-\lambda t} = 1 - \lambda t$ ——— (1)

$N = N_0(1 - \lambda t)$ ——— (1) 8M

$N_0 - N_1 = N_0 \lambda t$ ——— (1)

$= 7.5 \times 10^{33} \times 10^{-33} \times 1$ ——— (2)

$= 7.5$

$P(r) = \frac{\lambda^r e^{-\lambda}}{r!} = \frac{3^0 e^{-3}}{0!} = 0.05$ ——— (1)

c

Base Distance = $\frac{\text{Total distance} - \text{First frame distance}}{2}$

$= \frac{0.5 - 0.35}{2}$

$= 0.075$ (m)

Number of frame = $\frac{\text{Total distance}}{\text{Base distance}}$

$= \frac{0.5}{0.075}$

$= 7$

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DEPARTMENT OF MATHEMATICS
I-semester: I Internal Assessment Exam: JANUARY-2023
22MAT11- MATHEMATICS

ESTD:2002 20 YEARS Academic Excellence

Time: 90 min] **[Max marks: 40**

Note: Answer any 2 full questions choosing one full question from each part

PART-A

1. **a)** Prove with usual notations $\tan\varphi = r\frac{d\theta}{dr}$ **(CO1) (6M)**

b) Show that the pair of curves intersect orthogonally $r = a(1+\cos\theta)$ and $r = b(1-\cos\theta)$ **(CO1) (7M)**

c) Find the angle between the curves $r = \frac{a}{1+\cos\theta}$ and $r = \frac{b}{1-\cos\theta}$ **(CO1) (7M)**

OR

2. a) Prove with usual notation $(i)\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$ $(ii)\ \frac{1}{p^2} = u^2 + \left(\frac{du}{d\theta}\right)^2$ **(CO1) (6M)**

b) Show that the following pairs of curves intersect each other orthogonally $r^n = a^n cosn\theta$ *and* $r^n = b^n sinn\theta$ **(CO1) (7M)**

c) Find the angle between the pair of the curve $r = 6cos\theta$ *and* $r = 2(1+cos\theta)$ **(CO1) (7M)**

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DEPARTMENT OF MATHEMATICS
I-semester: I Internal Assessment Exam: JANUARY-2023
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PART-B

3. **a)** Find the rank of the matrix $A = \begin{bmatrix} 4 & 0 & 2 & 1 \\ 2 & 1 & 3 & 4 \\ 2 & 3 & 4 & 7 \\ 2 & 3 & 1 & 4 \end{bmatrix}$ **(CO1) (6M)**

b) Investigate the values of λ and μ such that the system of equations

$x + y + z = 6, x + 2y + 3z = 10, x + 2y + \lambda z = \mu$

may have (a) unique solution (b) infinite solution (c) no solution **(CO1) (6M)**

c) Solve the system of equation by Gauss elimination method

$x + y + z = 9, x - 2y + 3z = 8, 2x + y - z = 3.$ **(CO1) (6M)**

OR

4. **a)** Apply Gauss Jordan method to solve the system of equations

$2x + 5y + 7z = 52, 2x + y - z = 0, x + y + z = 9$ **(CO1) (6M)**

b) Solve the system of equations by Gauss Seidel method to obtain final solution correct to 3 decimalplaces

$x + y + 54z = 110, 27x + 6y - z = 85, 6x + 15y + 2z = 72$ **(CO1) (7M)**

c) Find the largest eigen value and corresponding eigen vector of the matrix A by the power method by

taking initial vector as $[1 \quad 1 \quad 1]^T, A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ **(CO1) (7M)**

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PART-B

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22MAT11 - MATHEMATICS [CS/EC/EEE/CV/ISE/AIDS]

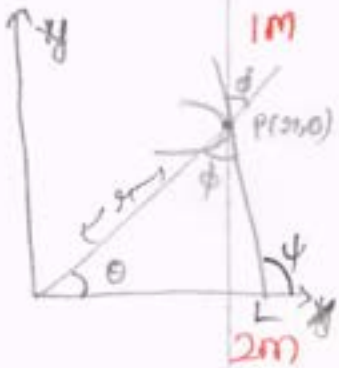
IIA Test : Scheme of Evaluation

PART - A

(1) a

Let $P(r,\theta)$ be any point on a curve $r=f(\theta)$

$\angle XOP = \theta$, $OP = r$



1M

using exterior property

$$\psi = \theta + \phi$$

$$\tan\psi = \frac{\tan\theta + \tan\phi}{1 - \tan\theta \cdot \tan\phi} \rightarrow (1)$$

2M

w.k.t $x = r\cos\theta$

$y = r\sin\theta$

$$\tan\psi = \frac{r\frac{d\theta}{dr} + \tan\theta}{1 - r\frac{d\theta}{dr}\tan\theta} \rightarrow (2)$$

2M

On comparing (1) & (2)

$$\tan\phi = r\frac{d\theta}{dr}$$

1M

b. $r = a(1+\cos\theta)$

$\downarrow$

$\phi_1 = \pi/2 + \theta/2$

$r = b(1-\cos\theta)$

$\downarrow$

$\phi_2 = \theta/2$

3M

3M

$|\phi_1 - \phi_2| = \pi/2$

1M

c. $r = \frac{a}{1+\cos\theta}$

$\downarrow$

$\phi_1 = \pi/2 - \theta/2$

$r = \frac{b}{1-\cos\theta}$

$\downarrow$

$\phi_2 = -\theta/2$

3M

3M

$|\phi_1 - \phi_2| = \pi/2$ //

1M

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a. $\sin\phi = \frac{p}{r}$

$p = r\sin\phi \rightarrow (1)$

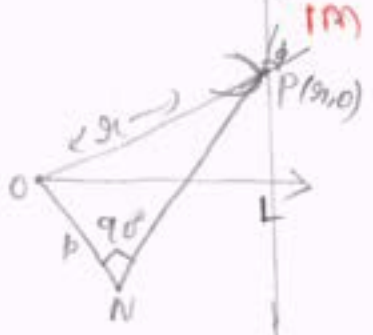
w.r.t $\cot\phi = \frac{1}{r}\frac{dr}{d\theta} \rightarrow (2)$

$p^2 = r^2\sin^2\phi$

$\frac{1}{p^2} = \frac{1}{r^2}(1+\cot^2\phi)$

$\frac{1}{p^2} = \frac{1}{r^2} + \left(1 + \frac{1}{r^2}\left(\frac{dr}{d\theta}\right)^2\right)$

$\frac{1}{p^2} = \frac{1}{r^2} + 1/r^4\left(\frac{dr}{d\theta}\right)^2 \rightarrow (3)$



1M

4M

Let $1/r = u$

'θ'

$-1/r^2\frac{dr}{d\theta} = \frac{du}{d\theta}$

$(3) \Rightarrow 1/p^2 = 1/r^2 + \left(\frac{du}{d\theta}\right)^2$

$= u^2 + \left(\frac{du}{d\theta}\right)^2$

2M

---

b. $r^n = a^n\cos n\theta$ & $r^n = b^n\sin n\theta$

$\log r^n = \log a^n + \log\cos n\theta$

$\log r^n = \log b^n + \log\sin n\theta$

Diff 'θ'

Diff 'θ'

$\cot\phi = -\tan n\theta$

$= \cot(\pi/2 + n\theta)$

$\phi_1 = \pi/2 + n\theta$

$\cot\phi = \cot n\theta$

$\phi_2 = n\theta$

$|\phi_1 - \phi_2| = \pi/2$

3M

3M

1M

---

c. $r = 6\cos\theta$ & $r = 2(1+\cos\theta)$

$\log r = \log 6 + \log\cos\theta$

$\log r = \log 2 + \log(1+\cos\theta)$

Diff 'θ'

Diff 'θ'

$\phi_1 = \pi/2 + \theta$

$\phi_2 = \pi/2 + \theta/2$

3M

3M

$|\phi_1 - \phi_2| = \theta/2$

$= \pi/3\times 2$

$= \pi/6$

on solving θ, we get $\theta = \pi/3$

1M

PART - B

(3) 3

(3)

a.

$R_2 \leftrightarrow R_1$

$$\begin{bmatrix} 2 & 1 & 3 & 4 \\ 4 & 0 & 2 & 1 \\ 2 & 3 & 4 & 7 \\ 2 & 3 & 1 & 4 \end{bmatrix} \quad \begin{matrix} R_2 \to R_2 - 2R_1 \\ R_3 \to R_3 - R_1 \\ R_4 \to R_4 - R_1 \end{matrix}$$

$$\begin{bmatrix} 2 & 1 & 3 & 4 \\ 0 & 2 & -4 & -7 \\ 0 & 2 & 1 & 3 \\ 0 & 2 & -2 & 0 \end{bmatrix} \quad \begin{matrix} R_3 \to R_3 + R_2 \\ R_4 \to R_4 + R_2 \end{matrix}$$ 3m

$$\begin{bmatrix} 2 & 1 & 3 & 4 \\ 0 & 2 & -4 & -7 \\ 0 & 4 & -3 & -4 \\ 0 & 4 & -6 & -7 \end{bmatrix} \quad R_4 \to R_4 - 2R_3$$

$$\therefore A = \begin{bmatrix} 2 & 1 & 3 & 4 \\ 0 & 2 & -4 & -7 \\ 0 & 4 & -3 & -4 \\ 0 & 4 & 0 & 1 \end{bmatrix}$$ 2m

$\rho(A) = 4$ 1m

b. $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 2 & \lambda \end{bmatrix}$ $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ $B = \begin{bmatrix} 6 \\ 10 \\ \mu \end{bmatrix}$ 1m

$$[A:B] = \begin{bmatrix} 1 & 1 & 1 & : 6 \\ 1 & 2 & 3 & : 10 \\ 1 & 2 & \lambda & : \mu \end{bmatrix} \quad \begin{matrix} R_2 \to R_2 - R_1 \\ R_3 \to R_3 - R_1 \end{matrix}$$

$$\begin{bmatrix} 1 & 1 & 1 & : 6 \\ 0 & 1 & 2 & : 4 \\ 0 & 1 & \lambda-1 & : \mu-6 \end{bmatrix} \quad R_3 \to R_3 - R_2$$

$$[A:B] = \begin{bmatrix} 1 & 1 & 1 & : 6 \\ 0 & 1 & 2 & : 4 \\ 0 & 0 & \lambda-3 & : \mu-10 \end{bmatrix}$$

a) unique : $\rho(A) = \rho(A:B) = r = n$

$\rho(A) = \rho(A:B) = 3 = 3$ 2m

if $\lambda - 3 \neq 0$ or $\lambda \neq 3$

b) Infinite : $\rho(A) = \rho(A:B) = r < n$

$= 2 < 3$ 2m

if $\lambda - 3 = 0$ (or) $\lambda = 3$ & $\mu - 10 = 0$ (or) $\mu = 10$

c) no solution:

$\rho(A) \neq \rho(A:B)$

$2 \neq 3$ 2m

if $\lambda - 3 = 0$ (or) $\lambda = 3$ $\mu - 10 \neq 0$ (or) $\mu \neq 10$

c

$$A:B = \begin{bmatrix} 1 & 1 & 1 & : 9 \\ 1 & -2 & 3 & : 8 \\ 2 & 1 & -1 & : 3 \end{bmatrix} \quad \begin{matrix} R_2 \to R_2 - R_1 \\ R_3 \to R_3 - 2R_1 \end{matrix}$$ 3m

$$\begin{bmatrix} 1 & 1 & 1 & : 9 \\ 0 & -3 & 2 & : -1 \\ 0 & -1 & -3 & : 15 \end{bmatrix} \quad R_3 \to 3R_3 - R_2$$

$$\begin{bmatrix} 1 & 1 & 1 & : 9 \\ 0 & -3 & 2 & : -1 \\ 0 & 0 & -11 & : -44 \end{bmatrix}$$

$x + y + z = 9$

$-3y + 2z = -1$

$-11z = -44$ 3m

$\Rightarrow$ $z = 4$ $y = 3$ $x = 2$ 1m

Verify: $x + y + z = 9$

$9 = 9$

a. $[A:B] = \begin{bmatrix} 2 & 5 & 7 & : & 52 \\ 2 & 1 & -1 & : & 0 \\ 1 & 1 & 1 & : & 9 \end{bmatrix}$ $R_3 \leftrightarrow R_1$

$\begin{bmatrix} 1 & 1 & 1 & : & 9 \\ 2 & 1 & -1 & : & 0 \\ 2 & 5 & 1 & : & 52 \end{bmatrix}$ $R_2 \to R_2 - 2R_1$, $R_3 \to R_3 - 2R_1$ — 2M

$\begin{bmatrix} 1 & 1 & 1 & : & 9 \\ 0 & -1 & 3 & : & -18 \\ 0 & 3 & 5 & : & 34 \end{bmatrix}$ $R_1 \to R_1 + R_2$, $R_3 \to R_3 + 2R_2$ — 3M

$\begin{bmatrix} 1 & 0 & -2 & : & -9 \\ 0 & -1 & -3 & : & -18 \\ 0 & 0 & -4 & : & -20 \end{bmatrix}$ $R_3 \to R_3/-4$

$\begin{bmatrix} 1 & 0 & -2 & : & -9 \\ 0 & -1 & -3 & : & -18 \\ 0 & 0 & 1 & : & 5 \end{bmatrix}$ $R_1 \to R_1 + 2R_3$, $R_2 \to R_2 + 3R_3$

$\begin{bmatrix} 1 & 0 & 0 & : & 1 \\ 0 & -1 & 0 & : & -3 \\ 0 & 0 & 1 & : & 5 \end{bmatrix}$ $x = 1, y = -3, z = 5$ — 2M

$x = 1, y = 3 \quad z = 5$

$x + y + z = 9$

$9 = 9$

b. 1st iteration

$x^{(1)} = 3.148$

$y^{(1)} = 3.541$

$z^{(1)} = 1.913$

2nd iteration:

$x^{(2)} = 2.432$

$y^{(2)} = 3.570$

$z^{(2)} = 1.926$

3rd iteration:

$x^{(3)} = 2.426$

$y^{(3)} = 3.573$

$z^{(3)} = 1.926$

4th iteration

$x^{(4)} = 2.425$

$y^{(4)} = 3.575$

$z^{(4)} = 1.926$

— 3M — 3M — 1M

c. 1st $Ax^{(0)} = 3\begin{bmatrix} 0.333 \\ 0 \\ -1.0000 \end{bmatrix} = \lambda^{(1)} y^{(1)}$

2nd $= 3\begin{bmatrix} 0.6666 \\ 0.6667 \\ 2.0000 \end{bmatrix} = \lambda^{(2)} y^{(2)}$

3rd $= 2.9334\begin{bmatrix} 0.4428 \\ -0.2856 \\ -1 \end{bmatrix} = \lambda^{(3)} x^{(3)}$

4th $= 2.2856\begin{bmatrix} 0.2499 \\ 0.1251 \\ 1 \end{bmatrix}$

5th $= 2.1251\begin{bmatrix} 0.1763 \\ -0.1704 \\ -1 \end{bmatrix}$

— 4M

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— 2M

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF MATHEMATICS

I-semester: II Internal Assessment Exam: FEBRUARY-2023

22MATE11- *EEE/ECE STREAM* CALCULUS and LINEAR ALGEBRA

[Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40]

Questions No.	PART-A	Marks	BLT	
1a.	Derive the expression for radius of curvature for a polar curve.	7	L1 & L2	CO1
b.	Find the radius of curvature for the curve $x^3 + y^3 = 3axy$ at the point $(3a/2, 3a/2)$ on it.	7	L1 & L2	CO1
c.	Expand $log(secx)$ upto the term containing x^6 using Maclaurin's series.	6	L1 & L2	CO2
	OR			
2a.	Show that for the curve $r(1 - cos\theta) = 2a$, ρ^2 varies as r^3.	7	L1 & L2	CO1
b.	Show that the radius of the curvature for the curve at any point θ on the cycloid $x = a(\theta + sin\theta)$, $y = a(1 - cos\theta)$ is $4acos(\theta/2)$	7	L1 & L2	CO1
c.	Expand e^{sinx} upto the term containing x^4 using Maclaurin's series.	6	L1 & L2	CO2

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	PART-B			
3a.	Solve $(4xy + 3y^2 - x)dx + x(x + 2y)dy = 0$	7	L1 & L2	CO3
b.	Solve $y(2xy + 1)dx - xdy = 0.$	7	L1 & L2	CO3
c.	Find the orthogonal trajectories of the family of curves $\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1$, where λ is the parameter.	6	L1 & L2	CO3
	OR			
4a.	Solve $[y(1 + {}^1/_x) + cosy]dx + [x + logx - xsiny]dy = 0$	7	L1 & L2	CO3
b.	Solve $\frac{dy}{dx} + ycotx = cosx.$	7	L1 & L2	CO3
c.	Show that the orthogonal trajectories of the family $r(1 - cos\theta) = a$ is the family $r(1 + cos\theta) = b$, where a, b are constants.	6	L1&L2	CO3

CO1: Apply the knowledge of calculus to solve problems related to polar curves.CO2 Able to find the Taylor's and Maclaurin's series, indeterminate forms, partial differentiation and maxima and minima for a function of two variables .CO3: Analyze the solution of linear and non linear ordinary differential equation

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DEPARTMENT OF MATHEMATICS

SCHEME OF SOLUTIONS

ACADEMIC YEAR: 2022-23 IA- II SUBJECT CODE: 22 MAT 11

QUESTION NO	SOLUTIONS	MARKS
(1) a	$\psi = \theta + \phi$	
	$\frac{d\psi}{ds} = \frac{d\theta}{ds} + \frac{d\phi}{ds}$	—1—
	$\rho = \frac{ds/d\theta}{1 + d\phi/d\theta}$	—1—
	$ds/d\theta = \sqrt{r_1^2 + r^2}$	—1—
	$1 + \frac{d\phi}{d\theta} = \frac{2r_1^2 + r^2 - rr_2}{r_1^2 + r^2}$	—1—
	$\rho = \frac{(r_1^2 + r^2)^{3/2}}{2r_1^2 + r^2 - rr_2}$	—3—
(b)	$x^3 + y^3 = 3axy$	
	$y' = \frac{ay - x^2}{y^2 - ax}$	—1—
	at $\left(\frac{3a}{2}, \frac{3a}{2}\right)$	—2—
	$y' = -1 \quad y'' = \frac{-32}{3a}$	—1—
	$\rho = \frac{[1 + y_1^2]^{3/2}}{y_{11}}$	—1—
	$\rho = \frac{3a\sqrt{2}}{16}$	—2—

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QUESTION NO	SOLUTIONS	MARKS
1.c	$y = y(0) + x y_1(0) + \frac{x^2}{2!} y_2(0) + \frac{x^3}{3!} y_3(0) + \dots$	1
	$y = \log \sec x \quad y(0) = 0$	1
	$y_1 = \tan x \quad y_1(0) = 0$	1
	$y_2 = \sec^2 x \quad y_2(0) = 1$	1
	$y_2 = 1 + y_1^2$	1
	$y_3 = 2 y_1 y_2 \quad y_3(0) = 0$	1
	$y_4 = 2[y_1 y_3 + y_2^2] \quad y_4(0) = 2$	1
	$y_5 = 2[y_1 y_4 + 3 y_2 y_3] \quad y_5(0) = 0$	1
	$y_6 = 2[y_1 y_5 + y_4 y_2 + 3 y_2 y_4 + 3 y_3^2] \quad y_6(0) = 16$	1
2(a)	$s = \frac{(r^2 + r_1^2)^{3/2}}{r^2 + 2r_1^2 - r r_2}$	1
	$r_1 = -r \cot \theta/2 \quad r_2 = r[\operatorname{cosec}^2 \theta/2 \frac{1}{2} + \cot^2 \theta/2]$	4
	$\boxed{s = \frac{4}{a} r^3}$	2
2(b)	$x = (\theta + \sin\theta)a \quad y = a(1 - \cos\theta)$	
	$\frac{dy}{dx} = \tan \theta/2, \quad \frac{d^2y}{dx^2} = \frac{1}{4a} \sec^4 \theta/2$	4
	$s = \frac{[1 + (y')^2]^{3/2}}{y_2}$	1
	$s = 4a \cos \theta/2$	2

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QUESTION NO	SOLUTIONS	MARKS
2c.	$y = e^{\sin x}$ $\quad y(0) = 1$	
	$y_1 = e^{\sin x}\cos x = y\cos x \quad y_1(0) = 1$	-1-
	$y_2 = -y\sin x + \cos x\, y_1 \quad y_2(0) = 1$	-1-
	$y_3 = -y_1 - 2y_1\sin x + \cos x \cdot y_2 \quad y_3(0) = 0$	-1-
	$y_4 = -y_2 - 2y_1\cos x - 3\sin x\, y_2 + \cos x\, y_3$	-1-
	$y_4(0) = -3$	-2-
	$e^{\sin x} = 1 + x + \frac{x^2}{2} - 3\frac{x^4}{4!}$	
3a)	$M = 4xy + 3y^2 - x \quad N = x^2 + 2xy$	-1-
	$\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} = 2(x+2y) \neq N$	-1-
	$\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right) = \frac{2}{x} = f(x)$	-1-
	$IF = e^{\int f(x)\,dx} = x^2$	-1-
	$x^2[4xy + 3y^2 - x]dx + x^2[x^2 + 2xy]dy = 0$	-3-
	$x^4y + x^3y^2 - \frac{x^3}{3} = c$	
3b)	$M = 2xy^2 + y \quad N = -x$	-1-
	$\frac{1}{M}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right) = \frac{2}{y} = g(y)$	-1-
	$IF = e^{-\int g(y)dy} = e^{-\int 2/y\,dy}$	
	$= 1/y^2$	-1-

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QUESTION NO	SOLUTIONS	MARKS
	$\frac{1}{y^2}[2xy^2+y]dx - \frac{x}{y^2}dy = 0$	-1-
	$\int M dx + \int N(y) dy = c$	-3-
	$\frac{x^2}{y} + \frac{x}{y} = c$	-1-
3c)	$\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1$ — (1)	
	diff w.r.t x	-1-
	$\frac{2x}{a^2} = \frac{-2y}{b^2+\lambda}\frac{dy}{dx}$ — (2)	-1-
	from — (1)	
	$\frac{x^2-a^2}{a^2} = \frac{-y^2}{b^2+\lambda}$ — (3)	-1-
	dividing (2) and (3)	
	$\frac{x}{x^2-a^2} = \frac{1}{y}\,dy/dx$	-1-
	Replace dy/dx by $-\frac{dx}{dy}$	
	$\frac{x}{x^2-a^2} = \frac{1}{y}\left(-\frac{dx}{dy}\right)$	-1-
	Seperate the variables and integrate	
	$y^2/2 = a^2 \log x - \frac{x^2}{2} + c$	-1-

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QUESTION NO	SOLUTIONS	MARKS
4a)	$[y(1+1/x)+\cos xy]dx + [x+\log x - x\sin xy]dy = 0$	-
	$\frac{\partial M}{\partial y} = 1+1/x - \sin xy \quad \frac{\partial N}{\partial x} = 1+1/x - \sin xy$	-2-
	$\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$	-1-
	$\int M dx + \int N(y) dy = c$	-2-
	$yx + y\log x + x\cos xy = c$	-2-
4b)	$\frac{dy}{dx} + y\cot x = \cos x$	-1-
	$IF = e^{\int P dx} = e^{\int \cot x dx} = \sin x$	-2-
	$y \sin x = \int Q(IF) dx + C$	-2-
	$y \sin x = -\frac{\cos 2x}{4} + C$	-2-
4c)	$r(1-\cos\theta) = a$	
	take log on b.s	-1-
	$\log r + \log(1-\cos\theta) = \log a$	
	diff w.r.t θ	
	$\frac{1}{r}\frac{dr}{d\theta} + \frac{\sin\theta}{1-\cos\theta} = 0$	-2-

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QUESTION NO	SOLUTIONS	MARKS
	Replace $\frac{dr}{d\theta}$ by $-r^2\frac{d\theta}{dr}$ $\frac{1-\cos\theta}{\sin\theta}d\theta = \frac{1}{r}dr$	-2-
	$\int \tan\theta/2\, d\theta = \int 1/r\, dr$ $\frac{\log \sec^2\theta/2}{1/2} - \log r = \log c$	-2-
	$\frac{\sec^2\theta/2}{r} = c$ $b = r(1+\cos\theta)$	

CO-ORDINATOR :

C Bindu M9

HOD:

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS

I-semester: III Internal Assessment Exam: *APRIL-2023*

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Mathematics-I for Civil Engineering stream (BMATC101)

[Time: 3hr] **Note:** Answer any five **full** questions, choosing atleast one question from each Module [Max marks:100]

Question No.	MODULE-1	Marks	
1 a.	With usual notation prove that $\frac{1}{p^2}=\frac{1}{r^2}+\frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$	7	CO1
b.	Find the radius of curvature for the curve $y^2=\frac{a^2(a-x)}{x}$, where the curves meet the x-axis.	7	CO1
c.	Show that the radius of curvature of the curve $r^n=a^n\cos n\theta$ varies inversely as r^n	6	CO1
	OR		
	With usual notation prove that $\tan\varphi=r\frac{d\theta}{dr}$.	7	CO1
b.	Show that the curve $r=a(1+cos\theta)$ *and* $r=a(1-cos\theta)$ cuts each other orthogonally	7	CO1
c.	Show that the radius of the curvature at any point θ on the cycloid $x=a(\theta+sin\theta), y=a(1-cos\theta)$ *is* $4acos(\frac{\theta}{2})$	6	CO1
	MODULE-2		
3a.	Expand log(secx) up to the term containing x^4 using Maclaurin's series	7	CO2
b.	Evaluate i) $\lim_{x\to 0}\left(\frac{a^x+b^x}{2}\right)^{1/x}$ ii) $\lim_{x\to 0}\left(\frac{tanx}{x}\right)^{1/x}$.	7	CO2
c.	If $u=f(x-y,y-z,z-x)$ show that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$	6	CO2
	OR		
4a.	Expand $\log(1+\cos x)$ up to the term containing x^4 using Maclaurin's series	7	CO2
b.	If $x+y+z=u, y+z=v$ *and* $z=uvw$, *find the value of* $\frac{\partial(x,y,z)}{\partial(u,v,w)}$	7	CO2
c.	Find the extreme value of the function $f(x,y)=x^3+3xy^2-3y^2-3x^2+4$	6	CO2
	MODULE-3		
5 a.	Solve $\frac{dy}{dx}+\frac{y}{x}=y^2x$	7	CO3
b.	Find the orthogonal trajectories of the family $r^n cosn\theta=a^n$.	7	CO3
c.	Solve $xyp^2-(x^2+y^2)p+xy=0$.	6	CO3
	OR		
6 a.	Solve $(4xy+3y^2-x)dx+x(x+2y)dy=0$	7	CO3
b.	Find the general solution of the equation $(px-y)(py+x)=a^2p$ by reducing into Clairaut's form by taking the substitution $X=x^2, Y=y^2$	7	CO3

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c.	If the temperature of the air is 30^0 C and a metal ball cools from 100^0C to 70^0C in 15 minutes, find how long will it take for the metal ball to reach the temperature of 40^0C?	6	CO3
	MODULE-4		
7 a.	Find the angle between the curve $r = a\log\theta$ and $r = \frac{a}{\log\theta}$	7	CO4
b.	Evaluate (i) $\lim_{x\to 0}\left(\frac{\sin x}{x}\right)^{1/x^2}$ (ii) $\lim_{x\to 0}(\tan x)^{\tan x}$	7	CO4
c.	Solve $y(2xy+1)dx - xdy = 0$	6	CO4
	OR		
8 a.	Find the rank of the matrix $\begin{bmatrix} 11 & 12 & 13 & 14 \\ 12 & 13 & 14 & 15 \\ 13 & 14 & 15 & 16 \\ 14 & 15 & 16 & 17 \end{bmatrix}$	7	CO4
b.	For what values of a and b the system of equation $x+y+z=6;\ x+2y+3z=10;\ x+2y+az=b$ has i) no solution ii) a unique solution and iii) infinite number of solution.	7	CO4
c.	Expand $e^{\sin x}$ upto the term containing x^4 using Maclaurin's series.	6	CO4
	MODULE-5		
9 a.	Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 1 \\ 2 & 1 & -1 & 0 \\ 3 & 3 & 2 & 1 \\ 2 & 4 & 6 & 2 \end{bmatrix}$	7	CO5
b.	Test for consistency and solve $5x+3y+7x=4;\ 3x+26y+2z=9;\ 7x+2y+10z=5$	7	CO5
c.	Using Gauss Jordan method, solve $x+y+z=11;\quad 3x-y+2z=12;\quad 2x+y-z=3$	6	CO5
	OR		
10a.	Solve by Gauss elimination method $2x+y+4z=12,\ 4x+11y-Z=33,\ 8x-3y+2z=20$	7	CO
b.	Solve the system of equations $2x-3y+20z=25,\ 20x+y-2z=9,\ 7x+2y+10z=-18$ using Gauss-Seidel method, taking (0, 0, 0) as an initial approximation.(Carry out 4 iterations).	7	CO5
c.	Using Rayleigh's power method find the dominant eigen value and the corresponding eigen vector of $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ by taking $[1\ 0\ 0]^T$ as the initial eigenvector [carry out 6 iterations]	6	CO5

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS

I-semester: III Intenal Assessment Exam: *APRIL-2023*

1	S	V							

Mathematics-I for Computer Science stream (BMATS101)

[Time: 3hr] Note: Answer any five full questions, choosing atleast one question from each Module [Max marks:100]

Question No.	MODULE-1	Marks	
1 a.	With usual notation prove that $\frac{1}{p^2}=\frac{1}{r^2}+\frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$	7	CO1
b.	Find the radius of curvature for the curve $y^2=\frac{a^2(a-x)}{x}$, where the curves meet the x-axis.	7	CO1
c.	Show that the radius of curvature of the curve $r^n=a^n\cos n\theta$ varies inversely as r^n	6	CO1
	OR		
2 a.	With usual notation prove that $\tan\varphi=r\frac{d\theta}{dr}$.	7	CO1
b.	Show that the curve $r=a(1+cos\theta)$ *and* $r=a(1-cos\theta)$ cuts each other orthogonally	7	CO1
c.	Show that the radius of the curvature at any point θ on the cycloid $x=a(\theta+sin\theta), y=a(1-cos\theta)$ *is* $4acos(\frac{\theta}{2})$	,6	CO1
	MODULE-2		
3a.	Expand log(secx) up to the term containing x^4 using Maclaurin's series	7	CO2
b.	Evaluate i) $\lim_{x\to0}\left(\frac{a^x+b^x}{2}\right)^{1/x}$ ii) $\lim_{x\to0}\left(\frac{tanx}{x}\right)^{1/x}$.	7	CO2
c.	If $u=f(x-y,y-z,z-x)$ show that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$	6	CO2
	OR		
4a.	Expand $\log(1+\cos x)$ up to the term containing x^4 using Maclaurin's series	7	CO2
b.	If $x+y+z=u, y+z=v$ *and* $z=uvw$, *find the value of* $\frac{\partial(x,y,z)}{\partial(u,v,w)}$	7	CO2
c.	Find the extreme value of the function $f(x,y)=x^3+3xy^2-3y^2-3x^2+4$	6	CO2
	MODULE-3		
5 a.	Solve $\frac{dy}{dx}+\frac{y}{x}=y^2x$	7	CO3
b.	Find the orthogonal trajectories of the family $r^n cosn\theta=a^n$.	7	CO3
c.	Solve $xyp^2-(x^2+y^2)p+xy=0$.	6	CO3
	OR		
6 a.	Solve $(4xy+3y^2-x)dx+x(x+2y)dy=0$	7	CO3
b.	Find the general solution of the equation $(px-y)(py+x)=a^2p$ by reducing into Clairaut's form by taking the substitution $X=x^2, Y=y^2$	7	CO3

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c.	When a switch is closed in a circuit containing a battery E, a resistance R and an inductance L, the current I build up at a rate given by $L\frac{dI}{dt} + RI = E$. find I as a function of t. How long will it be, before the current has reached one –half its final value, if E=6 volts, R=100ohms and L=0.1 henry?	6	CO3
	MODULE-4		
7 a.	Find the angle between the curve $r = a\log\theta$ and $r = \frac{a}{\log\theta}$	7	CO4
b.	Evaluate (i) $\lim_{x\to 0}\left(\frac{\sin x}{x}\right)^{1/x^2}$ (ii) $\lim_{x\to 0}(\tan x)^{\tan x}$	7	CO4
c.	Solve $y(2xy+1)dx - xdy = 0$	6	CO4
	OR		
8 a.	Find the rank of the matrix $\begin{bmatrix} 11 & 12 & 13 & 14 \\ 12 & 13 & 14 & 15 \\ 13 & 14 & 15 & 16 \\ 14 & 15 & 16 & 17 \end{bmatrix}$	7	CO4
b.	For what values of a and b the system of equation $x+y+z=6;\ x+2y+3z=10;\ x+2y+az=b$ has i) no solution ii) a unique solution and iii) infinite number of solution.	7	CO4
c.	Expand $e^{\sin x}$ upto the term containing x^4 using Maclaurin's series.	6	CO4
	MODULE-5		
9 a.	Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 1 \\ 2 & 1 & -1 & 0 \\ 3 & 3 & 2 & 1 \\ 2 & 4 & 6 & 2 \end{bmatrix}$	7	CO5
b.	Test for consistency and solve $5x+3y+7x=4;\ 3x+26y+2z=9;\ 7x+2y+10z=5$	7	CO5
c.	Using Gauss Jordan method, solve $x+y+z=11;\quad 3x-y+2z=12;\quad 2x+y-z=3$	6	CO5
	OR		
10a.	Solve by Gauss elimination method $2x+y+4z=12, 4x+11y-Z=33, 8x-3y+2z=20$	7	CO5
b.	Solve the system of equations $2x-3y+20z=25,\ 20x+y-2z=9,\ 7x+2y+10z=-18$ using Gauss-Seidel method, taking (0, 0, 0) as an initial approximation. (Carry out 4 iterations).	7	CO5
c.	Using Rayleigh's power method find the dominant eigen value and the corresponding eigen vector of $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ by taking $[1\ 0\ 0]^T$ as the initial eigenvector [carry out 6 iterations]	6	CO5

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
I-semester: III Internal Assessment Exam: *APRIL-2023*

1	S	V							

Mathematics-I for Electrical & Electronics Engineering stream (BMATE101)

[Time: 3hr] Note: Answer any five **full** questions, choosing atleast one question from each Module [Max marks:100]

Question No.	MODULE-1	Marks	
1 a.	With usual notation prove that $\frac{1}{p^2}=\frac{1}{r^2}+\frac{1}{r^4}(\frac{dr}{d\theta})^2$	7	CO1
b.	Find the radius of curvature for the curve $y^2=\frac{a^2(a-x)}{x}$, where the curves meet the x-axis.	7	CO1
c.	Show that the radius of curvature of the curve $r^n=a^n\cos n\theta$ varies inversely as r^{n}	6	CO1
	OR		
2 a.	With usual notation prove that $\tan\varphi=r\frac{d\theta}{dr}$.	7	CO1
b.	Show that the curve $r=a(1+cos\theta)$ *and* $r=a(1-cos\theta)$ cuts each other orthogonally	7	CO1
c.	Show that the radius of the curvature at any point θ on the cycloid $x=a(\theta+sin\theta), y=a(1-cos\theta)$ *is* $4acos(\frac{\theta}{2})$	6	CO1
	MODULE-2		
3a.	Expand log(secx) up to the term containing x^4 using Maclaurin's series	7	CO2
b.	Evaluate i) $\lim_{x\to0}\left(\frac{a^x+b^x}{2}\right)^{1/x}$ ii) $\lim_{x\to0}\left(\frac{tanx}{x}\right)^{1/x}$.	7	CO2
c.	If $u=f(x-y,y-z,z-x)$ show that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$	6	CO2
	OR		
4a.	Expand $\log(1+\cos x)$ up to the term containing x^4 using Maclaurin's series	7	CO2
b.	If $x+y+z=u, y+z=v$ *and* $z=uvw$, *find the value of* $\frac{\partial(x,y,z)}{\partial(u,v,w)}$	7	CO2
c.	Find the extreme value of the function $f(x,y)=x^3+3xy^2-3y^2-3x^2+4$	6	CO2
	MODULE-3		
5 a.	Solve $\frac{dy}{dx}+\frac{y}{x}=y^2x$	7	CO3
b.	Find the orthogonal trajectories of the family $r^n cosn\theta=a^n$.	7	CO3
c.	Solve $xyp^2-(x^2+y^2)p+xy=0$.	6	CO3
	OR		
6 a.	Solve $(4xy+3y^2-x)dx+x(x+2y)dy=0$	7	CO3
b.	Find the general solution of the equation $(px-y)(py+x)=a^2p$ by reducing into Clairaut's form by taking the substitution $X=x^2, Y=y^2$	7	CO3

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c.	When a switch is closed in a circuit containing a battery E, a resistance R and an inductance L, the current I build up at a rate given by $L\frac{di}{dt} + Ri = E$. find I as a function of t. How long will it be, before the current has reached one –half its final value, if E=6 volts, R=100ohms and L=0.1 henry?	6	CO3
	MODULE-4		
7 a.	Find the angle between the curve $r = a\log\theta$ and $r = \frac{a}{\log\theta}$	7	CO4
b.	Evaluate (i) $\lim_{x\to 0}\left(\frac{\sin x}{x}\right)^{1/x^2}$ (ii) $\lim_{x\to 0}(\tan x)^{\tan x}$	7	CO4
c.	Solve $y(2xy+1)dx - xdy = 0$	6	CO4
	OR		
8 a.	Find the rank of the matrix $\begin{bmatrix} 11 & 12 & 13 & 14 \\ 12 & 13 & 14 & 15 \\ 13 & 14 & 15 & 16 \\ 14 & 15 & 16 & 17 \end{bmatrix}$	7	CO4
b.	For what values of a and b the system of equation $x+y+z=6;\ x+2y+3z=10;\ x+2y+az=b$ has i) no solution ii) a unique solution and iii) infinite number of solution.	7	CO4
c.	Expand $e^{\sin x}$ upto the term containing x^4 using Maclaurin's series.	6	CO4
	MODULE-5		
9 a.	Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 1 \\ 2 & 1 & -1 & 0 \\ 3 & 3 & 2 & 1 \\ 2 & 4 & 6 & 2 \end{bmatrix}$	7	CO5
b.	Test for consistency and solve $5x+3y+7x=4;\ 3x+26y+2z=9;\ 7x+2y+10z=5$	7	CO5
c.	Using Gauss Jordan method, solve $x+y+z=11;\quad 3x-y+2z=12;\quad 2x+y-z=3$	6	CO5
	OR		
10a.	Solve by Gauss elimination method $2x+y+4z=12, 4x+11y-Z=33, 8x-3y+2z=20$	7	CO5
b.	Solve the system of equations $2x-3y+20z=25,\ 20x+y-2z=9,\ 7x+2y+10z=-18$ using Gauss-Seidel method, taking (0, 0, 0) as an initial approximation.(Carry out 4 iterations).	7	CO5
c.	Using Rayleigh's power method find the dominant eigen value and the corresponding eigen vector of $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ by taking $[1\ 0\ 0]^T$ as the initial eigenvector [carry out 6 iterations]	6	CO5

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SIRA ROAD, TUMKUR- 572 106
DEPARTMENT OF MATHEMATICS

SCHEME OF SOLUTIONS

ACADEMIC YEAR: 2022-23 IA- III SUBJECT CODE: BMATS101 BMATE101

QUESTION NO	SOLUTIONS	MARKS
1@	$p = r\sin\phi$ $\frac{1}{p^2} = \frac{1}{r^2}\frac{1}{\sin^2\phi}$ $\frac{1}{p^2} = \frac{1}{r^2}(1+\cot^2\phi)$ $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$	-2 -2- -3-
1(b)	points $(a,0)$ $\frac{dy}{dx} = \frac{-a^3}{2x^2y} = \infty$ hence $\frac{dx}{dy} = \frac{-2x^2y}{a^3} \Rightarrow$ at $(a,0)$ $\frac{dx}{dy} = 0$ at $(a,0)$ $\frac{d^2x}{dy^2} = -2/a$ $\rho = \frac{[1+(x')^2]^{3/2}}{x''} = -a/2$ $\boxed{\lvert\rho\rvert = a/2}$	-1- -1- -1- -1- -1- -2-
(c)	$r^n = a^n\cos n\theta$ $r_1 = -r\tan n\theta$ $r_2 = -[nr\sec^2 n\theta + \tan n\theta(-\tan n\theta \times r)]$ $= -[r\sec^2 n\theta \times n - \tan^2 n\theta \times r]$ $\rho = \frac{[r^2 + r_1^2]^{3/2}}{r^2 + 2r_1^2 - rr_2}$	-1- -1- -1- -1-

$\rho = \frac{r\sec n\theta}{1+n} \Rightarrow \rho = \frac{r}{n+1}\frac{a^n}{r^n}$

$\rho = \frac{a^n}{n+1}\frac{1}{r^{n-1}}$

$\boxed{\rho \propto \frac{1}{r^{n-1}}}$ -2-

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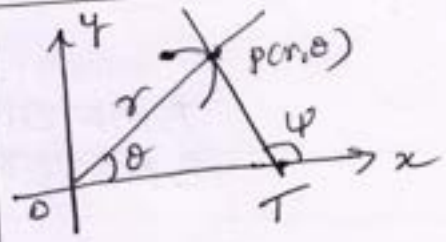
QUESTION NO	SOLUTIONS	MARKS
2a)	 $\tan\psi = \frac{\tan\theta + \tan\phi}{1-\tan\theta\tan\phi}$ $dy/dx = \frac{dy/d\theta}{dx/d\theta}$ $dy/dx = \frac{r\,d\theta/dr + \tan\theta}{1 - r\tan\theta\,\frac{d\theta}{dr}}$ $\boxed{\tan\phi = r\frac{d\theta}{dr}}$	-1- -1- -1- -1- -1- -2-
2b	$r = a(1+\cos\theta)$ $\tan\phi_1 = r\cdot\frac{d\theta}{dr}$ $\tan\phi_1 = -\cot\theta/2$ $\tan\phi_1 = \tan(\pi/2 + \theta/2)$ $\phi_1 = \frac{\pi}{2} + \theta/2$ $r = a(1-\cos\theta)$ $\tan\phi_2 = \frac{r\,d\theta}{dr}$ $\tan\phi_2 = \tan\theta/2$ $\phi_2 = \theta/2$ $\lvert\phi_1 - \phi_2\rvert = \pi/2$	-2- -3- -1- -1-
2c	$\rho = \frac{[1+(y')^2]^{3/2}}{y''}$ $\frac{dy}{dx} = \frac{dy/d\theta}{dx/d\theta} = \tan\theta/2$ $\frac{d^2y}{dx^2} = \frac{1}{4a}\sec^4\theta/2$ $\boxed{\rho = 4a\cos^2\theta/2}$	-1- -2- -2- -1-

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QUESTION NO	SOLUTIONS	MARKS
3a	$y = y(0) + xy'(0) + \frac{x^2}{2!}y''(0) + \frac{x^3}{3!}y'''(0) + \cdots$	-1-
	$y = \log\sec x$ $\quad y(0) = 0$	-1-
	$y' = \tan x$ $\quad y'(0) = 0$	-1-
	$y'' = \sec^2 x$ $\quad y''(0) = 1$	-1-
	$y'' = 1 + y'^2$	-1-
	$y''' = 0 + 2y'y''$ $\quad y'''(0) = 0$	-1-
	$y^{iv} = 2[y'y''' + (y'')^2]$ $\quad y^{iv}(0) = 2$	-1-
	$\log\sec x = \frac{x^2}{2!} + \frac{x^4}{4!} \times 2 +$	
3b (i)	$K = \lim_{x\to 0}\left(\frac{a^x + b^x}{2}\right)^{1/x}$	-4-
	$\log K = \lim_{x\to 0} \frac{\log\left(\frac{a^x + b^x}{2}\right)}{x}$	
	$\log K = \lim_{x\to 0} \frac{1}{\frac{a^x+b^x}{2}}\left[\frac{1}{2}(a^x \log a + b^x \log b)\right]$	
	$K = \sqrt{ab}$	
(ii)	$K = \lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{1/x}$	-3-
	$\log K = \lim_{x\to 0} \frac{\log\left(\frac{\tan x}{x}\right)}{x}$	
	$\log K = 2$	
	$\boxed{K = e^2}$	

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QUESTION NO	SOLUTIONS	MARKS
3c	$u = f(r, s, t)$ $u = f(x-y,\ y-z,\ z-x)$ $r = x-y \quad s = y-z, \quad t = z-x$ $\frac{\partial u}{\partial x} = \frac{\partial u}{\partial r}\frac{\partial r}{\partial x} + \frac{\partial u}{\partial s}\frac{\partial s}{\partial x} + \frac{\partial u}{\partial t}\frac{\partial t}{\partial x}$ $\frac{\partial u}{\partial y} = \frac{\partial u}{\partial r}\frac{\partial r}{\partial y} + \frac{\partial u}{\partial s}\frac{\partial s}{\partial y} + \frac{\partial u}{\partial t}\frac{\partial t}{\partial y}$ $\frac{\partial u}{\partial z} = \frac{\partial u}{\partial r}\frac{\partial r}{\partial z} + \frac{\partial u}{\partial s}\frac{\partial s}{\partial z} + \frac{\partial u}{\partial t}\frac{\partial t}{\partial y}$ $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$	-2- -1- -1- -1- -1- -1-
4a	$y = \log(1+\cos x)$ $\quad y(0) = \log 2$ $y' = -\tan x/2 \quad y'(0) = 0$ $y'' = -\frac{1}{2}[1+\tan^2 x/2] \quad y''(0) = -1/2$ $y''' = -1/2[1+(y')^2] \quad y'''(0) = 0$ $y''' = -y'y''$ $y^{iv} = -[y'y''' + y''y''] \quad y^{iv}(0) = -1/4$ $y = \log 2 - \frac{1}{2}\frac{x^2}{2!} - \frac{1}{4}\frac{x^4}{4!} - \cdots$	-1- -1- -1- -1- -1- -2-
4b	$x = u-v, \quad y = v-z \quad z = uvw$ $y = v - uvw$ $J = \begin{vmatrix} \frac{\partial x}{\partial u} & \frac{\partial x}{\partial v} & \frac{\partial x}{\partial w} \\ \frac{\partial y}{\partial u} & \frac{\partial y}{\partial v} & \frac{\partial y}{\partial w} \\ \frac{\partial z}{\partial u} & \frac{\partial z}{\partial v} & \frac{\partial z}{\partial w} \end{vmatrix} = \begin{vmatrix} 1 & -1 & 0 \\ -vw & 1-uw & -uv \\ vw & uw & uv \end{vmatrix}$ $\boxed{J = uv}$ HEAD Dept. Of Mathematics S.I.E.T., TUMKUR - 6	-3- -3- -1-

QUESTION NO	SOLUTIONS	MARKS
5c)	$xyp^2-(x^2+y^2)p+xy=0$	
	$xyp^2-x^2p-y^2p+xy=0$	-1-
	$xp(yp-x)-y(yp-x)=0$	-1-
	$(xp-y)(yp-x)=0$	-1-
	$x\frac{dy}{dx}=y$ $\quad y\frac{dy}{dx}=x$	
	Integrating $\quad (y^2-x^2)=c$	-3-
	$(y/x-c)$	
	Solution $(y/x-c)(y^2-x^2-c)=0$	
6a)	$(4xy^2+3y^2-x)\,dx+x(x+2y)\,dy=0$	-2-
	$\frac{\partial M}{\partial y}=4x+6y$ $\quad \frac{\partial N}{\partial x}=2x+2y$	
	$\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}=2x+4y=2(x+2y)\frac{1}{N}N$	-2-
	$IF=x^2 \Rightarrow \left[IF=e^{\int f(x)\,dx}\right]$ $\quad \frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$	-3-
	Solution $x^4y+x^3y^2-\frac{x^4}{4}=c$	
6b)	$\frac{di}{dt}+\frac{R}{L}i=\frac{E}{L}$	-4-
	$IF=e^{R/L\,t}$	
	Solution is $i=\frac{E}{R}+ce^{-R/L\,t}$	-2-
	$i=0.367A$	
6b)	$X=x^2$ $\quad Y=y^2$	-2-
	$\frac{dx}{dx}=2x$ $\quad \frac{dy}{dy}=2y$	
	$x=\sqrt{x}$ $\quad y=\sqrt{y}$	-2-
	$P=dy/dx=\frac{P\sqrt{x}}{\sqrt{y}}$	

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QUESTION NO	SOLUTIONS	MARKS
4c	$f(x,y) = x^3 + 3xy^2 - 3y^2 - 3x^2 + 4$ $\frac{\partial f}{\partial x} = p = 3x^2 + 3y^2 - 6x$, $\frac{\partial f}{\partial y} = q = 6xy - 6y$ $\frac{\partial^2 f}{\partial x^2} = r = 6x - 6$ $\frac{\partial^2 f}{\partial y^2} = t = 6x - 6$, $\frac{\partial^2 f}{\partial x \partial y} = 6y$ $(0,0)$ $(2,0)$ $(1,1)$ $(1,-1)$ maximum point $(0,0) \Rightarrow$ max value is 4 minimum point $(2,0) \Rightarrow$ min value is 0	-2- -2- -2-
5a	$\frac{dy}{dx} + y/x = y^2 x$ $\div$ by y^2 $\frac{1}{y^2}\frac{dy}{dx} + \frac{1}{yx} = x$ $\bar{y}' = t$ $-\frac{dt}{dx} + \frac{1}{x}t = x \Rightarrow IF = \frac{1}{x}$ Solution $\frac{1}{yx} = -x + C$	-2- -2- -1- -2-
5b	$r^n \cos n\theta = a^n$ taking log on both sides $\log(r^n) + \log\cos n\theta = \log a^n$ diff w.r.t θ $\frac{1}{r}\frac{dr}{d\theta} = \tan n\theta$ Replace $\frac{dr}{d\theta}$ by $-r^2 d\theta/dr$ $-r\frac{d\theta}{dr} = \tan n\theta$ Integrating $r^n = b\operatorname{cosec} n\theta$	-2- -2- -1- -2-

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QUESTION NO	SOLUTIONS	MARKS
	$Y = px - \frac{a^2 p}{p+1}$	-2-
	$y^2 = px^2 - \frac{a^2 p}{p+1}$	-1-
7a	$r = a\log\theta \qquad r = a/\log\theta$	-3-
	$\tan\phi_1 = \theta\log\theta \qquad \tan\phi_2 = -\theta\log\theta$	-3-
	$\tan\lvert\phi_1 - \phi_2\rvert = \frac{2e\log e}{1-e^2} = \frac{2e}{1-e^2}$	-1-
7b (i)	$K = \lim_{x\to 0}\left(\frac{\sin x}{x}\right)^{1/x^2}$	-4-
	$\log K = \lim_{x\to 0} \frac{\log\left(\frac{\sin x}{x}\right)}{x^2}$	
	$\log K = e^{-1/6}$	
	$K = \frac{1}{e^{1/6}}$	
(ii)	$K = \lim_{x\to 0} (\tan x)^{\tan x}$	-3-
	$\log K = \lim_{x\to 0} \tan x \log(\tan x)$	
	$\log K = \lim_{x\to 0} \frac{\log(\tan x)}{\cot x}$	
	Apply L H Rule	
	$\log K = \lim_{x\to 0} \frac{1/\tan x \,(\sec^2 x)}{(-\operatorname{cosec}^2 x)}$	
	$\log K = 0$	
	$K = 1$	

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QUESTION NO	SOLUTIONS	MARKS
7c)	$y(2xy+1)dx - xdy = 0$ $\frac{1}{M}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right) = 2/y$ $IF = 1/y^2$ $M = 2x + \frac{1}{y} \qquad N = -x/y^2$ $2xy + \log y = C$	2 2 2
8a)	$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ $S(A) = 2$	7
8b)	$[A:B] \sim \begin{bmatrix} 1 & 1 & 1 & : 6 \\ 0 & 1 & 2 & : 4 \\ 0 & 0 & a-3 & : b-10 \end{bmatrix}$ No Solution $a = 3 \quad b \neq 0$ $S(A) = 2 \quad S(A:B) = 3$ $S(A) \neq S(A:B)$ Unique Solution $a \neq 3$ $S(A) = 3 \quad S(A:B) = 3$ $r = 3, \ n = 3$ $S(A) = S(A:B) = 3$ Infinite Solution $a = 3, \ b = 10$ $S(A) = 2, \ S(A:B) = 2, \ r = 2, \ n = 3$ $S(A) = S(A:B) \quad r < n$	2 3 1 2

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QUESTION NO	SOLUTIONS	MARKS
8c)	$f(x) = f(0) + xf'(0) + \frac{x^2}{2!} f''(0) + \cdots$	
	$f'(x) = e^{\sin x} \cos x$ $\quad f'(0) = 1$	1
	$f''(x) = e^{\sin x}(-\sin x) + \cos^2 x\, e^{\sin x}$ $\quad f''(0) = 1$	1
	$f''(x) = y(-\sin x) + \cos^2 x\, y$	1
	$f'''(x) = -\sin x\, y' - \cos x\, y + \cos^2 x\, y' + 2\cos x(-\sin x)y$ $\quad f'''(0) = 0$	1
	$f^{IV}(x) = -\sin x\, y'' - y'\cos x - \cos x\, y' + \sin x\, y + \cos^2 x\, y'' + 2\cos x(-\sin x)y' - 2[\cos x \sin x\, y' + \cos x(\cos x)y + (-\sin x)\sin x\, y]$ $\quad f^{IV}(0) = -3$	1
	$f(x) = 1 + x + \frac{x^2}{2} - \frac{x^4}{8}$	1
9a)	$A = \begin{bmatrix} 1 & 2 & 3 & 1 \\ 0 & -3 & -7 & -2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$	7
	$S(A) = 2$	
9b)	$(A:B) \sim \begin{bmatrix} 5 & 3 & 7 & : & 4 \\ 3 & 26 & 2 & : & 9 \\ 7 & 2 & 10 & : & 5 \end{bmatrix}$	2
	$(A:B) = \begin{bmatrix} 5 & 3 & 7 & : & 4 \\ 0 & 121 & -11 & : & 33 \\ 0 & 0 & 0 & : & 0 \end{bmatrix}$	2
	$S(A) = 2 \quad S(A:B) = 2$	2
	Consistent and posses Infinite Solution	1
9c)	$[A:B] = \begin{bmatrix} 1 & 1 & 1 & : & 11 \\ 0 & 1 & 3 & : & 19 \\ 0 & 0 & -11 & : & -55 \end{bmatrix} \Rightarrow [A:B] = \begin{bmatrix} 4 & 0 & 0 & : & 8 \\ 0 & -4 & 0 & : & -16 \\ 0 & 0 & 1 & : & 5 \end{bmatrix}$	2
	$x = 2, \quad y = 4, \quad z = 5$	2

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QUESTION NO	SOLUTIONS	MARKS
10 a	$2x+y+4z=12,\ 4x+11y-z=33,\ 8x-3y+2z=20$ $A:B=\begin{bmatrix}2 & 1 & 4 & :12\\ 4 & 11 & -1 & :33\\ 8 & -3 & 2 & :20\end{bmatrix}$ $[A:B]=\begin{bmatrix}2 & 1 & 4 & :12\\ 0 & +9 & -9 & :9\\ 0 & 0-189 & & :-189\end{bmatrix}$ $z=1,\quad y=2,\quad x=3$	-2- -2- -3-
10 b	1^{st} iteration $x^1=0.4500$ $y^1=-1.0575$ $z^1=1.0464$ 2^{nd} iteration $x^2=0.6075$ $y^2=-1.6358$ $z^2=0.9439$ 3^{rd} iteration $x^{(3)}=0.6262$ $y^{(3)}=-1.5911$ $z^{(3)}=0.9487$ 4^{th} iteration $x^4=0.6244$ $y^4=-1.529$ $z^4=0.9486$	-2- -2- -2- -1-
10 c	$AX^{(0)}=25\begin{bmatrix}1\\0.04\\0.08\end{bmatrix}=\lambda^{(1)}X^{(1)}$ $ACX^{(1)}=25.2\begin{bmatrix}1\\0.0444\\0.0667\end{bmatrix}=\lambda^{(2)}X^{(2)}$ $AX^{(2)}=25.1778\begin{bmatrix}1\\0.0450\\0.0688\end{bmatrix}=\lambda^{(3)}X^{(3)}$ $AX^{(3)}=25.18\begin{bmatrix}1\\0.044\\0.068\end{bmatrix}=\lambda^{(4)}X^{(4)}$ $AX^{(4)}=25.18\begin{bmatrix}1\\0.044\\0.068\end{bmatrix}$ $=\lambda^{(5)}X^{(5)}$ $AX^{(5)}=25.18\begin{bmatrix}1\\0.044\\0.068\end{bmatrix}$ $\lambda=25.18$ Eigen vector $=[1, 0.044, 0.068]^T$	-1- -1- -1- -1- -1- -1-

TEST CO-ORDINATOR:

(Binder M.G)

HOD:

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QUESTION NO	SOLUTIONS	MARKS
6c)	$t=0,\ \theta=100,\ \theta_0=30^\circ \quad C=?$	1
	$\theta=\theta_0+ce^{-kt}$	2
	$C=70$	1
	$t=15,\ \theta=70,\ \theta_0=30 \quad C=70 \quad K=?$	
	$k=\frac{1}{15}\log\left(\frac{70}{40}\right)$	2
	$t=3.75$ mins	

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY – TUMKUR
DEPARTMENT OF MATHEMATICS

II-semester: I Internal Assessment Exam: JULY-2023 **(BMATC201/BMATE201/BMATS201)**

[Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40]

Q.NO.	PART-A	Marks	BLT	
1a.	Use Newton-Raphson method to find a real root of $xsinx + cosx = 0$ neaR $x_0 = \pi$. Carry out the iterations upto four decimal places of accuracy.	06	L2	CO4
b.	The area of a circle(A) corresponding to diameter (D) is given below. D: 80, 85, 90, 95, 100 A: 5026, 5674, 6362, 7088, 7854	07	L2	CO4
c.	Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's 1/3rd rule taking four equal strips and hence deduce an approximate value of π.	07	L3	CO4
	OR			
2a.	Find the approximate value of the root of the equations $xe^x = 3$, using the Regula falsi method carryout 3 iterations.	06	L2	CO4
b.	From the following table find the number of students who have obtained (a) less than 45 marks (b) between 40 and 45 marks. Marks: 30-40, 40-50, 50-60, 60-70, 70-80 No. of students: 31, 42, 51, 35, 31	07	L2	CO4
c.	Find the approximate value of $\int_0^{\pi/2} \sqrt{cos\theta}\, d\theta$ by Simpson's 1/3rd rule by dividing $[0,\pi/2]$ into 6 equal parts.	07	L3	CO4

P.T.O

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY – TUMKUR
DEPARTMENT OF MATHEMATICS

II-semester: I Internal Assessment Exam: JULY-2023 **(BMATC201/BMATE201/BMATS201)**

[Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40]

Q.NO.	PART-A	Marks	BLT	
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PART-B

3 a.	Determine f(x) as a polynomial in x for the following data using Newton Divided difference formula x: -4, -1, 0, 2, 5 y: 1245, 33, 5, 9, 1335	**06**	**L2**	**CO4**
b.	Use Lagrange's formula find the interpolation polynomial that approximate to the function describe by the following data x: 0, 1, 2, 5 f(x): 2, 3, 12, 147	**07**	**L2**	**CO4**
c.	Using modified Euler's method to solve $\frac{dy}{dx} = x + \lvert\sqrt{y}\rvert$ in the range $0 \le x \le 0.4$ by taking $h = 0.2$ given that y=1 at x=0 initially.	**07**	**L2**	**CO5**
	OR			
4 a.	Construct the interpolation polynomial for the data given below using Newton's general interpolation formula for divided differences X: 2, 4, 5, 6, 8, 10 Y: 10, 96, 196, 350, 868, 1746	**06**	**L2**	**CO4**
b.	Evaluate $\int_0^1 \frac{dx}{1+x}$ by taking 6 equal parts using Trapezoidal rule.	**07**	**L3**	**CO4**
c.	Use Taylor's series method to find y at x=0.1,0.2,0.3 considering terms upto third degree given that $\frac{dy}{dx} = x^2 + y^2$ and $y(0) = 1$	**07**	**L2**	**CO5**

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PART-B

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
SIRA ROAD, TUMKUR- 572 106
DEPARTMENT OF MATHEMATICS

ESTD: 2002 20 YEARS Academic Excellence

SCHEME OF SOLUTIONS

ACADEMIC YEAR: 2022-23 II Sem IA- I^st IA **SUBJECT CODE:**

QUESTION NO	SOLUTIONS	MARKS
01] a	Given, $x_0 = \pi$ $f(x) = x\sin x + \cos x$ we have, $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ $f'(x) = x\cos x + \sin x - \sin x = x\cos x$ 1st iteration :- $x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = \pi - \frac{f(\pi)}{f'(\pi)}$ $= \pi - \frac{1}{\pi}$ $x_1 = 2.8233$ → 2 Marks 2nd iteration :- $x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} = 2.8233 - \frac{f(x_1)}{f'(x_1)}$ $x_2 = 2.7986$ 3rd iteration :- $x_3 = x_2 - \frac{f(x_2)}{f'(x_2)} = 2.7986 - \frac{f(x_2)}{f'(x_2)}$ → 2 Marks $x_3 = 2.7984$ 4th iteration :- $x_4 = x_3 - \frac{f(x_3)}{f'(x_3)}$ $x_4 = 2.7984$ ∴ Thus the required root is 2.7984 → 2 Marks	6 Marks

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QUESTION NO	SOLUTIONS	MARKS

1. b. Given $D = 105$

The value of 105 is near to the end value of 100

$x = D$	$y = A$	∇y	∇y^2	∇y^3	∇y^4
60	5026				
		648			
85	5694		40		
		688		-2	
90	6362		38		4
		726		2	
95	7088		40		
		766			
$x_n = 100$	$y_n = 7854$				

→ 4 marks

$$p = \frac{x - x_n}{h} = \frac{105 - 100}{5} = 1$$

$$y = y_n + p\nabla y_n + \frac{p(p+1)}{2!}\nabla y_n^2 + \cdots$$

$y(105) = y = 8666$

→ 3 marks

7 Marks

1. c $$I = \int_0^1 \frac{1}{1+x^2}\,dx$$

$n = 4$, $a = 0$, $b = 1$

$$h = \frac{b-a}{n} = 1/4$$

x_0	0	1/4	2/4	3/4	1
y_0	1	16/17	4/5	16/25	1/2

$$I = h/3\,[(y_0 + y_4) + 4(y_1 + y_3) + 2(y_2)]$$

$$I = 0.7850$$

→ 4 marks

$$\int_0^1 \frac{dx}{1+x^2} = [\tan^{-1}x]_0^1 \Rightarrow [\tan^{-1}(1) - \tan^{-1}(0)]$$

$$= \pi/4$$

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QUESTION NO	SOLUTIONS	MARKS

9b. Let $y = f(x)$ denotes the no of student

Less than 40 marks = 31

50 marks = 31 + 42 = 73

60 marks = 124

70 marks = 159

80 marks = 190

x	y	Δy_0	$\Delta^2 y_0$	$\Delta^3 y_0$	$\Delta^4 y_0$
40	31	42			
50	73		9		
60	124	51	-16	-25	37
70	159	35		12	
80	190	31	-4		

→ 4 Marks

$$P = \frac{x - x_n}{h} = 0.5$$

a) $$y = y_0 + P\Delta y_0 + \frac{P(P-1)}{2!}\Delta^2 y_0 + \cdots$$

$$y(45) = 47.867 \approx 48$$

→ 2 Marks

b) No of student obtained 45 marks = 48

No of student obtained 40 marks = 31

$$= 48 - 31 = 17$$

→ 1 Mark

1 Marks

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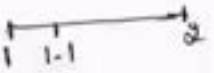
QUESTION NO	SOLUTIONS	MARKS
	$\int_0^1 \frac{dx}{1+x^2} = \pi/4$ $0.7850 = \pi/4$ $\pi = 3.1415$	→ 3 Marks 7 Marks
2a.	Given $xe^x = 3$ $f(x) = xe^x - 3$ $f(1) = -0.281$ $f(2) = 11.77$ real root lies between (1,2) $a = 1$ $b = 1.1$ $f(a) = -0.281$ $f(b) = 0.3045$ $x_1 = \frac{a f(b) - b f(a)}{f(b) - f(a)}$ $x_1 = 1.0480$ $f(x_1) = -0.0111$ $x_2 = 1.0498$ $f(x_2) = 0.0006$ $x_3 = 1.0498$ the approximate value of the root is 1.0498	 → 2 Marks → 2 Marks → 2 Marks 6 Marks

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QUESTION NO	SOLUTIONS	MARKS

2C.

$$I = \int_0^{\pi/2} \sqrt{\cos\theta}\, d\theta \quad , \; n = 6$$

$$h = \frac{b-a}{2} = \pi/12 = 15^\circ$$

x	0	15°	30°	45°	60°	75°	90°
y	1	0.982	0.930	0.840	0.707	0.588	0

→ 4 Marks

$$I = h/3\,[(y_0+y_6) + 4(y_1+y_3+y_5) + 2(y_2+y_4)]$$

$$I = \frac{\pi}{36}[(1+0) + 4(0.98+0.84+0.50) + 2(0.93+0.707)]$$

$$I = 1.186$$

→ 3 Marks

7 Marks

3.a

x	y	Ist D.D	IInd D.D	IIIrd D.D	IV D.D
−4	1245				
		−404			
−1	33		94		
		−28		−14	
0	5		10		3
		2		13	
2	9		88		
		442			
5	1335				

→ 4 Marks

Apply newton divided difference formula,

$$f(x) = f(x_0) + (x-x_0)f(x_0,x_1) + (x-x_0)(x-x_1)f(x_0,x_1,x_2) + (x-x_0)(x-x_1)(x-x_2)f(x_0,x_1,x_2,x_3)$$

$$= 1245 + (x+4)(-404) + (x+4)(x+1)94 + (x+4)(x+1)(x)(-14) + (x+4)(x+1)x(x-2)(3)$$

$$f(x) = 3x^4 - 5x^3 + 6x^2 - 14x + 5$$

→ 2 Marks

6 Marks

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QUESTION NO	SOLUTIONS	MARKS
3 b.		

x	0	1	2	5
$f(x)$	2	3	12	147

$x_0 = 0 \quad x_1 = 1 \quad x_2 = 2 \quad x_3 = 5$

$y_0 = 2 \quad y_1 = 3 \quad y_2 = 12 \quad y_3 = 147$

$$y = f(x) = \frac{(x-x_1)(x-x_2)(x-x_3)}{(x_0-x_1)(x_0-x_2)(x_0-x_3)} y_0 + \frac{(x-x_0)(x-x_2)(x-x_3)}{(x_1-x_0)(x_1-x_2)(x_1-x_3)} y_1$$

$$+ \frac{(x-x_0)(x-x_1)(x-x_3)}{(x_2-x_0)(x_2-x_1)(x_2-x_3)} y_2 + \frac{(x-x_0)(x-x_1)(x-x_2)}{(x_3-x_0)(x_3-x_1)(x_3-x_2)} y_3$$

$y =$

7 Marks

3.C	$x_1 = x_0 + h$, $y' = x + \lvert\sqrt{y}\rvert$ $x_1 = 0.2$ $x_0 = 0$, $y_0 = 1$, $f(x_0, y_0) = 0 + \sqrt{1}$ $= 1$ we have to find $y(0.2)$ By Euler's formula, Step I :- $y_1^{(0)} = y_0 + h f(x_0, y_0)$ $= 1 + (0.2)(1)$ $y_1^{(0)} = 1.2$ $y_1^{(1)} = y_0 + h/2 [f(x_0, y_0) + f(x_1, y_1^{(0)})]$ $y_1^{(1)} = 1.2295$ $y_1^{(2)} = y_0 + h/2 [f(x_0, y_0) + f(x_1, y_1^{(1)})]$ $= 1.2305$	

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QUESTION NO	SOLUTIONS	MARKS

$$y_1^{(3)} = y_0 + h/3\,[f(x_0, y_0) + f(x_1, y_1^{(2)})]$$

$$y_1^{(3)} = 1.2309$$

$\therefore y(0.2) = 1.230$ → 4 marks

Now we have to find $y(0.4)$

$x_1 = x_0 + h$ $\quad x_0 = 0.2$ $\quad f(x,y) = 1.309$

$= 0.4$ $\quad y_0 = 1.230$

$$y_1^{(0)} = y_0 + h f(x_0, y_0)$$

$$= 1.4918$$

$y_1^{(1)} = 1.5230$

$y_1^{(2)} = 1.5243$

$\therefore y(0.4) = 1.524$ → 3 marks

7 marks

4 a.

x	y	Ist D.D	IInd D.D	IIIrd D.D
2	10			
		43		
4	96		19	
		100		2
5	196		27	
		154		2
6	350		35	
		259		2
8	868		45	
		439		
10	1746			

→ 4 marks

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QUESTION NO	SOLUTIONS	MARKS
	$y = f(x) = f(x_0) + (x-x_0) f(x_0,x_1) + (x-x_0)(x-x_1) f(x_0,x_1,x_2)$ $+ (x-x_0)(x-x_1)(x-x_2) f(x_0,x_1,x_2,x_3)$ $y = 2x^3 - 3x^2 + 5x - 4$ ═══	→ 2 Marks 6 Marks
4 B.b	$I = \int_0^1 \frac{dx}{1+x}$ $n = 6, \quad h = \frac{b-a}{n}$ $= \frac{1-0}{6}$ $h = 1/6$	

x	0	1/6	2/6	3/6	4/6	5/6	1
y	1	6/7	3/4	2/3	3/5	6/11	1/2

→ 3 Marks

$$I = \int_a^b y\,dx = \frac{h}{2}\left[(y_0 + y_6) + 2(y_1 + y_2 + y_3 + y_4 + y_5)\right]$$

$$= \frac{0.16}{2}\left[(1 + 1/2) + 2(6/7 + 3/4 + 2/3 + 3/5 + 6/11)\right]$$

$$= 0.083\left[1.5 + 2(3.4192)\right]$$

$$I = 0.6920$$

→ 4 Marks

7 Marks

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QUESTION NO	SOLUTIONS	MARKS
H.C	$y(x) = y(x_0) + (x-x_0)\,y'(x_0) + \frac{(x-x_0)^2}{2!}\,y''(x_0) + \ldots$	
	Given, $x_0 = 0$, $y_0 = 1$, $f(x,y) = x^2+y^2$	→ 1 Mark
	$y(x) = y(0) + x\,y'(0) + \frac{x^2}{2!}\,y''(0) + \frac{x^3}{3!}\,y'''(0)$	
	① $y' = x^2+y^2$ $y'(0) = 0+1 = 1$	
	② $y'' = 2x + 2yy'$ $y''(0) = 0+2 = 2$	
	③ $y''' = 2 + 2(yy'' + (y')^2)$ $y'''(0) = 8$	→ 3 Marks
	$\therefore y(x) = 1 + x + x^2 + 4/3\,x^3$	
	we have to find $y(0.1)$, $y(0.2)$, $y(0.3)$	
	$y(0.1) = 1 + 0.1 + (0.1)^2 + 4/3\,(0.1)^3 = 1.1113$ $y(0.2) = 1 + 0.2 + (0.2)^2 + 4/3\,(0.2)^2 = 1.25$ $y(0.3) = 1 + 0.3 + (0.3)^2 + 4/3\,(0.3)^2 = 1.426$	→ 3 Marks
		7 Marks

TEST CO-ORDINATOR: Pramod. G.V

(Pramod)

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY – TUMKUR

DEPARTMENT OF MATHEMATICS

II-semester: II Internal Assessment Exam: AUGUST-2023

MATHEMATICS-II for Computer Science & Engineering (**BMATS201**)

[Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40]

Q. NO.	PART-A	Marks	BLT	
1a.	Use fourth order Runge-Kutta method to solve $(x+y)\frac{dy}{dx} = 1, y(0.4) = 1$ *at* $x = 0.5$ correct to four decimal places.	06	L2	CO5
b.	Apply Milne's method compute y at the specified value of x for $\frac{dy}{dx} + xy^2 = 0$ Compute $y(0.8)$ x: 0 | 0.2 | 0.4 | 0.6 y: 2 | 1.9231 | 1.7241 | 1.4706	07	L2	CO5
c.	Given $\vec{A} = x^2yz\,i + y^2zx\,j + z^2xy\,k$ let us find $div\vec{A}, curl\vec{A}$ *and* $\nabla^2\vec{A}$	07	L1	CO2
	OR			
	Using fourth order Runge-Kutta method , find $y(0.2)$ *for the equation* $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$ taking h=0.2	06	L2	CO5
b.	Applying Milne's Predictor-Corrector method, find $y(0.8)$, from $\frac{dy}{dx} = x^3 + y$, given $y(0) = 2,\ y(0.2) = 2.073,\ y(0.4) = 2.452, y(0.6) = 3.023$	07	L2	CO5
c.	If $\vec{F} = (3x^2y - z)i + (xz^3 + y^4)j - 2x^3z^2k$, *find* $grad(div\,\vec{F})$ *at* $(2,-1,0)$.	07	L1	CO2

	PART-B			
3 a.	Find the unit vector normal to the surface at the indicated points $xy^3z^2 = 4$ *at* $(-1,-1,2)$	06	L1	CO2
b.	Show that the following field $\vec{F}$ is a potential field and hence find its scalar potential $\vec{F} = 2xyz^2i + (x^2z^2 + zcosyz)j + (2x^2yz + ycosyz)$k.	07	L1	CO2
	Find the directional derivative of $\emptyset = x^2yz + 4xz^2$ *at* $(1,-2,-1)$ *along* $2i - j - 2k$.	07	L1	CO2
	OR			
4 a.	If the directional derivative of $\emptyset = axy^2 + byz + cz^2x^3$ *at* $(-1,1,2)$ has a maximum magnitude of 32 units in the direction parallel to y-axis find a, b,c.	06	L1	CO2
b.	If $\vec{F} = (x + y + az)i + (bx + 2y - z)j + (x + cy + 2z)k$,find a,b,c such that curl$\vec{F}$=0 and then find $\emptyset$ *such that* $\vec{F} = \nabla\emptyset$.	07	L1	CO2
c.	Find the angle between the surface $x^2 + y^2 + z^2 = 9$ *and* $z = x^2 + y^2 - 3$ *at* $(2,-1,2)$	07	L2	CO2

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY – TUMKUR

DEPARTMENT OF MATHEMATICS

II-semester: II Internal Assessment Exam: AUGUST-2023

MATHEMATICS-II for Civil Engineering (**BMATC201**)

[Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40]

Q. NO.	PART-A	Marks	BLT	
1a.	Use fourth order Runge-Kutta method to solve $(x+y)\frac{dy}{dx} = 1, y(0.4) = 1$ at $x = 0.5$ correct to four decimal places.	06	L2	CO5
b.	Apply Milne's method compute y at the specified value of x for $\frac{dy}{dx} + xy^2 = 0$ Compute $y(0.8)$ x: 0, 0.2, 0.4, 0.6 y: 2, 1.9231, 1.7241, 1.4706	07	L2	CO5
c.	Given $\vec{A} = x^2yz\,i + y^2zx\,j + z^2xy\,k$ let us find $div\vec{A}, curl\vec{A}$ and $\nabla^2\vec{A}$	07	L1	CO2
	OR			
	Using fourth order Runge-Kutta method , find $y(0.2)$ for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$ taking h=0.2	06	L2	CO5
b.	Applying Milne's Predictor-Corrector method, find $y(0.8)$, from $\frac{dy}{dx} = x^3 + y$, given $y(0) = 2$, $y(0.2) = 2.073$, $y(0.4) = 2.452, y(0.6) = 3.023$	07	L2	CO5
c.	If $\vec{F} = (3x^2y - z)i + (xz^3 + y^4)j - 2x^3z^2k$, find $grad(div\,\vec{F})$ at $(2,-1,0)$.	07	L1	CO2

	PART-B			
3 a.	Find the unit vector normal to the surface at the indicated points $xy^3z^2 = 4$ at $(-1,-1,2)$	06	L1	CO2
b.	Show that the following field $\vec{F}$ is a potential field and hence find its scalar potential $\vec{F} = 2xyz^2i + (x^2z^2 + zcosyz)j + (2x^2yz + ycosyz)$k.	07	L1	CO2
	Find the directional derivative of $\emptyset = x^2yz + 4xz^2$ at $(1,-2,-1)$ along $2i - j - 2k$.	07	L1	CO2
	OR			
4 a.	If the directional derivative of $\emptyset = axy^2 + byz + cz^2x^3$ at $(-1,1,2)$ has a maximum magnitude of 32 units in the direction parallel to y-axis find a, b,c.	06	L1	CO2
b.	If $\vec{F} = (x + y + az)i + (bx + 2y - z)j + (x + cy + 2z)k$,find a,b,c such that curl$\vec{F}$=0 and then find $\emptyset$ such that $\vec{F} = \nabla\emptyset$.	07	L1	CO2
c.	Find the angle between the surface $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at $(2,-1,2)$	07	L2	CO2

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY – TUMKUR

DEPARTMENT OF MATHEMATICS

II-semester: II Internal Assessment Exam: AUGUST-2023

MATHEMATICS-II for Electrical & Electronic Engineering **(BMATE201)**

[Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40]

Q. NO.	PART-A	Marks	BLT	
1a.	Use fourth order Runge-Kutta method to solve $(x+y)\frac{dy}{dx} = 1, y(0.4) = 1$ at $x = 0.5$ correct to four decimal places.	06	L2	CO5
b.	Apply Milne's method compute y at the specified value of x for $\frac{dy}{dx} + xy^2 = 0$ x: 0, 0.2, 0.4, 0.6 y: 2, 1.9231, 1.7241, 1.4706 Compute $y(0.8)$	07	L2	CO5
c.	Given $\vec{A} = x^2yz\,i + y^2zx\,j + z^2xy\,k$ let us find $div\vec{A}, curl\vec{A}$ and $\nabla^2\vec{A}$	07	L1	CO2
	OR			
	Using fourth order Runge-Kutta method , find $y(0.2)$ for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$ taking h=0.2	06	L2	CO5
b.	Applying Milne's Predictor-Corrector method, find $y(0.8)$, from $\frac{dy}{dx} = x^3 + y$, given $y(0) = 2$, $y(0.2) = 2.073$, $y(0.4) = 2.452, y(0.6) = 3.023$	07	L2	CO5
c.	If $\vec{F} = (3x^2y - z)i + (xz^3 + y^4)j - 2x^3z^2k$, find $grad(div\,\vec{F})$ at $(2,-1,0)$.	07	L1	CO2

	PART-B			
3 a.	Find the unit vector normal to the surface at the indicated points $xy^3z^2 = 4$ at $(-1,-1,2)$	06	L1	CO2
b.	Show that the following field $\vec{F}$ is a potential field and hence find its scalar potential $\vec{F} = 2xyz^2i + (x^2z^2 + zcosyz)j + (2x^2yz + ycosyz)$k.	07	L1	CO2
	Find the directional derivative of $\emptyset = x^2yz + 4xz^2$ at $(1,-2,-1)$ along $2i - j - 2k$.	07	L1	CO2
	OR			
4 a.	If the directional derivative of $\emptyset = axy^2 + byz + cz^2x^3$ at $(-1,1,2)$ has a maximum magnitude of 32 units in the direction parallel to y-axis find a, b,c.	06	L1	CO2
b.	If $\vec{F} = (x + y + az)i + (bx + 2y - z)j + (x + cy + 2z)k$,find a,b,c such that curl$\vec{F}$=0 and then find $\emptyset$ such that $\vec{F} = \nabla\emptyset$.	07	L1	CO2
c.	Find the angle between the surface $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at $(2,-1,2)$	07	L2	CO2

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Department of Mathematics

II Internal assessment : AUG-2023

Sub Code: Year/sem: I st year/II Sem

Marks

1a. We have $\frac{dy}{dx} = \frac{1}{x+y}$ and $y=1$ at $x=0.4$

$f(x,y) = \frac{1}{x+y}$, $x_0 = 0.4$

$y_0 = 1$

$y(0.5) = ?$

Here $x_0 + h = 0.5$

$0.4 + h = 0.5$

$h = 0.1$

We shall first compute K_1, K_2, K_3, K_4

- $K_1 = hf(x_0, y_0) \Rightarrow (0.1) f(0.4, 1)$

$= (0.1)\left[\frac{1}{0.4+1}\right] = 0.0714$ → 1 Mark

- $K_2 = hf\left(x_0 + \frac{h}{2}, y_0 + \frac{K_1}{2}\right) \Rightarrow (0.1) f(0.45, 1.0357)$

$= (0.1)\left[\frac{1}{0.45+1.0357}\right] = 0.0673$ → 1 Mark

- $K_3 = hf\left(x_0 + h/2, y_0 + \frac{K_2}{2}\right) \Rightarrow (0.1) f(0.45, 1.03365)$

$= (0.1)\left[\frac{1}{0.45+1.03365}\right] = 0.0674$ → 1 Mark

- $K_4 = hf(x_0+h, y_0+K_3) \Rightarrow (0.1) f(0.5, 1.0674)$

$= (0.1)\left[\frac{1}{0.5+1.0674}\right] = 0.0638$ → 1 Mark

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Marks

we have, $y(x_0+h) = y_0 + 1/6\,(K_1+2K_2+2K_3+K_4)$

$= 1 + 1/6\,[0.0714 + 2(0.0673) + 2(0.0674) + 0.0636]$

$y(0.5) = 1.0674$ → 2 Marks

6 Marks

1.b Given $\frac{dy}{dx} + xy^2 = 0$ $\quad y(0.8) = ?$

x	y	$y' = -xy^2$
$x_0 = 0$	$y_0 = 2$	$0 = y_0'$
$x_1 = 0.2$	$y_1 = 1.9231$	$-0.7396 = y_1'$
$x_2 = 0.4$	$y_2 = 1.7241$	$-1.1890 = y_2'$
$x_3 = 0.6$	$y_3 = 1.4706$	$-1.2975 = y_3'$
$x_4 = 0.8$	$y_4 = ?$	$y_4' = ?$

→ 3 Marks

For predictor

$$y_4^{(P)} = y_0 + \frac{4h}{3}\,[2y_1' - y_2' + 2y_3']$$

$y_4^{(P)} = 1.23061$

$\therefore y_4' = -1.2115$ → 2 Marks

For corrector,

$$y_4^{(C)} = y_2 + h/3\,(y_2' + 4y_3' + y_4')$$

$= 1.2180$

$\therefore y_4' = -1.1868$

Again substitute in corrector formula, we get

$$y_4^{(C)} = y_2 + h/3\,(y_2' + 4y_3' + y_4')$$

$y_4^{(C)} = 1.2197$

$\therefore y_4' = -1.1901$

→ 2 Marks

7 Marks

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Marks

1 c. Given $\vec{A} = x^2yz\,i + y^2zx\,j + z^2xy\,k$

i) $\text{div}\vec{A} = \nabla \cdot \vec{A} = \left(\frac{\partial}{\partial x} i + \frac{\partial}{\partial y} j + \frac{\partial}{\partial z} k\right) \cdot (x^2yz\,i + y^2zx\,j + z^2xy\,k)$

$= 2xyz + 2yzx + 2zxy$

$\nabla \cdot \vec{A} = 6xyz$ → 2 Marks

ii) $\nabla^2 \cdot \vec{A} = \frac{\partial^2 \vec{A}}{\partial x^2} + \frac{\partial^2 \vec{A}}{\partial y^2} + \frac{\partial^2 \vec{A}}{\partial z^2}$

$= 2yz + 2zx + 2xy$ → 2 Marks

iii) $\text{curl}\vec{A} = \nabla \times \vec{A} = \begin{vmatrix} i & j & k \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ x^2yz & y^2zx & z^2xy \end{vmatrix}$

$= (xz^2 - xy^2)\,i - (z^2y - x^2y)\,j + (zy^2 - x^2z)\,k$

$= x(z^2 - y^2)\,i + y(z^2 - x^2)\,j + z(y^2 - z^2)\,k$ → 3 Marks

7 Marks

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2 a. By data $f(x,y) = \frac{y-x}{y+x}$, $x_0 = 0$, $y_0 = 1$, $h = 0.2$

$K_1 = hf(x_0, y_0) = (0.2)\,f(0,1) = 0.2$ → 1 Mark

$K_2 = hf\left(x_0 + h/2, y_0 + K_1/2\right) = (0.2)\,f(0.1, 1.1) = 0.1667$ → 1 Mark

$K_3 = hf\left(x_0 + h/2, y_0 + K_2/2\right) = (0.2)\,f(0.1, 1.0835) = 0.1662$ → 1 Mark

$K_4 = hf(x_0 + h, y_0 + K_3) = (0.2)\,f(0.2, 1.1662) = 0.1414$ → 1 Mark

We have,

$y(x_0 + h) = y_0 + 1/6\,(K_1 + 2K_2 + 2K_3 + K_4)$

$= 1 + 1/6\,(0.2 + 2(0.1667) + 2(0.1662) + 0.1414)$

$y(0.2) = 1.1679$ → 2 Marks

6 Marks

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Marks

2 b. Given $\frac{dy}{dx} = x^3 + y$

x	y	$y' = x^3 + y$
$x_0 = 0$	$y_0 = 2$	$y_0' = 2$
$x_1 = 0.2$	$y_1 = 2.073$	$y_1' = 2.081$
$x_2 = 0.4$	$y_2 = 2.459$	$y_2' = 2.516$
$x_3 = 0.6$	$y_3 = 3.023$	$y_3' = 3.239$
$x_4 = 0.8$	$y_4 = ?$	$y_4' = ?$

→ 3 Marks

For predictor,

$$y_4^{(P)} = y_0 + \frac{4h}{3}\left[2y_1' - y_0' - 2y_3'\right]$$

$$= 2 + \frac{4(0.2)}{3}\left(2(2.081) - 2.516 - 2(3.239)\right]$$

$$y_4^{(P)} = 4.1664$$

$$\therefore y_4' = 4.6784$$

→ 2 Marks

For corrector,

$$y_4^{(C)} = y_2 + h/3\,(y_2' + 4y_3' + y_4')$$

$$= 2.453 + \frac{0.2}{3}(2.516 + 4(3.239) + 4.6784)$$

$$y_4^{(C)} = 3.7953$$

$$\therefore y_4' = 4.3073$$

→ 2 Marks

7 Marks

2 c. Given $\vec{F} = (3x^2y - z)\,i + (xz^3 + y^4)\,j - 2x^3z^2\,k$

$$\text{div}\,\vec{F} = \nabla \cdot \vec{F}$$

$$= \left(\frac{\partial}{\partial x}i + \frac{\partial}{\partial y}j + \frac{\partial}{\partial z}k\right) \cdot \left\{(3x^2y - z)\,i + (xz^3 + y^4)\,j - (2x^3z^2)k\right\}$$

$$\nabla \cdot \vec{F} = 6xy + 4y^3 - 4x^3z$$

$$\nabla \cdot \vec{F} = \phi$$

→ 3 Marks

Now, $\text{grad}(\text{div}\,\vec{F}) = \text{grad}\,\phi = \nabla\phi$

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We have, $\nabla\phi = \frac{\partial\phi}{\partial x} i + \frac{\partial\phi}{\partial y} j + \frac{\partial\phi}{\partial z} k$ — Marks

$\nabla\phi = (6y - 12x^2z)\, i + (6x + 12y^2) j + (-4x^3) k$ → 3 marks

At $(2,-1,0)$

$\nabla\phi_{(2,-1,0)} = -6i + 24j - 32k$ → 1 mark

7 Marks

3 a. Let $\phi = xy^3z^2$

$\nabla\phi = \frac{\partial\phi}{\partial x} i + \frac{\partial\phi}{\partial y} j + \frac{\partial\phi}{\partial z} k$

$\nabla\phi = y^3z^2 i + 3xy^2z^2 j + 2xy^3z\, k$

At $(-1,-1,2)$

$\nabla\phi_{(-1,-1,2)} = -4i - 12j + 4k$

$= -4(i + 3j - k)$ → 3 marks

The required unit vector normal $\hat{n} = \frac{\nabla\phi}{|\nabla\phi|}$

$\hat{n} = \frac{-4(i+3j-k)}{\sqrt{4^2(1+9+1)}} = \frac{-(i+3j-k)}{\sqrt{11}}$ → 3 marks

6 Mark

3 b. Given $\vec{F} = 2xyz^2 i + (x^2z^2 + 2\cos yz) j + (2x^2yz + y\cos yz) k$

$$\nabla \times \vec{F} = \begin{vmatrix} i & j & k \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ 2xyz^2 & (x^2z^2 + z\cos yz) & (2x^2yz + y\cos yz) \end{vmatrix}$$

$= i\{2x^2z + (-yz\sin yz + \cos yz) - 2x^2z - (-yz\sin yz + \cos yz)\}$

$- j(4xyz - 4xyz) + k(2xz^2 - 2xz^2) = 0$

$\therefore \nabla \times \vec{F} = 0$

$\therefore \vec{F}$ is potential field. → 3 marks

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Marks

Consider, $\nabla\phi = \vec{F}$

$$\frac{\partial\phi}{\partial x}i + \frac{\partial\phi}{\partial y}j + \frac{\partial\phi}{\partial z}k = 2xyz^2 i + (x^2z^2 + z\cos yz)j + (2x^2yz + y\cos yz)k$$

$$\Rightarrow \frac{\partial\phi}{\partial x} = 2xyz^2$$

$$\therefore \phi = \int 2xyz^2\,dx + f_1(y,z)$$

$$\phi = x^2yz^2 + f_1(y,z)$$

$$\Rightarrow \frac{\partial\phi}{\partial y} = x^2z^2 + z\cos yz$$

$$\phi = \int (x^2z^2 + z\cos yz)\,dy + f_2(x,z)$$

$$\phi = x^2yz^2 + \sin yz + f_2(x,z)$$

$$\Rightarrow \frac{\partial\phi}{\partial z} = 2x^2yz + y\cos yz$$

$$\phi = \int (2x^2yz + y\cos yz)\,dz + f_3(x,y)$$

$$\phi = x^2yz^2 + \sin yz + f_3(x,y)$$ → 3 Marks

Let us choose, $f_1(y,z) = \sin yz$

$f_2(x,z) = 0$

$f_3(x,y) = 0$

$\therefore \phi = x^2yz^2 + \sin yz$ → 1 Mark

7 Marks

3 c. $\phi = x^2yz + 4xz^2$

$$\nabla\phi = \frac{\partial\phi}{\partial x}i + \frac{\partial\phi}{\partial y}j + \frac{\partial\phi}{\partial z}k$$

$$\nabla\phi = (2xyz + 4z^2)i + (x^2z)j + (x^2y + 8xz)k$$

At $(1,-2,-1)$

$$\nabla\phi_{(1,-2,-1)} = 6i - j - 10k$$ → 3 Marks

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Marks

unit normal, $\hat{n}$ = a vector in the direction of $2\hat{i}-\hat{j}-2\hat{k}$

$$\hat{n} = \frac{2\hat{i}-\hat{j}-2\hat{k}}{\sqrt{4+1+4}} = \frac{2\hat{i}-\hat{j}-2\hat{k}}{3}$$

$$\therefore \nabla\phi \cdot \hat{n} = (8\hat{i}-\hat{j}-10\hat{k}) \cdot \left(\frac{2\hat{i}-\hat{j}-2\hat{k}}{3}\right)$$

$$= \frac{37}{3}$$

→ 4 Marks

7 Marks

4a. Maximum directional derivative is along $\nabla\phi$ and in the direction parallel to y-axis the magnitude is 32 unit.

$$\nabla\phi \cdot \hat{j} = 32 \text{ at } (-1,1,2)$$

we have, $\nabla\phi = \frac{\partial\phi}{\partial x}\hat{i} + \frac{\partial\phi}{\partial y}\hat{j} + \frac{\partial\phi}{\partial z}\hat{k}$

$$\nabla\phi = (ay^2+3cx^2z^2)\hat{i} + (2axy+bz)\hat{j} + (by+2cx^3z)\hat{k}$$

At (-1,1,2)

$$\nabla\phi_{(-1,1,2)} = (a+12c)\hat{i} + (-2a+2b)\hat{j} + (b-4c)\hat{k}$$

→ 3 Marks

Now, $\nabla\phi \cdot \hat{j} = -2a+2b = 32$

$$-a+b = 16$$

Since $\nabla\phi$ is parallel to y-axis

$$a+12 = 0 \text{ and } b-4c = 0$$

Solving this eqn we get,

$$a = -12, \quad b = 4, \quad c = 1$$

→ 3 Marks

6 Marks

4b. we have to show that curl $\vec{F} = 0$

$$\nabla \times \vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ (y+z) & (z+x) & (x+y) \end{vmatrix}$$

$$= \hat{i}(1-1) - \hat{j}(1-1) + \hat{k}(1-1)$$

$$\nabla \times \vec{F} = 0 \quad \therefore \vec{F} \text{ is irrotational}$$

→ 3 Marks

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Marks

Now let us consider $\nabla\phi = \vec{F}$

$$\frac{\partial\phi}{\partial x}i + \frac{\partial\phi}{\partial y}j + \frac{\partial\phi}{\partial z}k = (y+z)i + (z+x)j + (x+y)k$$

$$\Rightarrow \frac{\partial\phi}{\partial x} = y+z \qquad \therefore \phi = \int (y+z)\,dx + f_1(y,z)$$

$$\phi = xy + xz + f_1(y,z)$$

$$\Rightarrow \frac{\partial\phi}{\partial y} = z+x \qquad \therefore \phi = \int (z+x)\,dy + f_2(x,z)$$

$$\phi = yz + xy + f_2(x,z)$$

$$\Rightarrow \frac{\partial\phi}{\partial z} = x+y \qquad \therefore \phi = \int (x+y)\,dz + f_3(x,y)$$

$$\phi = xz + yz + f_3(x,y)$$

→ 3 Marks

Let us choose $f_1(y,z) = yz$

$f_2(z,x) = xz$

$f_3(x,y) = xy$

$\therefore \phi = xy + yz + zx$

→ 1 Mark

7 Marks

4 C. Given, $\phi_1 = x^2+y^2+z^2$ and $\phi_2 = x^2+y^2-z$

$$\nabla\phi = \frac{\partial\phi}{\partial x}i + \frac{\partial\phi}{\partial y}j + \frac{\partial\phi}{\partial z}k$$

$\nabla\phi_1 = 2xi + 2yj + 2zk \Rightarrow [\nabla\phi_1]_{(2,-1,2)} = 2(2i - j + 2k)$

$\nabla\phi_2 = 2xi + 2yj - k \Rightarrow [\nabla\phi_2]_{(2,-1,2)} = 4i - 2j - k$

→ 3 Marks

If θ is angle b/w two normals we have,

$$\cos\theta = \frac{\nabla\phi_1 \cdot \nabla\phi_2}{|\nabla\phi_1|\,|\nabla\phi_2|}$$

$$\cos\theta = \frac{2(8+2-2)}{\sqrt{2^2(4+1+4)}\sqrt{16+4+1}} = \frac{8}{3\sqrt{21}}$$

$$\theta = \cos^{-1}\left(\frac{8}{3\sqrt{21}}\right)$$

→ 4 Marks

7 Marks

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY - TUMKUR

DEPARTMENT OF MATHEMATICS

Second Semester B.E Degree Examination

Mathematics-II for Electrical & Electronics Engineering Stream-BMATE201

Time: 120 min USN: III - IAT Max marks: 60

Note: *1. Answer **ONE FULL** questions choosing one full question from each part.*
2. VTU Formula Hand Book Permitted.
3. M: Marks, L: Bloom's level, C: Course outcomes.

		PART-A	M	L	C
Q.01	a	Use Newton-Raphson method to find a real root of $x \log_{10} x = 1.2$, correct to three decimal places.	7	L2	CO1
	b	From the following table, estimate the number of student who obtained the marks between 40 and 45 is	7	L2	CO1
	c	Evaluate $\int_0^1 \frac{1}{1+x}\,dx$ taking 7 ordinates and applying Simpson's $(3/8)^{th}$ rule .Hence deduce the value of $\lim_{e} 2$.	6	L2	CO1

Marks less then(x)	30-40	40-50	50-60	60-70	70-80
Number of students (y)	31	42	51	35	31

OR

Q.02	a	Given $\frac{dy}{dx} = 1 + \frac{y}{x}$, $y = 2$ at $x = 1$, find the approximate value of y at x=1.4 by taking step size h=0.2 applying modified Euler's method. Also find the value of y at x=1.2 and 1.4	7	L2	CO2
	b	Given $\frac{dy}{dx} = 3x + \frac{y}{2}$, $y(0) = 1$ compute y (0.2) by taking h=0.2 using Runge-Kutta method of fourth order.	7	L2	CO2
	c	Given that $\frac{dy}{dx} = x - y^2$ and the data y(0)=0, y(0.2)=0.02, y(0.4)=0.0795 , y(0.6)=0.1762. Compute y at x=0.8 by applying Milne's method.	6	L2	CO2

OR

Q.03	a	Find $div\,\vec{F}$ and $curl\,\vec{F}$ where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$	7	L2	CO3
	b	Show that $\vec{F} = (2xy^2 + yz)i + (2x^2y + xz + 2yz^2)j + (2y^2z + xy)k$ is a conservative force field. Find its scalar potential.	7	L2	CO3
	c	Find the angle between the surface $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at $(2,-1,2)$.	6	L2	CO3

PART-B

Q.04	a	Find the laplace transform of i) $e^{-3t}(2cos5t - 3sin5t)$ ii) $\frac{cosat - cosbt}{t}$		L2	CO4
	b	Find the Laplace transform of the square wave function of period 2a , defined by $f(x) = \begin{cases} E, & 0 < t < a \\ -E, & a < t < 2a \end{cases}$	7	L3	CO4
	c	using Convolution theorem, find the inverse Laplace transform of i) $\frac{s}{(s^2+a^2)^2}$	6	L2	CO4

OR

Q.05	a	Find inverse laplace transform of i) $L^{-1}\left\{\frac{2s^2-6s+5}{s^3-6s^2+11s-6}\right\}$ ii) $\frac{s}{s^2+2s+3}$	7	L3	CO4
	b	Express $f(t) = \begin{cases} cost, 0 < t < \pi \\ cos2t, \pi < t < 2\pi \\ cos3t, t > 2\pi \end{cases}$ in terms of the Heaviside unit step function and hence find laplace transform.	7	L2	CO4
	c	solve the differential equation by using the laplace transform method $\frac{d^2y}{dt^2} + y = sin2t$, $y(0) = 0, y^1(0) = 0$	6	L2	CO4

PART-C

Q.06	a	Express the vector (3,5,2) as a linear combination of the vectors (1,1,0), (2,3,0),(0,0,1) of $V_3(R)$	7	L2	CO5
	b	Define a subspace. Show that the intersection of two subspaces of a vector space V is also a subspace of V.	7	L2	CO5
	c	State the rank-Nullity theorem and verify the theorem for the linear transformation $T: R^3 \to R^3$ defined by $T(x,y,z) = (x + 2y - z, y + z, x + y - 2z)$	6	L3	CO5

OR

Q.07	a	Prove that in $V_3(R)$, the vector {(1,2,1),(2,1,0),(1,-1,2)} are linearly independent.	7	L2	CO5
	b	Prove that $T: R^3 \to R^3$ be defined by $T(a,b,c) = (3a, a - b, 2a + b + c)$ is a linear transformation.	7	L2	CO5
	c	Define a basis for a vector space. Determine whether or not the vector (1,1,2), (1,2,5), (5,3,4) form a basis of R^3.	6	L2	CO5

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS

SCHEME OF SOLUTION

ACADEMIC YEAR: 22-23 | 3rd Internal Assessment | SUBJECT CODE:

QUESTION NO.	SOLUTION	MARKS
	PART - A	
1 a.	$f(x) = x\log_{10} x - 1.2$	
	$f'(x) = \log e + \log x$	1 mark
	$f(0) = -1.2 < 0$	
	$f(1) = -1.2 < 0$	
	$f(2) = -0.5979 < 0$, $f(3) = 0.2313 > 0$	2 marks
	A real root lies between (2,3)	
	I st approximation:-	
	$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$	
	$x_1 = 2.7918$	4 marks
	$x_2 = 2.7409$	
	$x_3 = 2.7407$	
	Hence the required approximation is 2.740	7 Marks
1.b	Let $y = f(x)$ denote the no of student	
	less than 40 marks = 31	
	50 marks = 31 + 42 = 73	
	60 marks = 31 + 42 + 51 = 124	
	70 marks = 31 + 42 + 51 + 35 = 159	
	80 marks = 31 + 42 + 51 + 35 + 31 = 190	1 mark

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QUESTION NO.	SOLUTION	MARKS

x	y	Δy_0	$\Delta^2 y_0$	$\Delta^3 y_0$	$\Delta^4 y_0$
40	31				
		42			
50	73		9		
		51		−25	
60	124		−16		37
		35		12	
70	159		−4		
		31			
80	190				

3 marks

$$P = \frac{x - x_0}{h} = \frac{45 - 40}{10} = 0.5$$

$$y = y_0 + P\Delta y_0 + \frac{P(P-1)}{2!}\Delta^2 y_0 + \cdots$$

2 marks

$y(45) = 47.867$

≈ 48

∴ No of student obtained 45 marks = 48

No of student obtained 40 marks = 48 − 31

= 17

1 mark

7 Marks

1. C

$$\int_0^1 \frac{1}{1+x}\,dx$$

$a = 0,\ b = 1,\ n = 6$

$$h = \frac{b-a}{n} = 1/6$$

x	0	1/6	2/6	3/6	4/6	5/6	1
y	1	6/7	3/4	2/3	3/5	6/11	1/2

2 marks

$$I = \frac{3h}{8}\left[(y_0 + y_6) + 3(y_1 + y_2 + y_4 + y_5) + 2y_3\right]$$

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QUESTION NO.	SOLUTION	MARKS
	$I = \frac{1}{16}[1.5 + 3.2577 + 1.333]$	2 marks
	$I = 0.6931$	
	$\therefore 0.6931 = \int_0^1 \frac{1}{1+x}\,dx$	
	$= \log(1+x)\Big\|_0^1$	2 marks
	$= \log 2 - \log 1$	
	$\log_e 2 = 0.6931$	6 Marks
2 a	$\frac{dy}{dx} = 1 + y/x \qquad y = 2$ at $x = 1$	
	$h = 0.2$	1 mark
	$x_0 = 1, \; y_0 = 2$	
	$y_1^{(0)} = y_0 + hf(x_0, y_0)$	
	$y_1^{(0)} = 2.6$	
	$y_1^{(1)} = y_0 + \frac{h}{2}[f(x_0, y_0) + f(x_1, y_1^{(0)})]$	
	$y_1^{(1)} = 2.616$	
	$y_1^{(2)} = 2.618$	3 marks
	$y_1^{(3)} = 2.618$	
	$\therefore y(1.2) = 2.618$	

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QUESTION NO.	SOLUTION	MARKS
	$x_1 = x_0 + h = 1.2 + 0.2$ $= 1.4$ $y_2^{(0)} = y_0 + hf(x_0, y_0)$ $= 3.2546$ $y_2^{(1)} = y_0 + h/2\,[f(x_0, y_0) + f(x_2, y_2^{(0)})]$ $= 3.2685$ $y_2^{(2)} = 3.2695$ $y_2^{(3)} = 3.2696$ $\therefore y(1.4) = 3.2696 \approx 3.27$	3 marks 7 Marks
2. b	$\frac{dy}{dx} = 3x + y/2 \quad , \quad y(0) = 1$ Given $x_0 = 0$, $y_0 = 1$ $f(x_0, y_0) = 1/2$ By using Runge-Kutta $K_1 = hf(x_0, y_0) = 0.1$ $K_2 = hf(x_0 + h/2, y_0 + K_1/2) = 0.165$ $K_3 = hf(x_0 + h/2, y_0 + K_2/2) = 0.1682$ $K_4 = hf(x_0 + h, y_0 + K_3) = 0.2368$ $\therefore y(x) = y_0 + 1/6\,(K_1 + 2K_2 + 2K_3 + K_4)$ $y(0.2) = 1.1672$	1 mark 4 marks 2 marks 7 Marks

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QUESTION NO.	SOLUTION	MARKS
2. c	$\frac{dy}{dx} = x - y^2$	

x	y	$y' = x - y^2$
0	0	0
0.2	0.02	0.1996
0.4	0.0795	0.3936
0.6	0.1762	0.5689
0.8	$y_4 = ?$	$y_4' = ?$

2 marks

$h = 0.2$ By predictor method.

$y_4^{(P)} = y_0 + \frac{4h}{3}[2y_1' - y_2' + 2y_3']$

2 marks

$y_4^{(P)} = 0.3048$

$y_4' = 0.7070$

By corrector method

$y_4^{(C)} = y_2 + h/3\,[y_2' + 4y_3' + y_4']$

2 marks

$y_4^{(C)} = 0.3043$

$y_4' = 0.7074$

6 Marks

3. a	$\phi = x^3 + y^3 + z^3 - 3xyz$	

$\nabla\phi = F = \text{grad}\,\phi = \left[\frac{\partial\phi}{\partial x} i + \frac{\partial\phi}{\partial y} j + \frac{\partial\phi}{\partial z} k\right]$

$\vec{F} = (3x^2 - 3yz)i + (3y^2 - 3xz)j + (3z^2 - 3xy)k$ 2 marks

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QUESTION NO.	SOLUTION	MARKS
	i) $\text{div}\,\vec{F} = \nabla \cdot \vec{F} = \frac{\partial f_1}{\partial x} + \frac{\partial f_2}{\partial y} + \frac{\partial f_3}{\partial z}$ $= 6.(x+y+z)$ ii) $\text{Curl}\,\vec{F} = \nabla \times \vec{F} = \begin{vmatrix} i & j & k \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ 3x^2-3yz & 3y^2-3xz & 3z^2-3xy \end{vmatrix}$ $= i(-3x+3x) - j(-3y+3y) + k(-3z+3z)$ $\nabla \times \vec{F} = 0$	2 marks 3 marks 7 Marks
3. b	$\nabla \times \vec{F} = \begin{vmatrix} i & j & k \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ (2xy^2+yz) & (2x^2y+2yz^2) & (2y^2z+xy) \end{vmatrix}$ $\nabla \times \vec{F} = 0$ $\therefore \vec{F}$ is conservative Now we have to find ϕ such $\nabla\phi = \vec{F}$ $\frac{\partial\phi}{\partial x} i + \frac{\partial\phi}{\partial y} j + \frac{\partial\phi}{\partial z} k = (2xy^2+yz) i + (2x^2y+2yz^2) j + (2y^2z+xy) k$	2marks

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QUESTION NO.	SOLUTION	MARKS
	$\frac{\partial \phi}{\partial x} = 2xy^2 + yz \Rightarrow \phi = x^2y^2 + xyz + f_1(y,z)$ $\frac{\partial \phi}{\partial y} = 2x^2y + 2yz^2 \Rightarrow \phi = x^2y^2 + xyz + y^2z^2 + f_2(x,z)$ $\frac{\partial \phi}{\partial z} = 2y^2z + xy \Rightarrow \phi = y^2z^2 + xyz + f_3(x,y)$ Let us choose $f_1(y,z) = y^2z^2$ $f_2(x,z) = 0$ $f_3(x,y) = x^2y^2$ $\therefore \phi = x^2y^2 + y^2z^2 + xyz$	3 marks 2 marks 7 Marks
3. C.	$\phi_1 = x^2 + y^2 + z^2$ $\nabla\phi_1 = \frac{\partial \phi_1}{\partial x} i + \frac{\partial \phi}{\partial y} j + \frac{\partial \phi}{\partial z} k$ $= 2x\hat{i} + 2y\hat{j} + 2z\hat{k}$ $\nabla\phi_{1(2,-1,2)} = 4\hat{i} - 2j + 4\hat{k}$ $\lvert\nabla\phi_1\rvert = \sqrt{16+4+16} = \sqrt{36} = 6$ $\phi_2 = x^2 + y^2 - z$ $\nabla\phi_2 = 2x\hat{i} + 2y\hat{j} - \hat{k}$ $\nabla\phi_{2(2,-1,2)} = 4\hat{i} - 2\hat{j} - \hat{k}$	2 marks

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QUESTION NO.	SOLUTION	MARKS
	$\lvert\nabla\phi_2\rvert = \sqrt{16+4+1} = \sqrt{21}$	2 marks
	$\therefore \cos\theta = \dfrac{\nabla\phi_1 \cdot \nabla\phi_2}{\lvert\nabla\phi_1\rvert\,\lvert\nabla\phi_2\rvert}$	
	$= \dfrac{16}{6\sqrt{21}}$	
	$\cos\theta = \dfrac{8}{3\sqrt{21}}$	2 marks
	$\theta = \cos^{-1}\left(\dfrac{8}{3\sqrt{21}}\right)$	6 Marks

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QUESTION NO.	SOLUTION	MARKS
04. a	i) $e^{-3t}(2\cos 5t - 3\sin 5t)$	

$a = -3$ $\quad f(t) = 2\cos 5t - 3\sin 5t$

$$L[f(t)] = 2L[\cos 5t] - 3L[\sin 5t]$$

$$= 2\left[\frac{s}{s^2+25}\right] - 3\left[\frac{5}{s^2+25}\right]$$ 1 mark

$$L[f(t)] = \frac{2s-15}{s^2+25} = F(s)$$

$$L[e^{-3t}f(t)] = F(s-a)$$

$$F(s+3)$$

$$= \frac{2(s+3)-15}{(s+3)^2+25}$$

$$= \frac{2s-9}{s^2+6s+34}$$ 2 marks

ii) $\dfrac{\cos at - \cos bt}{t}$

$\rightarrow f(t) = \cos at - \cos bt$

$$L[f(t)] = L[\cos at] - L[\cos bt]$$

$$= \frac{s}{s^2+a^2} - \frac{s}{s^2+b^2} = F(s)$$ 2 marks

$$L\left[\frac{f(t)}{t}\right] = \int_s^\infty \left[\frac{s}{s^2+a^2} - \frac{s}{s^2+b^2}\right] ds$$

$$= \tfrac{1}{2}\int_s^\infty \left[\frac{2s}{s^2+a^2} - \frac{2s}{s^2+b^2}\right] ds$$

$$= \tfrac{1}{2}\left[\log 1 - \log\frac{s^2+a^2}{s^2+b^2}\right] \Rightarrow \log\left(\frac{s^2+b^2}{s^2+a^2}\right)^{1/2}$$ 2 marks

7 Marks

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QUESTION NO.	SOLUTION	MARKS
4. b.	$f(t) = \begin{cases} E & , 0<t<a \\ -E & , a<t<2a \end{cases}$	
	$T = 2a$	1 mark
	$L[f(t)] = \frac{1}{1-e^{-sT}} \int_0^T e^{-st} f(t)\,dt$	
	$= \frac{1}{1-e^{-2as}} \int_0^{2a} e^{-st} f(t)\,dt$	2 marks
	$= \frac{1}{1-e^{-2as}} \left[\int_0^a e^{-st} E\,dt + \int_a^{2a} e^{-st}(-E)\,dt \right]$	
	$= \frac{E}{1-e^{-2as}} \left[\frac{e^{-st}}{-s} \Big|_0^a - \frac{e^{-st}}{-s} \Big|_a^{2a} \right]$	2 marks
	$= \frac{E}{(1-e^{-2as})s} \left[1 + e^{-2as} - 2e^{-as} \right]$	
	$= \frac{E}{s}(1-e^{-2as}) \left[1-e^{-as} \right]^2$	
	$= \frac{E}{s} \frac{1}{(1-e^{-as})(1+e^{-as})} \left[1-e^{-as}\right]^2$	2 marks
	$= \frac{E}{s} \left[\frac{1-e^{-as}}{1+e^{-as}} \right]$	7 Marks
4. c	$\frac{s}{(s^2+a^2)^2}$	
	$f(s) = \frac{s}{s^2+a^2}$ & $g(s) = \frac{1}{s^2+a^2}$	
	$L^{-1}[f(s)] = \cos at$ & $L^{-1}[g(s)] = \frac{\sin at}{a}$	2 marks

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QUESTION NO.	SOLUTION	MARKS
	$f(t-u) = \cos a(t-u)$ $\quad g(u) = \frac{\sin au}{a}$	1 mark
	By Convolution theorem,	
	$L^{-1}[f(s).g(s)] = \int_{u=0}^{t} f(t-u)\, g(u)\, du$	1 mark
	$= \int_0^t \cos a(t-u)\, \frac{\sin au}{a}\, du$	
	$= \frac{1}{2a} \int_0^t 2\cos(at-au).\sin au\, du$	
	$= \frac{1}{2a}\left[u \sin at - \frac{\cos(2au-at)}{2a} \right]_0^t$	2 marks
	$= \frac{1}{2a}\left[t\sin at - \frac{1}{2a}\cos at + \frac{1}{2a}\cos at \right]$	
	$= \frac{1}{2a}\, t \sin at$	6 Marks
05. a)	i) $L^{-1}\left\{ \frac{2s^2-6s+5}{s^3-6s^2+11s-6} \right\}$	
	$f(s) = \frac{2s^2-6s+5}{(s-1)(s-2)(s-3)}$	
	$= \frac{A}{s-1} + \frac{B}{(s-2)} + \frac{C}{(s-3)} \rightarrow (1)$	1 Mark
	$2s^2-6s+5 = A(s-1)(s-3) + B(s-1)(s-3) + C(s-1)(s-2)$	
	Put $s=1$, $\quad 1 = 2A$	
	$A = 1/2$	

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QUESTION NO.	SOLUTION	MARKS
	$s=2,\ 1=-B$ put, $s=3\ \ 5=2C$ $B=-1$ $C=5/2$	2marks
	$\therefore$ eq^n (1) $f(s)=\frac{1}{2}\left(\frac{1}{s-1}\right)-\frac{1}{s-2}+\frac{5}{2}\left(\frac{1}{s-3}\right)$ $L^{-1}[f(s)]=\frac{1}{2}L^{-1}\left(\frac{1}{s-1}\right)+L^{-1}\left(\frac{1}{s-2}\right)+L^{-1}\left(\frac{1}{s-2}\right)$ $=\frac{1}{2}e^{t}-e^{2t}+\frac{5}{2}e^{3t}$	1 mark
	ii) $\frac{s}{s^2+2s+3}$ $f(s)=\frac{s}{(s-1)^2+(\sqrt{2})^2}$, $a=1$ $L^{-1}(f(s))=L^{-1}\left(\frac{s}{s^2+(\sqrt{2})^2}\right)$ $=f(t)$ $=e^{t}\left(\frac{\cos\sqrt{2}t}{\sqrt{2}}\right)$	2marks 1 mark 7 marks
5 b.	$f(t)=\begin{cases}\cos t, & 0<t<\pi\\ \cos 2t, & \pi<t<2\pi\\ \cos 3t, & t>2\pi\end{cases}$ $f_1(t)=\cos t,\ f_2(t)=\cos 2t,\ f_3(t)=\cos 3t$ $\therefore f(t)=f_1(t)+[f_2(t)-f_1(t)]u(t-a)+$ $[f_3(t)-f_2(t)]u(t-b)$	2 marks

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QUESTION NO.	SOLUTION	MARKS
	$a=\pi \quad b=2\pi$ $f(t) = \cos t + [\cos 2t - \cos t]\, u(t-\pi) + [\cos 3t - \cos 2t]\, u(t-2\pi)$ $\mathcal{L}[f(t)] = \mathcal{L}[\cos t] + \mathcal{L}[\cos 2t - \cos t]\, u(t-\pi) + \mathcal{L}[\cos 3t - \cos 2t]\, u(t-2\pi) \rightarrow (1)$ $\mathcal{L}[\cos t] = \frac{s}{s^2+1}$ $\mathcal{L}[\cos 2t - \cos t]\, u(t-\pi) = e^{-\pi s}\left[\frac{s}{s^2+4} - \frac{s}{s^2+1}\right]$ $\mathcal{L}[\cos 3t - \cos 2t]\, u(t-2\pi) = e^{-2\pi s}\left[\frac{s}{s^2+9} - \frac{s}{s^2+4}\right]$ $(1) \Rightarrow$ $\mathcal{L}[f(t)] = \frac{s}{s^2+1} + e^{-\pi s}\left(\frac{s}{s^2+4} - \frac{s}{s^2+1}\right) + e^{-2\pi s}\left(\frac{s}{s^2+9} - \frac{s}{s^2+4}\right)$	2 marks 2 marks 1 mark 7 Marks
5. C	$\frac{d^2y}{dt^2} + y = \sin 2t \quad , \quad y(0)=0 \ , \ y'(0)=0$ $y''(t) + y(t) = \sin 2t$ $\mathcal{L}[y''(t)] + \mathcal{L}[y(t)] = \mathcal{L}[\sin 2t]$ $\{s^2\mathcal{L}[y(t)] - s\,y(0) - y(0)\} + \mathcal{L}[y(t)] = \frac{2}{s^2+4}$ $(s^2+1)\,\mathcal{L}[y(t)] = \frac{2}{s^2+4}$ $y(t) = 2\,\mathcal{L}^{-1}\left[\frac{1}{(s^2+4)(s^2+1)}\right]$	2 marks

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QUESTION NO.	SOLUTION	MARKS
	$F(s) = L^{-1}\left[\frac{1}{s^2+2^2}\right]$ $\quad g(s) = L^{-1}\left[\frac{1}{s^2+1}\right]$	
	$F(u) = \frac{\sin 2u}{2}$ $\quad g(t-u) = \sin(t-u)$	2 marks
	Convolution theorem,	
	$L^{-1}\left[\frac{1}{(s^2+4)(s^2+1)}\right] = \int_0^t \frac{\sin 2u}{2} \sin(t-u)\,du$	
	$= \frac{1}{2}\int_0^t \cos(3u-t)\,du - \int_0^t \cos(u+t)\,du$	
	$= \frac{1}{12}\sin 2t + \frac{1}{12}\sin t + \frac{1}{4}\sin 2t - \frac{1}{4}\sin t$	2 marks
	$= \frac{1}{3}\sin 2t - \frac{1}{6}\sin t$	6 Marks
	Part - C	
6 a.	Let $\alpha = c_1\alpha_1 + c_2\alpha_2 + c_3\alpha_3$	
	$(3,5,2) = c_1(1,1,0) + c_2(2,3,0) + c_3(0,0,1)$	
	$= (c_1, c_1, 0) + (2c_2, 3c_2, 0) + (0, 0, c_3)$	3 marks
	$= (c_1+2c_2),\ (c_1+3c_2),\ (0+c_3)$	
	$c_1 + 2c_2 = 3$	$c_1 + 2c_2 = 3$
	$\therefore \boxed{c_2 = 2}$	$c_1 + 3c_2 = 5$
		$-c_2 = -2$
	$\therefore \boxed{c_3 = 2}$, $\quad c_1 + 2c_2 = 3$	4 marks
	$c_1 + 4 = 3$	7 Marks
	$c_1 = 3 - 4$	
	$\boxed{c_1 = -1}$	
	$\therefore (3,5,2) = -1(1,1,0) + 2(2,3,0) + 2(0,0,1)$	

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QUESTION NO.	SOLUTION	MARKS
6. b	**Subspace:-** A non-empty subset W of a vector space V over the field F is called a subspace of V. **Theorem:-** Let S and T be any two subspace of vector space V over the field F. Now $S \cap T = \{\alpha / \alpha \in S, \alpha \in T\}$ $0 \in S$, $0 \in T$ $\therefore 0 \in S \cap T$ $\therefore S \cap T$ is non-empty We shall show that for every $\alpha, \beta \in S \cap T$ $\alpha, \beta \in S \cap T$ $\Rightarrow c_1\alpha + c_2\beta \in S$ & $c_1\alpha + c_2\beta \in T$ $\therefore c_1\alpha + c_2\beta \in S \cap T$ Hence $S \cap T$ is the subspace of V over F	1 mark 3 marks 3 marks 7 Marks
6. c.	$T(x,y,z) = (x+2y-z,\ y+z,\ x+y-2z)$ $T(1,0,0) = (1,0,1) = \alpha_1$ $T(0,1,0) = (2,1,1) = \alpha_2$ $T(0,0,1) = (-1,1,-2) = \alpha_3$ Consider, $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 1 \\ -1 & 1 & -2 \end{bmatrix}$ $R_2 \to R_2 - 2R_1$, $R_3 \to R_3 + R_1$	1 mark 2 marks

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QUESTION NO.	SOLUTION	MARKS
	$A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & -1 \\ 0 & 1 & -1 \end{bmatrix}$ $R_3 \to R_3 - R_2$ $A \sim \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & -1 \\ 0 & 0 & 0 \end{bmatrix}$ $\dim(R(T)) = 2 = \text{rank}$ To find nullity, $T(x,y,z) = (0,0,0)$ $x+2y-z=0$, $y+z=0$ $x+y-2z=0$ $\boxed{z=1}$, $\boxed{y=-1}$, $\boxed{x=3}$ $N(T) = (3,-1,1)$ $N(T) = 1$ Rank + nullity = 3 = dim(R) Hence Rank nullity theorem Verified	2 marks 1 mark 6 Marks
7. a.	Consider $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 0 \\ 1 & -1 & 2 \end{bmatrix}$ $\lvert A \rvert = 1(2) - 2(4) + 1(-3)$ $\lvert A \rvert = 9$ $\therefore \lvert A \rvert \neq 0$ $\therefore$ Given vector $V_3(R)$ is linearly independent	3 marks 3 marks 1 mark 7 Marks

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QUESTION NO.	SOLUTION	MARKS
7. b	$T(a,b,c) = (3a, a-b, 2a+b+c)$ $\alpha = (a_1, b_1, c_1) \quad \beta = (a_2, b_2, c_2)$ $T(\alpha+\beta) = T[(a_1,b_1,c_1) + (a_2,b_2,c_2)]$ $= T[a_1+a_2, b_1+b_2, c_1+c_2]$ $= 3(a_1+a_2) + (a_1+a_2)-(b_1+b_2), 2(a_1+a_2)+ (b_1+b_2) + (c_1+c_2)$ $= [3a_1, (a_1-b_1), 2a_1+b_1+c_1] + (3a_2, a_2-b_2, 2a_2+b_2+c_2]$ $= T[a_1,b_1,c_1] + T(a_2,b_2,c_2)$ $= T(\alpha) + T(\beta)$ Consider, $T(c.\alpha) = T[c(a_1,b_1,c_1)]$ $= [3ca_1, (ca_1-cb_1), 2ca_1+cb_1+cc_1]$ $= cT[a_1,b_1,c_1]$ $= cT(\alpha)$ $\therefore$ T is linear transformation	2 marks 2 marks 3 marks 7 Marks
7. c	Basis:- A subset B of a vector space V(F) is called basis of V if i) B is a linearly independent ii) $L(B) = V$	2 marks

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QUESTION NO.	SOLUTION	MARKS
	Consider, $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 5 \\ 5 & 3 & 4 \end{bmatrix}$	2 marks
	$\|A\| = 1(8-15) - 1(4-25) + 2(3-10)$	
	$\|A\| = 0$	
	$\therefore$ Given vector are linearly dependent	2 marks
	Hence given vector do not form a basis of R^3	
		6 Marks

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
III-semester: I Internal Assessment Exam: DECEMBER-2022
21MAT31- TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES

Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40

PART-A

1. a) Find the Laplace Transform of $2^t + \frac{cos2t-cos3t}{t} + tsint$ (CO1)(6M)

b) Find the Laplace Transform of $te^{-t}sin2t - \frac{cos2t-cos3t}{t}$ (CO1)(7M)

c) If $f(t) = \begin{cases} t & ,0 \le t \le a \\ 2a-t, & a \le t \le 2a \end{cases}$, $f(t+2a) = f(t)$. *Show that* $L[f(t)] = \frac{1}{s^2}tanh\left(\frac{as}{2}\right)$ (CO1)(7M)

OR

2. a) Find the Laplace Transform of $(i)\ cost\ cos2t\ cos3t$ $(ii)\ \left(\sqrt{t} - \frac{1}{\sqrt{t}}\right)^3$ (CO1)(6M)

b) Using unit step function, find the Laplace Transform of $f(t) = \begin{cases} cost, 0 \le t \le \pi \\ cos2t, \pi \le t \le 2\pi \\ cos3t, t > 2\pi \end{cases}$ (CO1)(7M)

c) Using Laplace Transform evaluate $\int_0^\infty e^{-t}t\ sin^2 3t\ dt$ (CO1)(7M)

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
III-semester: I Internal Assessment Exam: DECEMBER-2022
21MAT31- TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES

Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40

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b) Find the Laplace Transform of $te^{-t}sin2t - \frac{cos2t-cos3t}{t}$ (CO1)(7M)

c) If $f(t) = \begin{cases} t & ,0 \le t \le a \\ 2a-t, & a \le t \le 2a \end{cases}$, $f(t+2a) = f(t)$. *Show that* $L[f(t)] = \frac{1}{s^2}tanh\left(\frac{as}{2}\right)$ (CO1)(7M)

OR

2. a) Find the Laplace Transform of $(i)\ cost\ cos2t\ cos3t$ $(ii)\ \left(\sqrt{t} - \frac{1}{\sqrt{t}}\right)^3$ (CO1)(6M)

b) Using unit step function, find the Laplace Transform of $f(t) = \begin{cases} cost, 0 \le t \le \pi \\ cos2t, \pi \le t \le 2\pi \\ cos3t, t > 2\pi \end{cases}$ (CO1)(7M)

c) Using Laplace Transform evaluate $\int_0^\infty e^{-t}t\ sin^2 3t\ dt$ (CO1)(7M)

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PART-B

3. a) Find the inverse Laplace Transform of $(i)\ \frac{(s^2-1)^2}{s^5}$ $(ii)\ \frac{s}{s^2+6s+13}$ (CO1)(6M)

b) Using Convolution theorem, find the inverse Laplace Transform of $\frac{s}{(s^2+a^2)^2}$ (CO1)(7M)

c) Solve by using Laplace Transform techniques $y'' - 3y' + 2y = e^{3t}, y(0) = 1, y'(0) = -1$ (CO1)(7M)

OR

4. a) Find the inverse Laplace Transform of $\frac{2s^2-6s+5}{s^3-6s^2+11s-6}$ (CO1)(6M)

b) Using Convolution theorem, find the inverse Laplace Transform of $\frac{1}{(s^2+1)(s^2+9)}$ (CO1)(7M)

c) Solve by using Laplace Transform techniques $\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t, x(0) = 2, x'(0) = -1$ (CO1)(7M)

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PART-B

3. a) Find the inverse Laplace Transform of $(i)\ \frac{(s^2-1)^2}{s^5}$ $(ii)\ \frac{s}{s^2+6s+13}$ (CO1)(6M)

b) Using Convolution theorem, find the inverse Laplace Transform of $\frac{s}{(s^2+a^2)^2}$ (CO1)(7M)

c) Solve by using Laplace Transform techniques $y'' - 3y' + 2y = e^{3t}, y(0) = 1, y'(0) = -1$ (CO1)(7M)

OR

4. a) Find the inverse Laplace Transform of $\frac{2s^2-6s+5}{s^3-6s^2+11s-6}$ (CO1)(6M)

b) Using Convolution theorem, find the inverse Laplace Transform of $\frac{1}{(s^2+1)(s^2+9)}$ (CO1)(7M)

c) Solve by using Laplace Transform techniques $\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t, x(0) = 2, x'(0) = -1$ (CO1)(7M)

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21MAT31 : Transform Calculus, Fourier Series and Numerical Techniques

I^st internal Assessement Test

(1) a) $L[2^t] = \frac{1}{s-\log 2}$ — 1M

$L\left[\frac{\cos 2t - \cos 3t}{t}\right] = \int_s^\infty f(s)\,ds = \log\sqrt{\frac{s^2+9}{s^2+4}}$ — 2M

$L[t\sin t] = \boxed{n=1} = \frac{2s}{(s^2+1)^2}$ — 2M

$L[f(t)] = \frac{1}{s-\log 2} + \log\sqrt{\frac{s^2+9}{s^2+4}} + \frac{2s}{(s^2+1)^2}$ — 1M

b) $L[e^{-t}(t\sin 2t)] = a=-1,\ f(t)=t\sin 2t$

$L[f(t)] = L[t\sin 2t] = \frac{-4s}{(s^2+4)^2} (= F(s))$ — 1M

$= F(s-a) = F(s+1)$

$= \frac{-4(s+1)}{((s+1)^2+4)^2}$ — 2M

$L\left[\frac{\cos 2t - \cos 3t}{t}\right] = \int_s^\infty F(s)\,ds = \frac{1}{2}\int_s^\infty \left(\frac{2s}{s^2+4} - \frac{2s}{s^2+9}\right)ds$ — 2M

$= \log\sqrt{\frac{s^2+9}{s^2+4}}$ — 1M

$L[e^{-t}(t\sin 2t)] = \frac{-4(s+1)}{((s+1)^2+4)^2} - \log\sqrt{\frac{s^2+9}{s^2+4}}$ — 1M

c) $L[f(t)] = \frac{1}{1-e^{-sT}}\int_0^T e^{-st} f(t)\,dt$ — 1M

$= \frac{1}{1-e^{-2as}}\left\{\int_0^a e^{-st}\,t\,dt + \int_a^{2a} e^{-st}(2a-t)\,dt\right\}$ — 3M

$= \frac{1}{1-e^{-2as}}\left\{1 + (e^{-as})^2 + 2e^{as}\right\} = \frac{(1-e^{-as})^2}{(1+e^{-as})(1-e^{-as})}$

x^ly Numerator & Denominator by $e^{as/2}$ — 2M

$= \frac{1}{s^2}\frac{(e^{as/2} - e^{-as/2})}{(e^{as/2}+e^{-as/2})} = \frac{1}{s^2}\tanh\left(\frac{as}{2}\right)$ ——

(2) a) (i) $\cos t\cos 2t\cos 3t$ — 2M

$= \frac{1}{4}\{\cos 6t + 1 + \cos 4t + \cos 2t\}$

$= \frac{1}{4}\{L[\cos 6t] + L[1] + L[\cos 4t] + L[\cos 2t]\}$ — 3M

$= \frac{1}{4}\left\{\frac{s}{s^2+36} + \frac{1}{s} + \frac{s}{s^2+16} + \frac{s}{s^2+4}\right\}$ — 1M

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(ii) $\left(\sqrt{t}-\frac{1}{\sqrt{t}}\right)^3 = t^{3/2} - t^{-3/2} - 3t^{1/2} + 3t^{-1/2}$ 1m

$L\left[\left(\sqrt{t}-\frac{1}{\sqrt{t}}\right)^3\right] = L[t^{3/2}] - L[t^{3/2}] - 3L[t^{1/2}] + 3L[t^{-1/2}]$

$= \frac{\lfloor 5/2}{s^{5/2}} - \frac{\lfloor -1/2}{s^{-1/2}} - 3\frac{\lfloor 3/2}{s^{3/2}} + 3\frac{\lfloor 1/2}{s^{1/2}}$

$= \frac{3\sqrt{\pi}}{4s^{5/2}} + \frac{2\sqrt{\pi}}{s^{-1/2}} - \frac{3\sqrt{\pi}}{2s^{3/2}} + \frac{3\sqrt{\pi}}{s^{1/2}}$ 2m

b) $f_1(t) = \cos t$, $f_2(t) = \cos 2t$, $f_3(t) = \cos 3t$, $a = \pi$, $b = 2\pi$ 1m

$f(t) = f_1(t) + [f_2(t) - f_1(t)]u(t-a) + [f_3(t) - f_2(t)]u(t-b)$

$f(t) = \cos t + [\cos 2t - \cos t]u(t-\pi) + [\cos 3t - \cos 2t]u(t-2\pi)$ 1m

$L[f(t)] = L[\cos t] + L[(\cos 2t - \cos t)u(t-\pi)] + L[(\cos 3t - \cos 2t)u(t-2\pi)]$

$= \frac{s}{s^2+1} + e^{-\pi s}\left(\frac{s}{s^2+4} + \frac{s}{s^2+1}\right) + e^{-2\pi s}\left(\frac{s}{s^2+9} - \frac{s}{s^2+4}\right)$ 5m

c) $s = 1$ $f(t) = t\sin^2 3t$.

$n = 1$, $f(t) = \sin^2 3t = \frac{1-\cos 6t}{2}$ 2m

$L[f(t)] = L\left[\frac{1-\cos 6t}{2}\right] = \frac{1}{2}\left[\frac{1}{s} - \frac{s}{s^2+36}\right] (= F(s))$

$= (-1)\frac{d}{ds}\left[\frac{1}{2}\left(\frac{1}{s} - \frac{s}{s^2+36}\right)\right]$

$= (-1)\frac{1}{2}\left(-\frac{1}{s^2} - \frac{(s^2+36)(1) - (s)(2s+0)}{(s^2+36)^2}\right)$ 3m

$= \frac{1}{2s^2} + \frac{1}{2}\left(\frac{s^2-36}{(s^2+36)^2}\right)$ 2m

put $s = 1$, $L[f(t)] = 702/1369$ 1m

(3) a) (i) $\frac{(s^4+1-2s^2)}{s^5} = \frac{1}{s} + \frac{1}{s^5} - \frac{2s^2}{s^3}$

$= L^{-1}\left[\frac{1}{s}\right] + L^{-1}\left[\frac{1}{s^5}\right] - 2L^{-1}\left[\frac{1}{s^3}\right]$ 2m

$= 1 + \frac{t^4}{4!} - \frac{2t^2}{2!}$ 1m

(ii) $L^{-1}\left[\frac{s}{s^2+6s+13}\right] = e^{-3t}L^{-1}\left[\frac{s-3}{(s+3)^2+4}\right]$

$= e^{-3t}\left\{L^{-1}\left[\frac{s}{(s-3)^2+4}\right] - L^{-1}\left[\frac{3}{(s+3)^2+4}\right]\right\}$ 2m

$= e^{-3t}\left[\cos 2t - \frac{3}{2}\sin 2t\right]$

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(b) $F(s) = \frac{1}{(s^2+a^2)}$ $G(s) = \frac{s}{(s^2+a^2)}$.

$L^{-1}[F(s)] = L^{-1}\left[\frac{1}{s^2+a^2}\right]$ $L^{-1}[G(s)] = L^{-1}\left[\frac{s}{s^2+a^2}\right]$

$= \frac{\sin at}{a} (= f(t))$ $= \cos at (= g(t))$ 2m

$L^{-1}[F(s)G(s)] = \int_{u=0}^{t} \frac{\sin au}{a} \cos(at-au)\,du$.

$= \frac{1}{a}\int_{u=0}^{t} \sin au \cos(at-au)\,du$.

$= \frac{1}{2a}\left\{t\sin at - \frac{1}{2a}(\cos at - \cos at)\right\}$

$= \frac{1}{2a} t\sin at$. 5m

(c) $L[y''(t)] - 3L[y'(t)] + 2L[y(t)] = L[e^{3t}]$ 1m

$\{s^2L[y(t)] - sy(0) - y'(0)\} - 3\{sL[y(t)] - y(0)\} + 2L[y(t)] = \frac{1}{s-3}$

$\{s^2-3s+2\}L[y(t)] = \frac{s^2-7s+13}{s-3}$

$y(t) = L^{-1}\left[\frac{s^2-7s+13}{(s-1)(s-2)(s-3)}\right]$

$= L^{-1}\left[\frac{A}{s-1} + \frac{B}{s-2} + \frac{C}{s-3}\right]$ 5m

$A = 7/2$, $B = -3$ $C = 1/2$.

$= L^{-1}\left(\frac{7}{2}\frac{1}{s-1}\right) + L^{-1}\left[\frac{-3}{s-3}\right] + L^{-1}\left[\frac{1}{2}\frac{1}{s-3}\right]$ 1m

$= \frac{7}{2}\{7e^t - 6e^{2t} + e^{3t}\}$

1m

(4) a) $\frac{2s^2-6s+5}{s^3-6s^2+11s-6} = \frac{A}{s-1} + \frac{B}{s-2} + \frac{C}{s-3}$. 3m

$s=1$, $A = 1/2$

$s=2$, $B = -1$

$s=3$, $C = 5/2$

$L^{-1}\left[\frac{2s^2-6s+5}{s^3-6s^2+11s-6}\right] = \frac{1}{2}L^{-1}\left[\frac{1}{s-1}\right] - L^{-1}\left[\frac{1}{s-2}\right] + \frac{5}{2}L^{-1}\left[\frac{1}{s-3}\right]$ 2m

$= \frac{1}{2}e^t - e^{2t} + \frac{5}{2}e^{3t}$ //

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(b) $F(s) = \frac{1}{s^2+1}$ $\quad G(s) = \frac{1}{s^2+9}$

$L^{-1}[F(s)] = L^{-1}\left[\frac{1}{s^2+1}\right]$ $\quad L^{-1}[G(s)] = L^{-1}\left[\frac{1}{s^2+9}\right]$

$= \sin t \ (= f(t))$ $\quad = \frac{\sin 3t}{3} \ (= g(t))$ — 2M

$L^{-1}\left[\frac{1}{s^2+1}\cdot\frac{1}{s^2+9}\right] = \int_{u=0}^{t} \sin u \, \frac{1}{3}\sin 3(t-u)\,du.$

$= \frac{1}{2}\int_{u=0}^{t} \frac{1}{2}[\cos(4u-3t) - \cos(3t-2u)]\,du.$

$= \frac{1}{8}\left[\frac{\sin t + \sin 3t + 2\sin t - 2\sin 3t}{4}\right]$ — 5M

$= \frac{1}{24}[3\sin t - \sin 3t]$

(c) $L[x''(t)] - 2L[x'(t)] + L[x(t)] = L[e^t]$

$\{s^2 L[x(t)] - sx(0) - x'(0)\} - 2\{sL[x(t)] - x(0)\} + L[x(t)] = \frac{1}{s-1}$

$x(t) = L^{-1}\left[\frac{2s^2 - 7s + 6}{(s+1)(s-1)^2}\right]$

$= L^{-1}\left[\frac{A}{s-1} + \frac{B}{(s-1)^2} + \frac{C}{(s-1)^3}\right]$

put $s = 1$, $C = 1$

Coeff of s^2 to zero, $A = 2$

Coeff of s to zero, $B = -3$ — 5M

$= L^{-1}\left[\frac{2}{s-1}\right] + L^{-1}\left[\frac{-3}{(s-1)^2}\right] + L^{-1}\left[\frac{1}{(s-1)^3}\right]$

$= 2e^t - 3e^t t + e^t t^2$ — 1M

$x(t) = e^t(2 - 3t + t^2)$

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
III-semester: II Internal Assessment Exam: JANUARY-2023
21MAT31- TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES

Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40

PART-A

1. a) Using Runge-kutta method solve the following differential equation $\frac{d^2y}{dx^2} = x^3(y + \frac{dy}{dx})$ at $x = 0.1$ under the given condition y(0)=1, $y'(0) = 0.5$ by taking $h = 0.1$ **(CO5)(6M)**

b) Using Milne method obtain an approximate solution at the point $x = 0.4$ of the problem $\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 6y = 0, y(0) = 1,\ y'(0) = 0.1,\ y(0.1) = 1.03995, y'(0.1) = 0.6955, y(0.2) = 1.138036,$ $y'(0.2) = 1.258, y(0.3) = 1.29865,\ y'(0.3) = 1.873.$ **(CO5)(7M)**

c) Derive Euler's equation **(CO5)(7M)**

OR

2. a) Compute $y(0.1)$ given $\frac{d^2y}{dx^2} = y^3$ and $y = 10, \frac{dy}{dx} = 5$ at $x = 0$ by RK method of fourth order. **(CO5)(6M)**

b) Using Milne method obtain an approximate solution at the point $x = 1.4$ of the problem $2\frac{d^2y}{dx^2} = 4x + \frac{dy}{dx}, y(1) = 2,\ y'(1) = 2,\ y(1.1) = 2.2156, y'(1.1) = 2.3178,\ y(1.2) = 2.4649,\ y'(1.2) =$ $2.6725,\ y(1.3) = 2.7514,\ y'(1.3) = 3.0657$ **(CO5)(7M)**

c) Solve the variational problem $\delta\int_0^1 (12xy + y'^2)dx$ under the conditions $y(0) = 3$ *and* $y(1) = 6$ **(CO5)(7M)**

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
III-semester: II Internal Assessment Exam: JANUARY-2023
21MAT31- TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES

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c) Derive Euler's equation **(CO5)(7M)**

OR

2. a) Compute $y(0.1)$ given $\frac{d^2y}{dx^2} = y^3$ and $y = 10, \frac{dy}{dx} = 5$ at $x = 0$ by RK method of fourth order. **(CO5)(6M)**

b) Using Milne method obtain an approximate solution at the point $x = 1.4$ of the problem $2\frac{d^2y}{dx^2} = 4x + \frac{dy}{dx}, y(1) = 2,\ y'(1) = 2,\ y(1.1) = 2.2156, y'(1.1) = 2.3178,\ y(1.2) = 2.4649,\ y'(1.2) =$ $2.6725,\ y(1.3) = 2.7514,\ y'(1.3) = 3.0657$ **(CO5)(7M)**

c) Solve the variational problem $\delta\int_0^1 (12xy + y'^2)dx$ under the conditions $y(0) = 3$ *and* $y(1) = 6$ **(CO5)(7M)**

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PART-B

3. a) Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ $in\ 0 < x < 2\pi$. Hence deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \text{---} = \frac{\pi}{4}$ (CO1)(6M)

b) Obtain the Fourier series expansion of the function $f(x) = \begin{cases} x & ,0 < x < \pi \\ 2\pi - x, & \pi < x < 2\pi \end{cases}$. Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \text{---} = \frac{\pi^2}{8}$ (CO1)(7M)

c) Obtain the Fourier series expansion of the function $f(x) = \begin{cases} -k & ,-\pi < x < 0 \\ k & , \quad 0 < x < \pi \end{cases}$. Hence deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \text{---} = \frac{\pi}{4}$ (CO1)(7M)

OR

4. a) If $f(x) = x(2\pi - x)$ $in\ \ 0 \le x \le 2\pi$. Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \text{---} = \frac{\pi^2}{8}$ (CO1)(6M)

b) Find Fourier series of $f(x) = |x|$ in $(-\pi, \pi)$. Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \text{---} = \frac{\pi^2}{8}$ (CO1)(7M)

c) Obtain the Fourier series expansion of the function $f(x) = \begin{cases} 1 + \frac{2x}{\pi} & ,-\pi < x < 0 \\ 1 - \frac{2x}{\pi}, & 0 < x < \pi \end{cases}$ (CO1)(7M)

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PART-B

3. a) Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ $in\ 0 < x < 2\pi$. Hence deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \text{---} = \frac{\pi}{4}$ (CO1)(6M)

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c) Obtain the Fourier series expansion of the function $f(x) = \begin{cases} -k & ,-\pi < x < 0 \\ k & , \quad 0 < x < \pi \end{cases}$. Hence deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \text{---} = \frac{\pi}{4}$ (CO1)(7M)

OR

4. a) If $f(x) = x(2\pi - x)$ $in\ \ 0 \le x \le 2\pi$. Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \text{---} = \frac{\pi^2}{8}$ (CO1)(6M)

b) Find Fourier series of $f(x) = |x|$ in $(-\pi, \pi)$. Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \text{---} = \frac{\pi^2}{8}$ (CO1)(7M)

c) Obtain the Fourier series expansion of the function $f(x) = \begin{cases} 1 + \frac{2x}{\pi} & ,-\pi < x < 0 \\ 1 - \frac{2x}{\pi}, & 0 < x < \pi \end{cases}$ (CO1)(7M)

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21MAT31 - Transform Calculus, Fourier Series and Numerical Techniques

II IA Test: Scheme of Valuation.

1.

a) $\frac{dy}{dx} = z$, $\frac{dz}{dx} = x^3(y+z)$ 1M

$y_0 = 1$, $x_0 = 0$ $z_0 = 0.5$,

$K_1 = 0.05$, $l_1 = 0$

$K_2 = 0.05$, $l_2 = 0$ 4M

$K_3 = 0.05$, $l_3 = 0$

$K_4 = 0.05$

$y(0.1) = y_0 + \frac{1}{6}(K_1 + 2K_2 + 2K_3 + K_4) = 1.05$ 1M

b)

x	y	z	$z' = 6y - 3xz$
0	1	0.1	6
0.1	1.08995	0.6955	6.0311
0.2	1.138036	1.258	6.0734
0.3	1.29865	1.873	6.1062.
0.4	$y_4 = ?$		

3M

$y_4^{(P)} = y_0 + \frac{4h}{3}(2z_1 - z_2 + 2z_3) = 1.5172$ 3M

$z_4^{(P)} = z_0 + \frac{4h}{3}(2z_1' - z_2' + 2z_3') = 2.5268$

$y_4^{(C)} = y_2 + \frac{h}{3}(z_2 + 4z_3 + z_4) = 1.5139$. 1M

$\boxed{y(0.4) = 1.5139}$

c) Euler's Equation : 7M

$$\boxed{\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0}$$

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(2)

(a) $\frac{dy}{dx} = z$, $\frac{dz}{dx} = y^3$ — 1m

$x_0 = 0, y_0 = 10$ $x_0 = 0, z_0 = 5$, $h = 0.1$

$k_1 = 0.5000$, $l_1 = 100.0000$ — 4M

$k_2 = 6.5000$, $l_2 = 107.6891$

$k_3 = 5.8845$, $l_3 = 207.2672$.

$k_4 = 21.2267$ — 1m

$y(0.1) = y_0 + \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4) = 17.4160$.

(b)

x	y	z	$z' = \frac{4x+z}{2}$
1	2	2	3
1.1	2.2156	2.3178	3.6589
1.2	2.4649	2.6725	3.7362
1.3	2.7514	3.0657	4.1329.

3m

$y_4^{(P)} = y_0 + \frac{4h}{3}(2y_1' - y_2' + 2y_3') = 3.0793$ — 3m

$z_4^{(P)} = z_0 + \frac{4h}{3}(2z_1' - z_2' + 2z_3') = 3.4997$

$y_4^{(C)} = y_2 + \frac{h}{3}(z_2 + 4z_3 + z_4) = 3.0794$.

1m

$\boxed{y(1.4) = 3.0794}$

(c) $f(x, y, y') = (y')^2 + 12xy$.

Euler's Equation: $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$.

$12x - 2y'' = 0$ (or) $y'' = 6x$.

On integrating. — 4M

$\boxed{y = x^3 + C_1 x + C_2}$.

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$y(0) = 3 \Rightarrow C_1 = 2$.

$y(1) = 6 \Rightarrow C_2 = 3$

$\therefore \boxed{y = x^3 + 2x + 3}$ is the Curve. — 3M

3.

a) $a_0 = \frac{1}{\pi}\int_0^{2\pi} f(x)dx = 0$

$a_n = \frac{1}{\pi}\int_0^{2\pi} f(x)\cos nx\,dx = 0$

$b_n = \frac{1}{\pi}\int_0^{2\pi} f(x)\sin nx\,dx = 1/n$

$f(x) = \frac{\pi - x}{2} = \sum_{n=1}^{\infty} \frac{1}{n}\sin nx.$

put $x = \pi/2$: $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \cdots\cdots$

(OR) $f(x) = \frac{\pi - x}{2}$

odd function : $a_0 = 0, a_n = 0$ 3m

1m

1m

b) $f(x) = \begin{cases} x, & 0 \le x \le \pi \\ 2\pi - x, & \pi \le x \le 2\pi \end{cases}$ Even function: $b_n = 0$.

(OR)

$a_0 = \frac{1}{\pi}\int_0^{2\pi} f(x)dx = \frac{4\pi^2}{3}$

$a_n = \frac{1}{\pi}\int_0^{2\pi} f(x)\cos nx\,dx = -\frac{4}{n^2}$

$b_n = 0$.

put $x = 0$: $\frac{\pi^2}{6} \sum_{n=1}^{\infty} \frac{1}{n^2}$ - (1) & $x = \pi$: $\frac{\pi^2}{12} = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$ - (2)

adding (1) & (2) $\Rightarrow \frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots\cdots$

4m

1m

1m

c) $f(x) = \begin{cases} -K, & -\pi < x < 0 \\ K, & 0 < x < \pi \end{cases}$

odd function : $a_n = 0, a_0 = 0$.

$b_n = \frac{2}{\pi}\int_0^{\pi} f(x)\sin nx\,dx = \frac{2K}{n\pi}[1 - (-1)^n]$

$f(x) = \sum_{n=1}^{\infty} \frac{2K}{n\pi}[1 - (-1)^n]\sin nx.$

put $x = \pi/2$: $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \cdots\cdots$

2m

2m

1m

2m

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④

(a) $f(x) = x(2\pi - x)$ — 1m

Even function : $b_n = 0$.

$a_0 = \frac{2}{\pi}\int_0^{2\pi} f(x)\,dx = \frac{4\pi^2}{3}$ — 2m

$a_n = \frac{2}{\pi}\int_0^{\pi} f(x)\cos nx\,dx = -\frac{4}{n^2}$ — 1m

put $x=0$: $\frac{\pi^2}{6} = \sum_{n=1}^{\infty}\frac{1}{n^2}$ — ① — 1m

put $x=\pi$: $\frac{\pi^2}{12} = \sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n^2}$ — ② — 1m

adding ① and ② : $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$ — 1m

b). Even function : $b_n = 0$.

$a_0 = \frac{1}{\pi}\int_{-\pi}^{\pi} f(x)\,dx = \frac{2}{\pi}\int_0^{\pi} f(x)\,dx = \pi$

$a_n = \frac{2}{\pi}\int_0^{\pi} f(x)\cos nx\,dx = \frac{2((-1)^n - 1)}{\pi n^2}$ — 4m

$b_n = \frac{2}{\pi}\int_0^{\pi} f(x)\sin nx\,dx = 0$

$x=0$: $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$ — 2m

c) $f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & -\pi < x < 0 \\ 1 - \frac{2x}{\pi}, & 0 < x < \pi \end{cases}$ — 1m

Even function : $b_n = 0$.

$a_0 = \frac{2}{\pi}\int_0^{\pi} f(x)\,dx = 0$.

$a_n = \frac{2}{\pi}\int_0^{\pi} f(x)\cos nx\,dx = \frac{4}{n^2\pi^2}(1 - (-1)^n)$ — 4m

$f(x) = \sum_{n=1}^{\infty} \frac{4}{n^2\pi^2}(1 - (-1)^n)\cos nx$. — 2m

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④

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
III-semester: III Internal Assessment Exam: MARCH-2023
21MAT31- TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES

Time: 3 hrs] [Max marks:100

Note: Answer any **FIVE** full questions, choosing at least **ONE** question from each module

MODULE 1

1. a) Find the Laplace Transform of $te^{-t}sin2t - \frac{cos2t-cos3t}{t}$ (CO1)(6M)

b) If $f(t) = \begin{cases} t & ,0 \le t \le a \\ 2a-t, & a \le t \le 2a \end{cases}, f(t+2a) = f(t).$ *Show that* $L[f(t)] = \frac{1}{s^2}tanh\left(\frac{as}{2}\right)$ (CO1)(7M)

c) Using the convolution theorem find the inverse Laplace transform of $\frac{1}{(s^2+1)(s^2+9)}$ (CO1)(7M)

OR

2. a) Find the inverse Laplace Transform of $(i)\ \frac{(s^2-1)^2}{s^5}$ $(ii)\ \frac{s}{s^2+6s+13}$ (CO1)(6M)

b) Using unit step function, find the Laplace Transform of $f(t) = \begin{cases} cost, 0 \le t \le \pi \\ cos2t, \pi \le t \le 2\pi \\ cos3t, t > 2\pi \end{cases}$ (CO1)(7M)

c) Solve by using Laplace Transform techniques $\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t, x(0) = 2, x'(0) = -1$ (CO1)(7M)

MODULE 2

3. a) Obtain the Fourier series expansion of the function $f(x) = x^2$ *in* $-\pi < x < \pi$ (CO2)(6M)

b) Find Half-Range Fourier series expansion of the function $f(x) = (x-1)^2$ *in* $0 < x < 1$ and hence show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + --- = \frac{\pi^2}{8}$ (CO2)(7M)

c) Find Fourier series expansion of y up to first harmonic if it is given by (CO2)(7M)

x	0	1	2	3	4	5
f(x)	9	18	24	28	26	20

OR

4. a) Obtain the Fourier series expansion of the function $f(x) = \begin{cases} x & ,0 < x < \pi \\ 2\pi - x, & \pi < x < 2\pi \end{cases}$. Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + --- = \frac{\pi^2}{8}$ (CO2)(6M)

b) Obtain the Half Range Sine Series of $f(x) = \begin{cases} kx & ,0 \le x \le 1/2 \\ k(1-x), & 1/2 \le x \le 1 \end{cases}$ (CO2)(7M)

c) Expand y as a Fourier series up to first harmonic if the values of y given by (CO2)(7M)

x	0	$\pi/6$	$\pi/3$	$\pi/2$	$2\pi/3$	$5\pi/6$
y	1.98	1.30	1.05	1.30	-0.88	-0.25

MODULE 3

5. a) Find the Fourier transform of $f(x) = \begin{cases} 1, |x| \le 1 \\ 0, |x| > 1 \end{cases}$. Hence evaluate $\int_0^\infty \frac{sinx}{x}dx$ (CO3)(6M)

b) Find the Z-transforms of $\cosh n\theta$ and $\sinh n\theta$ (CO3)(7M)

c) Using z –transformation, solve the difference equation $u_{n+2} + 6u_{n+1} + 9u_n = 2^n, u_0 = 0, u_1 = 0$ (CO3)(7M)

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OR

6. a) Find the Fourier transform of $e^{-a^2x^2}, a > 0$. Hence deduce that it is self reciprocal in respect of Fourier series. (CO3)(6M)

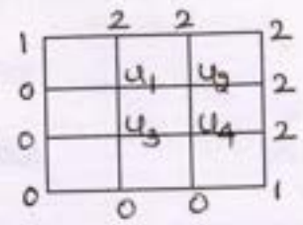
b) Find the inverse Z-transforms of $\frac{2z^2+3z}{(z+2)(z-4)}$ (CO3)(7M)

c) Find the inverse cosine transform of $F_C(\alpha) = \begin{cases} 1-\alpha, 0 \le \alpha \le 1 \\ 0, \alpha > 1 \end{cases}$ and hence evaluate $\int_0^\infty \left(\frac{\sin t}{t}\right)^2 dt$ (CO3)(7M)

MODULE 4

7. a) Find the solution of the parabolic equation $u_{xx} = 2u_t$ when $u(0,t) = 0, u(4,t) = 0$ *and* $u(x,0) = x(4-x)$ *taking* $h = 1$. Find the values upto t=5. (CO4)(10M)

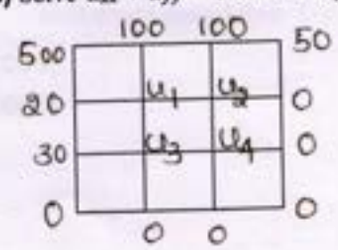
b) Solve $u_{xx} + u_{yy} = 0$ for the square mesh with boundary values as given below (CO4)(10M)



OR

8.a) Evaluate the pivotal values of the equation $u_{tt} = 16u_{xx}$, *taking* $h = 1$ *upto* $t = 1.25$, *the boundary condition are* $u(0,t) = u(5,t) = 0, u_t(x,0) = 0$ *and* $u(x,0) = x^2(5-x)$ (CO4)(10M)

b) Solve $u_{xx} + u_{yy} = 0$ for the square mesh with boundary values as given below (CO4)(10M)



MODULE 5

9. a) Using Runge-kutta method solve the following differential equation $\frac{d^2y}{dx^2} = x^3(y + \frac{dy}{dx})$ at $x = 0.1$ under the given condition y(0)=1, $y'(0) = 0.5$ by taking $h = 0.1$ (CO5)(6M)

b) Using Milne method obtain an approximate solution at the point $x = 0.4$ of the problem $\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 6y = 0, y(0) = 1,\ y'(0) = 0.1,\ y(0.1) = 1.03995, y'(0.1) = 0.6955, y(0.2) = 1.138036,$ $y'(0.2) = 1.258, y(0.3) = 1.29865,\ y'(0.3) = 1.873.$ (CO5)(7M)

c) Derive Euler's equation (CO5)(7M)

OR

10. a) Compute $y(0.1)$ given $\frac{d^2y}{dx^2} = y^3$ and $y = 10, \frac{dy}{dx} = 5$ at $x = 0$ by RK method of fourth order. (CO5)(6M)

b) Using Milne method obtain an approximate solution at the point $x = 1.4$ of the problem $2\frac{d^2y}{dx^2} = 4x + \frac{dy}{dx}, y(1) = 2,\ y'(1) = 2,\ y(1.1) = 2.2156, y'(1.1) = 2.3178,\ y(1.2) = 2.4649,\ y'(1.2) =$ $2.6725,\ y(1.3) = 2.7514,\ y'(1.3) = 3.0657$ (CO5)(7M)

c) Solve the variational problem $\delta \int_0^1 (12xy + y'^2)dx$ under the conditions $y(0) = 3$ *and* $y(1) = 6$ (CO5)(7M)

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21MAT31 - Transform calculus, Fourier series and Numerical Techniques

III Internal Assessment Exam

Scheme of Evaluation

Module 1

1a $L[t e^{-t} \sin 2t)$

$a=-1,\ f(t) = t \sin 2t$.

$L[t \sin 2t) = \frac{4s}{(s^2+4)^2}$

$L[e^{-t} f(t)] = \left\{\frac{4s}{(s^2+4)^2}\right\}_{s \to s+1}$

$L[f(t)] = \frac{4(s+1)}{((s+1)^2+4)^2}$ 2M

$L\left[\frac{\cos 2t - \cos 3t}{t}\right]$

$L\left[\frac{f(t)}{t}\right] = \int_s^\infty \left[\frac{s}{s^2+4} - \frac{s}{s^2+9}\right] ds$ 4M

$= \log \sqrt{\frac{s^2+9}{s^2+4}}$

1b $L[f(t)] = \frac{1}{1-e^{-sT}} \int_0^T e^{-st} f(t)\,dt$. 2M

$T = 2a$.

$= \frac{1}{s^2} \frac{(1-e^{-as})}{(1+e^{-as})}$

$\times$(y Numerator & denominator by $e^{\frac{as}{2}}$ 5M

$= \frac{1}{s^2} \tanh\left(\frac{as}{2}\right)$

1c. $f(u) = \sin u,\ g(t-u) = \frac{\sin(3t-3u)}{3}$ 2M

$L^{-1}[F(s)\,G(s)] = \int_0^t \sin u \frac{\sin(3t-3u)}{u} du$ 5M

$= \frac{1}{24}[3\sin t - \sin 3t]$

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2a (i) $\frac{(s+3)-3}{(s+3)^2+2^2}$

$= L^{-1}\left[\frac{(s+3)}{(s+3)^2+2^2}\right] - 3L^{-1}\left[\frac{1}{(s+3)^2+2^2}\right]$ —①

① $\Rightarrow e^{-3t}\cos 2t - 3e^{-3t}\frac{\sin 2t}{2}$ 5M 1M

2b $f_1(t)=\cos t$, $f_2(t)=\cos 2t$, $f_3(t)=\cos 3t$, $a=\pi$, $b=2\pi$ 2M

$L[f(t)] = L[\cos t] + L[[\cos 2t-\cos t]u(t-\pi)] + L[(\cos 3t-\cos 2t)u(t-2\pi)]$ —①

$= \frac{s}{s+1} + e^{-\pi s}\left(\frac{s}{s^2+4} + \frac{s}{s^2+1}\right) + e^{-2\pi s}\left(\frac{s}{s^2+9} - \frac{s}{s^2+4}\right)$ 5M

2c $L[x''(t)] - 2L[x'(t)] + L[x(t)] = L[e^t]$

$(s^2-2s+1)L[x(t)] = \frac{1}{s-1} + 2s - 5$

$L^{-1}[x(t)] = \frac{2s^2-7s+6}{(s-1)^3}$ 3M

$L^{-1}\left[\frac{2s^2-7s+6}{(s-1)^3}\right] = \frac{A}{s-1} + \frac{B}{(s-1)^2} + \frac{C}{(s-1)^3}$

$\boxed{A=2}$ $\boxed{B=-3}$ $\boxed{C=1}$

$= e^t\left[2 - 3t + \frac{t^2}{2}\right]$ 4M

Module 2 1M

3a $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n\cos nx + \sum_{n=1}^{\infty} b_n \sin x$.

function is even, $b_n = 0$.

$\boxed{a_0 = \frac{2\pi^2}{3}}$ $\boxed{a_n = \frac{4}{n^2}(-1)^n}$ 5M

$f(x) = \frac{\pi^2}{3} + \sum_{n=1}^{\infty} \frac{4}{n^2}(-1)^n \cos nx$.

3b $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos n\pi x$ —① 2M

$\boxed{a_0 = 2/3}$ $\boxed{a_n = \frac{4}{n^2\pi^2}}$

① $\Rightarrow f(x) = \frac{2}{6} + \sum_{n=1}^{\infty} \frac{4}{n^2\pi^2}\cos n\pi x$ —② 3M

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put $x=0$.

$$\frac{\pi^2}{6} = \sum_{n=1}^{\infty} \frac{1}{n^2} \quad \text{—(3)}$$

put $x=1$

$$\frac{\pi^2}{12} = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2} \quad \text{—(4)}$$

Adding (3) & (4)

$$\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$$

2M.

3c $l=3$.

$$f(x) = \frac{a_0}{2} + a_1 \cos\frac{\pi x}{3} + b_1 \sin\frac{\pi x}{3} \quad \text{—(1)}$$

1M

x	$f(x)$	$f(x)\cos\pi x/3$	$f(x)\sin\pi x/3$
0	9	9	0
1	18	9	15.588
2	24	-12	20.784
3	28	-28	0
4	26	-13	-12.516
5	20	10	-17.32
total	125	-25	-31.464

4M

$a_0 = 41.666$ $\quad a_1 = -8.33$ $\quad b_1 = -1.1546$

2M.

$$\therefore f(x) = 20.833 + (-8.33)\cos\frac{\pi x}{3} - 1.1546 \sin\frac{\pi x}{3}$$

1M

4a Even function $b_n = 0$.

3M

$$a_0 = \pi \qquad a_n = \frac{2}{n^2\pi}\left[(-1)^n - 1\right]$$

$$f(x) = \frac{\pi}{2} + \sum_{n=1}^{\infty} \frac{2}{\pi n^2}\left[(-1)^n - 1\right]\cos nx$$

put $x=0$.

2M

$$\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$$

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4b $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\frac{n\pi x}{l} + \sum_{n=1}^{\infty} b_n \sin\frac{n\pi x}{l}$ 1M

$a_0 = \frac{kl}{2}$

To find sine series

$b_n = \frac{2}{l}\int_0^l f(x) \sin\frac{n\pi x}{l}\, dx$ 6M

$b_n = \frac{4kl}{n^2\pi^2} \sin\frac{n\pi}{2}$

4c $l = \pi/2$ 1M

$f(x) = \frac{a_0}{2} + a_1 \cos\frac{2\pi x}{l} + b_1 \sin\frac{2\pi x}{l}$

x	$f(y)$	$f(x)\cos\frac{2\pi}{t}$	$f(x)\sin\frac{2\pi}{t}$
0	1.98	1.98	0
$\pi/6$	1.30	0.65	1.1258
$\pi/3$	1.05	-0.525	0.9093
$\pi/2$	1.30	-1.3	0
$2\pi/3$	-0.88	0.44	0.7621
$5\pi/6$	-0.25	-0.05	0.2165
Total	4.5	1.12	3.0137

4M

$a_0 = 2.5$ $a_1 = 0.3733$ $b_1 = 1.0045$ 2M

$f(x) = 0.75 + 0.3733 \cos\frac{2\pi x}{\pi} + 1.0045 \sin\frac{2\pi x}{\pi}$

$= 0.75 + 0.3733 \cos 2x + 1.0045 \sin 2x$

Module 3

5a $F(u) = \int_{-1}^{1} f e^{iux}\, dx$ 2M

$= \frac{2\sin u}{u}$.

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$f(x) = \frac{1}{2\pi}\int_{-\infty}^{\infty} \frac{2\sin u}{u} e^{iux}\,dx.$

put $x=0$

$1 = \frac{1}{\pi}\int_{-\infty}^{\infty} \frac{\sin u}{u}\,du.$

It is even function $\therefore 1 = \frac{2}{\pi}\int_{0}^{\infty} \frac{\sin u}{u}\,du.$

changing $u \to x$

$\frac{\pi}{2} = \int_{0}^{\infty} \frac{\sin x}{x}\,dx$ ——

5b $Z_T[\cosh n\theta] = Z_T\left[\frac{e^{n\theta}+e^{-n\theta}}{2}\right]$

$= \frac{z^2 - z\cosh\theta}{z^2 - 2z\cosh\theta + 1}$

$Z_T[\sinh n\theta] = Z_T\left[\frac{e^{n\theta}-e^{-n\theta}}{2}\right]$

$= \frac{z\sinh\theta}{z^2 - 2z\cosh\theta + 1}$ ——

5c $\bar{u}(z) = \frac{z}{(z-2)(z+3)^2}.$

$\frac{z}{(z-2)(z+3)^2} = \frac{Az}{z-2} + \frac{Bz}{z+3} + \frac{C(-3z)}{(z+3)^2}.$

$C = 1/15$ $\quad A = 1/25$ $\quad B = -1/25$

$Z_T^{-1}[\bar{u}(z)] = \frac{1}{25}2^n - \frac{1}{25}(-3)^n + \frac{1}{15}(-3)^n n$

6a $F(u) = \int_{-\infty}^{\infty} e^{-a^2x^2} e^{iux}\,dx$

$F(u) = e^{-u^2/4a^2}\int_{-\infty}^{\infty} e^{-(ax - \frac{iu}{2a})^2}\,dx$

$ax - \frac{iu}{2a} = t.$

$a\,dx = dt.$

$F\left[e^{-a^2x^2}\right] = \frac{e^{-u^2/4a^2}\sqrt{\pi}}{a}$

$F\left(e^{-x^2/2}\right) = \sqrt{2\pi}\,e^{-u^2/2}$ ——

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2M

2M

4M

3M.

5M

2M.

3M

3M.

6b $\frac{2z^2+3z}{(z+2)(z-4)} = \frac{Az}{z+2} + \frac{Bz}{z-4}$ 5M

$B = 11/6$ $\quad A = 1/6$ 2M

$= \frac{1}{6}(-2)^n + \frac{11}{6}4^n$

6c $F_c(\omega) = \frac{2}{\pi}\int_0^1 (1-\alpha)\cos\alpha\theta\, d\alpha$

$f(\theta) = \frac{4\sin^2\theta/2}{\pi\theta^2}$

$F_c(\alpha) = \int_0^\infty \frac{4\sin^2\theta/2}{\pi\theta^2}\cos^2\alpha\theta\, d\theta$ 5M

put $\alpha = \theta$

$F_c(\theta) = 1$

$\frac{\pi}{2} = \int_0^\infty \frac{\sin^2 t}{t^2}\, dt$ 2M

Module 4

7a $k=1, h=1$ 1M

t \ x		x_0	x_1	x_2	x_3	x_4
		0	1	2	3	4
t_0	0	0	3	4	3	0
t_1	1	0	2	3	2	0
t_2	2	0	1.5	2	1.5	0
t_3	3	0	1	1.5	1	0
t_4	4	0	0.75	1	0.75	0
t_5	5	0	0.5	0.75	0.5	0

5M

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7b $4u_1 - u_2 - u_3 = 2$ — (1)

$4u_2 - u_1 - u_4 = 4$ — (2)

$4u_3 - u_1 - u_4 = 0$ — (3)

$4u_4 - u_2 - u_3 = 2$ — (4)

$15u_2 - u_3 - 4u_4 = 18$ — (5)

$4u_2 - 4u_3 = 4$ — (6)

$14u_2 - 2u_3 = 20$ — (7)

$u_1 = 1$, $u_2 = 1.5$, $u_3 = 0.5$, $u_4 = 1$

1M

8a

$t \mid x$	x_0 0	x_1 1	x_2 2	x_3 3	x_4 4	x_5 5
t_0 0	0	4	12	18	16	0
t_1 0.25	0	6	11	14	9	0
t_2 0.5	0	5	8	2	-2	0
t_3 0.75	0	2	-4	-8	-7	0
t_4 1	0	-9	-14	-13	-6	0
t_5 1.25	0	-16	-18	-12	-6	0

6M

8b $4u_1 - u_2 - u_3 = 120$ — (1)

$4u_2 - u_1 - u_4 = 100$ — (2)

$4u_3 - u_1 - u_4 = 30$ — (3)

$4u_4 - u_2 - u_3 = 0$ — (4)

$15u_2 - u_3 - u_4 = 520$ — (5)

$4u_2 - 4u_3 = 70$ — (6)

$14u_2 - 2u_3 = 520$ — (7)

$u_1 = 45.835$ $u_2 = 40.41$

$u_3 = 22.92$ $u_4 = 15.835$

5M

2M

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Module 5

9a $\frac{dy}{dx} = z$ $\qquad$ $\frac{dz}{dx} = x^2(y+z)$ — 1M

$f(x,y,z) = z$ $\qquad$ $g(x,y,z) = x^2(y+z)$

$y(x_1) = y_0 + \frac{1}{6}(k_1 + 2k_2 + 2k_3 + k_4)$ — (1)

$k_1 = 0.0500$ $\qquad$ $l_1 = 0$

$k_2 = 0.0500$ $\qquad$ $l_2 = 0$ — 4M

$k_3 = 0.0500$ $\qquad$ $l_3 = 0$

$k_4 = 0.0500$ $\qquad$ $l_4 = 0.0002$ — 1M

$y(0.1) = 1.0500$ $\qquad$ $z(0.1) = 0.5000$

9b $z' = 6y - 3xz$

$z_0' = 6.0000$

$z_1' = 6.0311$ — 4M

$z_2' = 6.0731$

$z_3' = 6.1062$

$y_4^{(p)} = 1.5172$

$z_4^{(p)} = 2.5268$

$y_4^{(c)} = 1.5139$ — 3M

$z_4^{(c)} = 2.4770$

9c Book work — 7M

$$\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$$

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10a. $\frac{dy}{dx} = z$ $\qquad$ $\frac{dz}{dx} = y^3$ $\qquad$ 2M

$f(x, y, z) = z$ $\qquad$ $g(x, y, z) = y^3$

$k_1 = 0.5000$ $\qquad$ $l_1 = 100.0000$

$k_2 = 5.5000$ $\qquad$ $l_2 = 107.6891$

$k_3 = 5.8845$ $\qquad$ $l_3 = 207.2692$

$k_4 = 21.2267$ $\qquad$ $l_4 = 400.7935$ $\qquad$ 4M.

$y(0.1) = 17.4160$

10b. $z' = \frac{4x + z}{2}$

$z_0' = 3.0000$

$z_1' = 3.3589$ $\qquad$ 4M

$z_2' = 3.7363$

$z_3' = 4.1329$

$y_4^{(P)} = 3.0793$

$z_4^{(P)} = 3.4996$

$y_4^{(C)} = 3.0794$ $\qquad$ 3M.

$z_4^{(C)} = 3.4998$

10c. $\frac{\partial f}{\partial y} = 12x$ $\qquad$ $\frac{\partial f}{\partial y'} = 2y'$ $\qquad$ 2M

$\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0.$ $\qquad$ 2M

$\frac{d}{dx}\left(\frac{dy}{dx}\right) = 6x.$

$\int$ w.r.t x.

$\frac{dy}{dx} = 3x^2 + C_1$

$\int$ w.r.t x. $\qquad$ 2M

$y = x^3 + C_1 x + C_2$

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$y(0) = 3$ $\quad$ $y(1) = 6$.

$\boxed{C_2 = 3}$ $\quad$ $\boxed{C_1 = 2}$

1M

$y = x^3 + 2x + 3$

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY – TUMKUR

DEPARTMENT OF MATHEMATICS

IV-semester: I Internal Assessment Exam: JULY-2023 **(22MAT41)**

[Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40]

Q.NO.	PART-A	Marks	BLT	
1a.	If P is the pull required to lift a load W by means of a pulley block, find a linear law of the form P=mW+c connecting P and W, using the following data P: 12, 15, 21, 25 W: 50, 70, 100, 120	06	L2	CO3
b.	Find the parabola of the form $y = a + bx + cx^2$ which fits most closely with the observations. x: -3, -2, -1, 0, 1, 2, 3 y: 4.63, 2.11, 0.67, 0.09, 0.63, 2.15, 4.58	07	L2	CO3
c.	Find the coefficient of correlation for the following data x: 92, 89, 87, 86, 83, 77, 70, 63, 53, 50 y: 86, 83, 91, 77, 68, 85, 54, 82, 37, 57	07	L3	CO3
	OR			
2a.	Fit a least square geometric curve $y = ax^b$ for the following data x: 1, 2, 3, 4, 5 y: 0.5, 2, 4.5, 8, 12.5	06	L2	CO3
b.	Find the coefficient of correlation for the following data x: 1, 2, 3, 4, 5 y: 2, 5, 3, 8, 7	07	L2	CO3
c.	If $8x - 10y + 66 = 0$ *and* $40x - 18y = 214$ are two regression lines. Find the mean of x's and y's and the correlation coefficient. Find σ_y *if* $\sigma_x = 3$.	07	L3	CO3

	PART-B			
3 a.	In a partially destroyed laboratory record, only the lines of regression y on x and x on y are available as $4x - 5y + 33 = 0$ *and* $20x - 9y - 107 = 0$ respectively. calculate $\bar{x}, \bar{y}$ and the coefficient correlation between x and y.	06	L2	CO3
b.	A random variable X takes the values -3,-2,-1,0,1,2,3 such that probability $P(x = 0) = P(x < 0)$ *and* $P(x = -3) = P(x = -2) = P(x = -1) = P(x = 1) = P(x = 2) = P(x = 3)$. Find the probability distrubtion.	07	L2	CO4
c.	Derive mean and standard deviation for binomial distrubtion.	07	L2	CO4
	OR			
4 a.	Show that if θ is the angle between the lines of regression $tan\theta = \frac{\sigma_x \sigma_y}{\sigma^2_x \sigma^2_y}\left(\frac{1-r^2}{r}\right)$	06	L2	CO3
b.	Find the mean value of K such that the following distribution represents a finite probability distribution. Hence find its mean and standard deviation. Also find $P(x \leq 1), P(x > 1)$ *and* $P(-1 \leq x \leq 2)$. x: -3, -2, -1, 0, 1, 2, 3 P(x): k, 2k, 3k, 4k, 3k, 2k, 3k	07	L2	CO4
c.	Derive mean and standard deviation for passion distrubtion.	07	L2	CO4

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS

SCHEME OF SOLUTION

ACADEMIC YEAR: 2022-23 IA- IV sem/ I^st IA SUBJECT CODE:

1. a

Let $P = mw + c \rightarrow (1)$

Normal equation are $\Sigma P = m\Sigma w + nc$

$\Sigma wP = m\Sigma w^2 + c\Sigma w$ $\Big\} \rightarrow (2)$

$n = 4$

P	W	WP	W^2
12	50	600	2500
15	70	1050	4900
21	100	2100	10000
25	120	3000	14400
$\Sigma = 73$	$\Sigma w = 340$	$\Sigma = 6750$	$\Sigma = 31800$

→ 3 Marks

From eqn (2) $73 = 340m + 4c$

$6750 = 31800m + 340c$

$m = 0.19$

$c = 2.28$

$(1) \Rightarrow P = 0.19w + 2.28$

→ 3 Marks

6 Marks

1. b.

$y = a + bx + cx^2 \rightarrow (1)$

$\Sigma y = na + b\Sigma x + c\Sigma x^2$

$\Sigma xy = a\Sigma x + b\Sigma x^2 + c\Sigma x^3$ $\Big\} \rightarrow (2)$

$\Sigma x^2 y = a\Sigma x^2 + b\Sigma x^3 + c\Sigma x^4$

→ 2 Marks

$n = 7$

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QUESTION NO.	SOLUTION	MARKS

x	y	x^2	x^3	x^4	xy	x^2y
-3	4.63	9	-27	81	-13.89	41.67
-2	2.11	4	-8	61	-4.29	8.44
-1	0.67	1	-1	1	-0.67	0.67
0	0.09	0	0	0	0	0
1	0.63	1	1	1	0.63	0.63
2	2.15	4	8	16	4.30	8.60
3	4.58	9	27	81	13.74	41.22
$\Sigma x=0$	$\Sigma y=14.86$	28	0	196	-0.11	101.23

→ 3Marks

From ② $\Rightarrow$ $14.86 = 7a + 28c$

$-0.11 = 28b$

$101.23 = 28a + 196c$

$a = 0.13$

$b = 0$

$c = 0.50$

① $\Rightarrow$ $y = 0.13 + 0.50x^2$ → 2Marks

7Marks

1.C We have $r = \dfrac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}}$ $\quad x = x - 75$, $y = y - 72$ → 2Marks

x	y	$X = x-75$	$Y = y-72$	XY	X^2	Y^2
92	86	17	14	238	289	196
89	83	14	11	154	196	121
87	91	12	19	228	144	361
86	77	11	5	55	121	25
83	68	8	-4	-32	64	16
77	85	2	13	26	4	169
70	54	-5	-18	90	25	324
63	82	-12	10	-120	144	100
53	37	-22	-35	770	484	1225
50	57	-25	-15	375	625	225
				1784	2096	2762

→ 3Marks

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QUESTION NO.	SOLUTION	MARKS
	$r = \frac{1784}{\sqrt{2096 \times 2769}}$ $r = 0.74$	→ 2 Marks 7 Marks
2. a.	$y = ax^b$ $\log y = \log a + b \log x$ $Y = A + BX$ normal eqn are $\Sigma Y = nA + B\Sigma X$ $\Sigma XY = A\Sigma X + B\Sigma X^2$, $n = 5$	→ 2 Marks
		→ 3 Marks
	$A = -0.69$ but $a = e^A$ $B = 2$ $a = 0.59$, $b = 2$ $y = 0.50x^2$	→ 1 Mark 6 Marks
2. b.	$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}}$ $X = x - \bar{x}$ $Y = y - \bar{y}$ $\bar{x} = \frac{\Sigma x}{n} = \frac{15}{5} = 3$ $\bar{y} = \frac{\Sigma y}{n} = \frac{25}{5} = 5$ $X = x - 3$ $Y = y - 5$	→ 2 Marks

x	y	$X = \log x$	$Y = \log y$	XY	X^2
1	0.5	0	-0.69	0	0
2	2	0.69	0.69	0.48	0.48
3	4.5	1.10	1.50	1.65	1.21
4	8	1.39	2.08	2.89	1.93
5	12.5	1.61	2.53	4.07	2.59
		$\Sigma X = 4.79$	$\Sigma Y = 6.11$	$\Sigma = 9.09$	$\Sigma = 6.21$

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QUESTION NO.	SOLUTION	MARKS

x	y	$X=x-3$	$Y=y-5$	XY	X^2	Y^2
1	2	-2	-3	6	4	9
2	5	-1	0	0	1	0
3	3	0	-2	0	0	4
4	8	1	3	3	1	9
5	7	2	2	4	4	4
				13	10	26

→ 3 Marks

$$r = \frac{10}{\sqrt{10 \times 26}} = \frac{13}{16.12}$$

$$r = 0.81$$

→ 2 Marks

7 Marks

2.c. Let $x = \bar{x}$

$y = \bar{y}$

$$5\bar{x} - 10\bar{y} = -66$$
$$40\bar{x} - 16\bar{y} = 214$$

→ 2 Marks

$\bar{x} = 13$

$\bar{y} = 17$

$r = \pm\sqrt{b_{xy}\, b_{yx}}$

$r = \pm 0.6$

$r = 0.6$ [∵ coefficient xy are +ve so $r = +0.6$]

→ 2 Marks

The co-efficient of $\frac{r\sigma_y}{\sigma_x} = 0.8$ & $\frac{r\sigma_x}{\sigma_y} = 0.45$

$\sigma_x = 3$, $\sigma_y = ?$

$$\therefore \frac{r\sigma_y}{\sigma_x} = 0.8$$

$$\sigma_y = \frac{2.4}{0.6}$$

$$\boxed{\sigma_y = 4}$$

→ 3 Marks

7 Marks

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QUESTION NO.	SOLUTION	MARKS
3 a.	$4\bar{x} - 5\bar{y} + 33 = 0$ $20\bar{x} - 9\bar{y} - 107 = 0$ $x = \bar{x}$ $y = \bar{y}$ $\bar{x} = 13$ $\bar{y} = 17$ the coefficient of correlation $r = \pm\sqrt{b_{yx} b_{xy}}$ $= \pm\sqrt{(0.8)(0.45)}$ $r = 0.6$	→ 3 Marks → 3 Marks 6 Marks
3 b.		

x_i	-3	-2	-1	0	1	2	3
$P(x_i)$	P_1	P_2	P_3	P_4	P_5	P_6	P_7

i) $P(x=0) = P(x<0)$

$\Rightarrow P(x=0) = P(x=-3) + P(x=-2) + P(x=-1)$ → 1 Mark

$P_4 = P_1 + P_2 + P_3$

ii) $P(x=-3) = P(-2) = P(-1) = P(1) = P(2) = P(3)$

$P_1 = P_2 = P_3 = P_5 = P_6 = P_7$

$\Rightarrow P_4 = P_1 + P_2 + P_3$

$P_4 = P_1 + P_2 + P_1$ → 2 Marks

$P_4 = 3P_1$ $\quad P_1 = 1/3\, P_4$

x_i	-3	-2	-1	0	1	2	3
$P(x_i)$	0.11	0.11	0.11	0.33	0.11	0.11	0.11

→ 2 Marks

i) $P(x_i) \geq 0$

ii) $\Sigma P(x_i) = 1$

$P_1 + P_1 + P_1 + 3P_1 + P_1 + P_1 + P_1 = 1$

$9P_1 = 1$ → 2 Marks

$P_1 = 1/9 = 0.11$ //

7 Marks

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QUESTION NO.	SOLUTION	MARKS
3.C	**Binomial Distribution :-**	

→ Mean $(\mu) = \sum_{x=0}^{\infty} x \cdot p(x)$

$= \sum_{x=0}^{\infty} x \, {}^nC_x \, p^x q^{n-x}$

$= \sum_{x=0}^{\infty} x \, \frac{n!}{(n-x)!\,x!} \, p^x q^{n-x}$

$= \sum_{x=0}^{\infty} x \, \frac{n(n-1)!}{(n-x)!\,x(x-1)!} \, p^{x-1} p \, q^{(n-1)-(x-1)}$

$= np \sum_{x=1}^{n} \frac{(n-1)!}{(x-1)!(n-x)!} \, p^{x-1} q^{(n-1)-(x-1)}$

$= np \, (p+q)^{n-1}$

$= np \, (p+1-p)^{n-1}$

$\boxed{\mu = np}$ → 3 marks

Variance, $V = \sum x^2 p(x) - \mu^2 \longrightarrow (1)$

Let Now,

$\sum x^2 p(x) = \sum [x(x-1) + x] \, p(x)$

$= \sum_{x=0}^{\infty} x(x-1) p(x) + \sum_{x=0}^{\infty} x \, p(x)$

$= \sum x(x-1) \, {}^nC_x \, p^x q^{n-x} + np$

$= \sum_{x=2}^{n} \frac{n(n-1)(n-2)!}{[(n-2)-(x-2)]!\,(x-2)!} \, p^{x-2} p^2 q^{(n-2)-(x-2)} + np$

$= p^2 n(n-1) \sum_{x=2}^{\infty} \frac{(n-2)!}{(x-2)![(n-2)-(x-2)]} + np$

$= n(n-1) p^2 \, (p+q)^{n-2} + np$

$\sum x^2 p(x) = n^2 p^2 - n^2 p^2 + np$.

(1) $\Rightarrow \boxed{V = npq}$ → 4 marks

7 marks

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QUESTION NO.	SOLUTION	MARKS
	S.D, $\sigma = \sqrt{V}$ $\sigma = \sqrt{npq}$	
4. a	y on x $y - \bar{y} = b_{yx}(x - \bar{x})$ $m_1 = b_{yx}$ $m_1 = r\frac{\sigma_y}{\sigma_x}$ x on y $x - \bar{x} = b_{xy}(y - \bar{y})$ $m_2 = \frac{1}{b_{xy}}$ $m_2 = \frac{1}{r}\frac{\sigma_y}{\sigma_y}$ Consider angle b/w straight line is, $\tan\theta = \frac{m_2 - m_1}{1 + m_1 m_2}$ $= \frac{\frac{1}{r}\frac{\sigma_y}{\sigma_x} - r\frac{\sigma_y}{\sigma_x}}{1 + \left(r\frac{\sigma_y}{\sigma_x}\right)\left(\frac{1}{r}\frac{\sigma_y}{\sigma_x}\right)}$ $= \frac{\frac{\sigma_y}{\sigma_x}\left(\frac{1}{r} - r\right)}{1 + \frac{\sigma_y^2}{\sigma_x^2}}$ $= \frac{\frac{\sigma_y}{\sigma_x}\left(\frac{1 - r^2}{r}\right)}{\frac{\sigma_x^2 + \sigma_y^2}{\sigma_x^2}}$ $= \frac{\sigma_y}{\sigma_x}\left(\frac{1 - r^2}{r}\right) \times \frac{\sigma_x^2}{\sigma_x^2 + \sigma_y^2}$ $\tan\theta = \left(\frac{1 - r^2}{r}\right)\frac{\sigma_y \sigma_x}{\sigma_x^2 + \sigma_y^2}$ → 4 Marks	→ 2 Marks 6 Marks

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QUESTION NO.	SOLUTION	MARKS
4. b	w.k.t i) $P(x_i) \geq 0$ if $k \geq 0$	
	ii) $\sum P(x_i) = 1$	
	$k + 2k + 3k + 4k + 2k + 3k + k = 1$	
	$k = 1/18$	

x_i	-3	-2	-1	0	1	2	3
$P(x_i)$	1/18	2/18	3/18	4/18	3/18	2/18	1/18

→ 2 Marks

a) Mean $(\mu) = \sum x_i P(x_i)$

$\mu = 0$

b) Variance $(V) = \sum x_i^2 P(x_i) - \mu^2$

$V = 2.50$

c) S.D $(\sigma) = \sqrt{V}$

$= \sqrt{2.50}$

$= 1.58$

d) $P(x \leq 1) = P(-3) + P(-2) + P(-1) + P(0) + P(1)$

$= 13/16$

e) $P(x > 1) = P(2) + P(3)$

$= 3/16$

f) $P(-1 \leq x \leq 2) = P(-1) + P(0) + P(1) + P(2)$

$= 3/4$

→ 5 Marks

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7 Marks

QUESTION NO.	SOLUTION	MARKS
4. C.	Mean $(\mu) = \sum x\, p(x)$	

$$= \sum_{x=0}^{\infty} x \frac{m^x e^{-m}}{x!}$$

$$= \sum_{x=0}^{\infty} x \cdot \frac{m^x e^{-m}}{x(x-1)!}$$

$$= m e^{-m} \sum_{x=1}^{\infty} \frac{m^{x-1}}{(x-1)!}$$

$$= m e^{-m} \left[1 + m + \frac{m^2}{2!} + \cdots\right]$$

$$= m e^{-m} [e^m]$$

$$\boxed{\mu = m}$$

→ 3 Marks

Variance, $(V) = \sum x^2 p(x) - \mu^2 \longrightarrow (1)$

Now, $\sum x^2 p(x) = \sum_{x=0}^{\infty} [x(x-1) + x]\, p(x)$

$$= \sum_{x=0}^{\infty} x(x-1) p(x) + \sum_{x=0}^{\infty} x\, p(x)$$

$$= \sum_{x=0}^{\infty} x(x-1) \frac{m^x e^{-m}}{x!} + m$$

$$= \sum_{x=0}^{\infty} x(x-1) \frac{m^x e^{-m}}{x(x-1)(x-2)!} + m$$

$$= m^2 e^{-m} \sum_{x=2}^{\infty} \frac{m^{x-2}}{(x-2)!} + m$$

$$= m^2 e^{-m} \left[1 + \frac{m}{1!} + \frac{m^2}{2!} + \cdots\right] + m$$

$$\sum x^2 p(x) = m^2 e^{-m} (e^m) + m$$

$(1) \Rightarrow V = m^2 + m - m^2$

$$\boxed{V = m}$$

→ 4 Marks

7 Marks

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QUESTION NO.	SOLUTION	MARKS
	Standard deviation S.D (σ) = $\sqrt{V}$ = $\sqrt{m}$ Thus mean (μ) = m Variance (V) = m S.D = $\sqrt{m}$	

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Test Coordinator:-
Pramod

HOD

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY – TUMKUR

DEPARTMENT OF MATHEMATICS

IV-semester: II Internal Assessment Exam: AUGUST-2023

Mathematics-IV (**21MAT41**)

[Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40]

Q. NO.	PART-A	Marks	BLT	
1a.	If the mean and standard deviation of the number of correctly answered question in a test given to 4096 students are 2.5 and $\sqrt{1.875}$. Find an estimate of the number of candidates answering correctly (i) 8 or more question (ii) 2 or less (iii) 5 questions.	06	L2	CO5
b.	A 4 coins are tossed 100 times and the following result were obtained. Fit a binomial distribution for the data and calculate the theoretical frequencies. Number of heads: 0 | 1 | 2 | 3 | 4 Frequency: 5 | 29 | 36 | 25 | 5	07	L2	CO5
c.	In a certain factory turning out razor blades there is a small probability of 1/500 for any blade to be defective. The blades are supplied in a packets of 10. Use poisson distrubtion to calculate the approximate number of packets containing (i) no defective (ii) one defective (iii) two defective blades in a consignment of 10,000 packets.	07	L1	CO2
	OR			
2a.	In 800 families with 5 children each how many families would be expected to have (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys (iv) atmost 2 girls by assuming probabilities for boys and girls to be equal.	06	L2	CO5
b.	The number of accidents per day(x) as recorded in a textile industry over a period of 400 days is given. Fit a poisson distribution for the data and calculate the theorectical frequencies. x: 0 | 1 | 2 | 3 | 4 | 5 f: 173 | 168 | 37 | 18 | 3 | 1	07	L2	CO5
c.	2% of the fuses manufactured by a firm are found to be defective. Find the probability that a box containing 200 fuses contains (i) no defective fuses (ii) 3 or more defective fuses.	07	L1	CO2

	PART-B			
3 a.	Find the constant k such that $f(x) = \begin{cases} kx^2, 0 < x < 3 \\ 0 \quad otherwise \end{cases}$ is a p.d.f Also compute (i) $P(1 < x < 2)$ (ii)$P(x \leq 1)$ (iii)$P(x > 1)$ (iv) Mean (v) Variance	06	L1	CO4
b.	The marks of 1000 student in an examination follows a normal distribution with mean 70 and standard deviation 5.Find the number of student whose marks will be(i)less than 65 (ii)more than 75 (iii) between 65 and 75 [given: $\emptyset(1) = 0.3413$]	07	L1	CO4
c.	The joint distribution of two random variable X and Y is as follow \ | -4 | 2 | 7 1 | 1/8 | 1/4 | 1/8 5 | 1/4 | 1/8 | 1/8 compute the following 1) E(x) & E(y) 2) E(XY) 3) σ_x & σ_y 4) Cov(X,Y) 5) $\rho(X,Y)$	07	L1	CO5
	OR			
4 a.	If x is a normal variate with mean 30 and standard deviation 5 find the probability that $(i)\ 26 \leq x \leq 40$ $(ii)x \geq 45$	06	L1	CO4
b.	In a normal distribution 31% of the items are under 45 and 8% of the items are over 64. Find the mean and S.D of the distribution. [Given: $\emptyset(0.5) = 0.19$, $\emptyset(1.4) = 0.42$]	07	L1	CO4
c.	The joint Probability distribution of two discrete random variable X & Y is given by $f(x,y) = k(2x + y)$ where x and y are integer such that $0 \leq x \leq 2$ *and* $0 \leq y \leq 3$ i) Find the value of constant k ii) marginal probability distribution iii) Show that the random variable X and Y are dependent iv) compute E(x), E(y), E(xy), $E(x^2)$, $E(y^2)$, σ_x, σ_y	07	L2	CO5

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS

II year - IV - Sem
SCHEME OF SOLUTION

ACADEMIC YEAR 2022-23 IA- II SUBJECT CODE: 21MAT41

14/08/2023

QUESTION NO.	SOLUTION	MARKS
1] a.	We have $\mu = np$ $\sigma = \sqrt{npq}$ By data $np = 2.5$ and $\sqrt{npq} = \sqrt{1.875}$ $npq = 1.875$ $2.5q = 1.875$ $\therefore q = 0.75$; $p = 1-q = 0.25$ Since $np = 2.5$ we have $(0.25)n = 2.5$ $\therefore n = 10$ Let x denote the number of correctly answered question $P(x) = {}^nC_x\, p^x q^{n-x}$ $= {}^{10}C_x\,(1/4)^x(3/4)^{10-x}$ $4096\,P(x) = {}^{10}C_x\,(1/4)^x(3/4)^{10-x}$ → 2 Marks i) we have to find $f(8)+f(9)+f(10)$ $P(x) = {}^{10}C_8\,(1/4)^8(3/4)^{10-8} + {}^{10}C_9\,(1/4)^9(3/4)^{10-9}$ $+ {}^{10}C_{10}\,(1/4)^{10}(3/4)^{10-10}$ $= 436 \times 4096$ $= 1.703$ ≈ 2 → 2 Marks ii) we have to find $f(2)+f(1)+f(0)$ $P(x) = {}^{10}C_2\,(1/4)^2(3/4)^{10-2} + {}^{10}C_1\,(1/4)^1(3/4)^{10-1}$ $+ {}^{10}C_1\,(1/4)^1(3/4)^{10-0}$ $= 4096 \times 64$ $= 2152.9$ ≈ 2153 → 1 Mark	

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QUESTION NO.	SOLUTION	MARKS
	iii) we have to find $f(5)$ $P(x) = {}^{10}C_5 (1/4)^5 (3/4)^{10-5}$ $= 239.3$ ≈ 239	→ 1 Marks 6 Marks
b	Let x denote the number of heads and f the corresponding frequency. $\text{Mean}(\mu) = \frac{\Sigma fx}{\Sigma f} = \frac{0+29+72+75+20}{100} = \frac{196}{100}$ $= 1.96$ → 2 Marks But $\mu = np$, $n = 4$ $1.96 = 4P$ $P = 0.49$, $q = 1-P = 0.51$ Binomial distribution is given by, $P(x) = {}^nC_x\, p^x q^{n-x} = {}^4C_x (0.49)^x (0.51)^{4-x}$ $\therefore F(x) = 100\, P(x)$ $= 100\, {}^4C_x (0.49)^x (0.51)^{4-x}$ → 2 Marks where $x = 0, 1, 2, 3, 4$ $F(0) = 100.(0.51)^4 = 6.765 \approx 7$ $F(1) = 100.{}^4C_1 (0.49)(0.51)^3 = 25.999 \approx 26$ $F(2) = 100.{}^4C_2 (0.49)^2 (0.51)^2 = 37.47 \approx 37$ $F(3) = 100.{}^4C_3 (0.49)^3 (0.51) = 24.0004 \approx 24$ $F(4) = 100.{}^4C_4 (0.49)^4 = 5.765 \approx 6$ Thus the required theoritical frequencies are 7, 26, 37, 24, 6 → 3 marks	7 Marks

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QUESTION NO.	SOLUTION	MARKS
	iii) we have to find $f(2)+f(3)$ $= 25.\ {}^5C_2 + 25\ {}^5C_3 = 50.\ {}^5C_2$ $= 50 \times 10$ $= 500$	→ 1 Mark
	iv) At most 2 girls means that, families can have 5 boys and 0 girls or 4 boys and 1 girls or 3 boys and 2 girls. to find $f(5)+f(4)+f(3)$ $= 25\ {}^5C_5 + 25\ {}^5C_4 + 25\ {}^5C_3$ $= 25 \times 16$ $= 400$	→ 1 Mark 6 Marks
b.	we have poisson distribution; Mean $(\mu) = m = \frac{\Sigma fx}{\Sigma f} = \frac{0+168+74+54+12+5}{400} = 0.7825$ $\therefore P(x) = \frac{m^x e^{-m}}{x!}$ $\therefore f(x) = 400\,P(x)$ $= 400\ \frac{(0.7825)^x e^{-0.7825}}{x!}$ $f(x) = 182.9\ \frac{(0.7825)^x}{x!}$ to find $x = 0,1,2,3,4,5$ in $f(x)$ $f(0) = (182.9)(1) \approx 183$; $f(1) \approx 143$ $f(2) = (182.9)\frac{(0.7825)^2}{2} \approx 56$; $f(3) \approx 15$ $f(4) \approx 3$, $f(5) \approx 0$ Hence: 183, 143, 56, 15, 3, 0 are the frequency	→ 2 Marks → 2 Marks → 3 Marks 7 Marks

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QUESTION NO.	SOLUTION	MARKS
c.	p = probability of a defective blade = $1/500 = 0.002$ $m = np = 10 \times 0.002 = 0.02$ Poisson distribution is $P(x) = \frac{m^x e^{-m}}{x!}$ $= \frac{e^{-0.02}(0.02)^x}{x!}$ $\therefore f(x) = \frac{9802(0.2)^x}{x!}$	→ 3 Marks
	i) Probability of no defective = $f(0) = 9802$ ii) Probability of one defective = $f(1) = 9802(0.02)$ ≈ 196 iii) Probability of two defective = $f(2) = \frac{9802(0.02)^2}{2!}$ ≈ 2	→ 4 Marks 1 Marks
2) a.	p = probability of boys = $1/2$ q = probability of girls = $1/2$ Let x denote the number of boys in the family. $P(x) = {}^nC_x p^x q^{n-x}$ $\therefore n=5$ $P(x) = {}^5C_x (1/2)^x (1/2)^{5-x}$ $\therefore 800\,P(x) = 800 \times \frac{{}^5C_x}{32} = 25 \cdot {}^5C_x$	
	i) we have to find $f(3)$ $f(3) = 25 \cdot {}^5C_3 = 25 \times 10 = 250$	→ 3 Marks
	ii) we have to find $f(0)$ $f(0) = 25\ {}^5C_0 = 25 \times 1 = 25$	→ 1 Mark

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QUESTION NO.	SOLUTION	MARKS
2. c	P = probability of a defective fuse $= \frac{2}{100} = 0.02$ $\mu = m = np = 200 \times 0.02$ $= 4$ $\therefore P(x) = \frac{m^x e^{-m}}{x!}$ i.e., $P(x) = \frac{4^x e^{-4}}{4x!}$ but $e^{-4} = 0.0183$ $P(x) = 0.0183 \frac{4^x}{x!}$ i) probability of no defective fuse $= P(0) = 0.0183$ ii) probability of 3 or more defective fuses $= 1 - [P(0) + P(1) + P(2)]$ $= 1 - 0.0183(1+4+8)$ ≈ 0.7621	→ 4 Marks → 1 Mark → 2 Marks 7 Marks
3] a	$f(x) \geq 0$ if $K \geq 0$ we have $\int_{-\infty}^{\infty} f(x)\,dx = 1$ i.e., $\int_0^3 Kx^2\,dx = 1 \Rightarrow \left[\frac{Kx^3}{3}\right]_0^3 = 1$ $9K = 1$ $\therefore K = 1/9$ i) $P(1<x<2) = \int_1^2 f(x)dx = \int_1^2 \frac{x^2}{9}\,dx = 7/27$ ii) $P(x \leq 1) = \int_0^1 \frac{x^2}{9}\,dx = \left[\frac{x^3}{27}\right]_0^1 = 1/27$	→ 2 Marks → 1 Mark

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QUESTION NO.	SOLUTION	MARKS
	iii) $P(x>1) = \int_1^3 \frac{x^2}{9}\,dx = \left[\frac{x^3}{27}\right]_1^3 = \frac{26}{27}$ iv) Mean $= \mu = \int_{-\infty}^{\infty} x \cdot f(x)\,dx = \int_0^3 x \cdot \frac{x^2}{9} = \frac{81}{36} = \frac{9}{4}$	2 Marks
	v) $V = \int_{-\infty}^{\infty} x^2 f(x)\,dx - (\mu)^2$ $= \int_0^3 x^2 \cdot \frac{x^2}{9}\,dx - \left(\frac{9}{4}\right)^2$ $= \frac{27}{80}$	→ 1 Mark 6 Marks
3 b.	Let x represent the marks of student. By data, $\mu = 70$, $\sigma = 5$ $z = \frac{x-\mu}{\sigma} = \frac{x-70}{5}$	→ 1 Mark
	i) if $x = 65$, $z = -1$ $P(z<-1) = P(z>1)$ $= P(z \geq 0) - P(0<z<1)$ $= 0.5 - \phi(1)$ $= 0.5 - 0.3413$ $= 0.1587$ $\therefore 1000 \times 0.1587$ $= 158.7 \approx 159$	→ 2 Marks
	ii) if $x = 75$, $z = 1$ $P(z>1) = P(z \geq 0) - P(0<z<1)$ $= 0.5 - \phi(1)$ $= 0.5 - 0.3413 \Rightarrow 0.1587$ $\therefore 1000 \times 0.1587 = 158.7 \approx 159$	→ 2 Marks

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QUESTION NO.	SOLUTION	MARKS
	iii) We have to find $P(-1<z<1)$ $P(-1<z<1) = 2P(0<z<1)$ $= 2\phi(1)$ $= 2(0.3413) \Rightarrow 0.6826$ $\therefore 1000 \times 0.6826$ $= 682.6$ ≈ 683	→ 2 Marks 7 Marks
3 c.	a) $E(x) = \sum x_i f(x_i)$ $= 1(0.50) + 5(0.50)$ $E(x) = 3$	→ 1 Mark
	ii) $E(y) = \sum y_j g(y_j)$ $= -4(0.38) + 2(0.38) + 7(0.25)$ $= 0.99$	→ 1 Mark
	iii) $E[xy] = \sum x_i y_j J_{ij}$ $= \sum x_i y_j f(x_i) g(y_i)$ $= 1.50$	→ 1 Mark
	iv) $\sigma_x^2 = E(x^2) - \mu_x^2$ $[\because \mu_x = E(x)]$ $= \sum x_i^2 f(x_i) - 3^2$ $\sigma_x^2 = 4$ $\sigma_x = 2$ and $\sigma_y^2 = E(y^2) - \mu_y^2$ $= \sum y_j^2 g(y_j) - (0.99)^2$ $\sigma_y = 4.34$	→ 2 MARKS

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QUESTION NO.	SOLUTION	MARKS
	v) $Cov(x,y) = E[xy] - \mu_x \mu_y$ $= 1.50 - (3)(0.99)$ $= -1.47$ vi) $\rho(x,y) = \frac{Cov(x,y)}{\sigma_x \sigma_y} = \frac{-1.47}{2 \times 4.34} = -0.17$	→ 2 Marks 7 Marks
4] a	we have standard normal variate $z = \frac{x-\mu}{\sigma} = \frac{x-30}{5}$ i) To find $P(26 \le x \le 40)$ if $x = 26$, $z = -0.8$ if $x = 40$, $z = 2$ $P(-0.8 \le z \le 2) = P(-0.8 \le z \le 0) + P(0 \le z \le 2)$ $= P(0 \le z \le 0.8) + P(0 \le z \le 2)$ $= \phi(0.8) + \phi(2)$ $= 0.7653$ ii) To find $P(x \ge 45)$ if $x = 45$, $z = 3$ $P(z \ge 3) = P(z \ge 0) - P(z \le 3)$ $= 0.5 - \phi(3)$ $= 0.0013$	→ 1 Mark → 3 Marks → 2 Marks 6 Marks
4. b	By data, $P(x < 45) = 0.31$ & $P(x > 64) = 0.08$ $z = \frac{x-\mu}{\sigma}$ when $x = 45$, $z = \frac{45-\mu}{\sigma} = z_1$ $x = 64$, $z = \frac{64-\mu}{\sigma} = z_2$	→ 2 Marks

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we have, $P(z < z_1) = 0.31$ & $P(z > z_2) = 0.08$

$\phi(z_1) = -0.19$ & $\phi(z_2) = 0.42$

$\phi(z_1) = -\phi(0.5)$ & $\phi(z_2) = \phi(1.4)$ → 2 marks

$z_1 = -0.5$ & $z_2 = 1.4$

$\frac{45-\mu}{\sigma} = -0.5$ & $\frac{64-\mu}{\sigma} = 1.4$

$\mu - 0.5\sigma = 45$ & $\mu + 1.4\sigma = 64$

By solving we get $\mu = 50$, $\sigma = 10$ → 3 marks

7 Marks

4. C

Let $X = \{0, 1, 2\}$

$Y = \{0, 1, 2, 3\}$

$f(x, y) = K(2x + y)$

x \ y	0	1	2	3	f(xi)
0	0	K	2K	3K	6K
1	2K	3K	4K	5K	14K
2	4K	5K	6K	7K	22K
g(yj)	6K	9K	12K	15K	42K

w.k.t $42K = 1$

$K = 1/42$

$K = 0.02$

x \ y	0	1	2	3
0	0	0.02	0.04	0.06
1	0.04	0.06	0.08	0.10
2	0.08	0.10	0.12	0.14

f) marginal distribution of X

X = xi	0	1	2
f(xi)	0.12	0.26	0.44

marginal distribution of Y

Y = yj	0	1	2	3
g(yj)	0.12	0.14	0.24	0.30

→ 2 marks

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ii) $J_{ij} = f(x_i)g(y_j)$

$J_{12} = 0.02$

$f(x_1) = 0.12$

$g(y_2) = 0.16$

$\therefore 0.02 = 0.12 \times 0.16$

$0.02 = 0.02$

$\therefore$ It is independent variable. → 1 Mark

iii)

- $E(x) = \sum x_i f(x_i)$

  $= 1.16$

- $E(y) = \sum y_j g(y_j)$

  $= 1.56$

- $E(xy) = \sum x_i y_j J_{ij}$

  $= \sum x_i y_j f(x_i) g(y_j)$

  $= 2.04$

- $\sigma_x^2 = E(x^2) - [E(x)]^2$

  $= \sum x_i^2 f(x_i) - (E(x))^2$

  $= 0.67$

- $\sigma_y^2 = E(y^2) - (E(y))^2$

  $= \sum y_j^2 g(y_j) - (E(y))^2$

  $= 1.19$ → 3 marks

- $Cov(x,y) = E(xy) - E(x)E(y)$

  $= 0.23$

- $\rho(x,y) = \dfrac{Cov(x,y)}{\sigma_x \sigma_y} = 0.24$

→ 2 Marks

7 Marks

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY – TUMKUR

DEPARTMENT OF MATHEMATICS

Fourth Semester BE III-Internals Date:11/09/2023

Mathematical Foundation for Computing, Probability and Statistics-21MATCS41

Time: 120 min USN: Max marks: 60

Note: *1. Answer ONE FULL questions choosing one full question from each part.*
2. VTU Formula Hand Book Permitted. 3. M: Marks, L: Bloom's level, C: Course outcomes.

		PART-A	M	L	C
Q.01	a	Fit a second degree parabola for the following data x: 1.0, 1.5, 2, 2.5, 3, 3.5, 4 y: 1.1, 1.3, 1.6, 2.0, 2.7, 3.4, 4.1	7	L2	CO4
	b	The following table gives the height of father(x) and sons(y): x: 65, 66, 67, 67, 68, 69, 70, 72 y: 67, 68, 65, 68, 72, 72, 69, 71 Find the lines of regression and Calculate the coefficient of correlation.	7	L2	CO4
	c	In a partially destroyed laboratory record, the lines of regression of y on x and x on y are available as 4x-5y+33=0 and 20x-9y=107. Calculate $\bar{x}$ *and* $\bar{y}$ and the coefficient of correlation between x and y.	6	L2	CO4
		OR			
Q.02	a	A random variable X has the following probability function:Find the value of k and find mean , variance. x: -2, -1, 0, 1, 2, 3 P(x): 0.1, k, 0.2, 2k, 0.3, k	7	L2	CO3
	b	Find the mean and standard deviation of the Binomial distribution	7	L2	CO3
	c	In a test on 2000 electric bulbs, it was found that the life of a particular makes was normally distributed with an average life of 2040 hours and standard deviation of 60 hours. Estimate the number of bulbs likely to burn for i) More than 2150 hours ii) Less than 1950 hours iii) Between 1920 and 2160 hours	6	L2	CO3
		OR			
Q.03	a	The joint distribution of two random variable X and Y is as follows: compute the following i) E(x) &E(y) ii) E(xy) iii) Cov(x,y) iv) $\rho(x,y)$ x \ y: -4, 2, 7 1: 1/8, 1/4, 1/8 5: 1/4, 1/8, 1/8	7	L2	CO5
	b	A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure 5, 2, 8,-1, 3, 0, 6,-2, 1,5,0 and 4. Can it be concluded that the stimulus will increase the blood pressure? ($t_{.05}$ For 11 d.f=2.201).	7	L2	CO5
	c	A sample of 100 students is taken from a large population. The mean height of students in this sample is 160 cm. Can it be reasonably regarded that in the population the mean height is 165 cm and the standard deviation is 10 cm at 5% level of significance?	6	L2	CO5
		PART-B			
Q.04	a	Define tautology. Show that $\{(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)\} \rightarrow r$ is a tautology by constructing the truth table.	7	L2	CO1
	b	Test the validity of the arguments using rules of inference $(\sim p \vee q) \rightarrow r$ $r \rightarrow (s \vee t)$ $\sim s \wedge \sim u$ $\sim u \rightarrow \sim t$ --- $\therefore p$	7	L3	CO1
	c	Given direct proof and proof by contradiction for the statement "if n is an odd integer then n+9 is an even integer"	6	L2	CO1
		OR			

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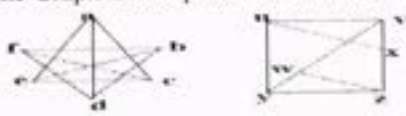
Q.05	a	Prove the following using the law of logic $[\sim p \wedge (\sim q \wedge r)] \vee [(q \wedge r) \vee (p \wedge r)] \leftrightarrow r$	7	L3	CO1
	b	Find Whether the following arguments are valid or not for which the universe is the set of all triangles. In triangle XYZ, there is no pair of angles of equal measures. If the triangle has two sides of equal length, then it is isosceles. If the triangle is isosceles, then it has two angles of equal measures. Therefore triangle XYZ has no two sides of equal length.	7	L2	CO1
	c	For any two integers m and show that i) m+n is even ii)mn is odd.	6	L2	CO1
		PART-C			
Q.06	a	Let f from R to R defined by $f(x) = \begin{cases} 3x-5 \ for \ x > 0 \\ -3x+1 \ for \ x \leq 0 \end{cases}$ (i) Determine the f(0), f(-1), f(5/3) (ii) Find $f^{-1}(0), f^{-1}(-1), f^{-1}(-6)$	7	L2	CO2
	b	Let f and g be the function from R to R defined by $g(x) = ax + b$ and $g(x) = 1 - x + x^2$, if $gof(x) = 9x^2 - 9x + 3$. Find a and b.	7	L2	CO2
	c	Define Graph isomorphism. Determine whether the following graphs are isomorphic or not. 	6	L3	CO2
		OR			
Q.07	a	Let $f: A \to B$, $g: B \to C$ and $h: c \to D$ be three function then prove that $(hog)of = ho(gof)$	7	L2	CO2
	b	Let A={1,2,3,4,6} and R be a relation onA defined by aRb if and only if "a is multiple of b". Write down the relation R, relation matrix M® and draw its digraph	7	L2	CO2
	c	Draw the hasse diagram representing the positive divisors of 36	6	L2	CO2

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF MATHEMATICS

SCHEME OF SOLUTION

ACADEMIC YEAR: 2022-23 | 3rd Internal Assessment | SUBJECT CODE: 21MATCS41

Subject: Mathematical foundation for computing probability and statistics 21MATCS41

QUESTION NO.	SOLUTION	MARKS
(1) a	$y = ax^2 + bx + c$ $\Sigma y = a\Sigma x^2 + b\Sigma x + nc$, $\Sigma xy = a\Sigma x^3 + b\Sigma x^2 + c\Sigma x$ $\Sigma x^2 y = a\Sigma x^4 + b\Sigma x^3 + c\Sigma x^2$ $\Sigma x = 17.5$, $\Sigma y = 16.2$ $\Sigma x^2 = 50.75$, $\Sigma x^3 = 161.875$ $\Sigma x^4 = 548.18$ $\Sigma xy = 47.65$, $\Sigma x^2 y = 154.47$ $a = 0.240$, $b = -0.18$, $c = 1.025$	1 4 3
(b)	$\bar{x} = 68$, $\bar{y} = 69 = \frac{\Sigma y}{n}$ $X = x - \bar{x}$ $Y = y - \bar{y}$ $\Sigma XY = 24$, $\Sigma X^2 = 36$, $\Sigma Y^2 = 44$ $r = \frac{\Sigma XY}{\sqrt{\Sigma x^2 \Sigma y^2}} = 0.60$ $(y - \bar{y}) = \frac{\Sigma XY}{\Sigma x^2}(x - \bar{x})$ $(x - \bar{x}) = \frac{\Sigma XY}{\Sigma Y^2}(y - \bar{y})$ $y = 0.66x + 24.12$ $x = 0.545y + 30.4$	2 2 2 1
(c)	$4\bar{x} - 5\bar{y} = -33$ $20\bar{x} - 9\bar{y} = 107$ $\bar{x} = 13$, $\bar{y} = 17$ $x = 0.45y + 5.35$ $y = 0.80x + 6.6$ $r = \pm\sqrt{(\text{Co-eff of } x) \times (\text{Co-eff of } y)}$ $r = 0.6$	2 4
(2) a	$4K = 0.4$ $K = 0.1$	1

x	-2	-1	0	1	2	3
$P(x)$	0.1	0.1	0.2	0.2	0.3	0.1

1

Mean (μ) $= \Sigma x_i P(x_i)$ — 2

$= 0.80$

Variance $V = \Sigma x^2 P(x_i) - \mu^2$ — 3

$= 2.16$

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QUESTION NO.	SOLUTION	MARKS
2(b)	$\mu = \Sigma x p(x)$ $= \Sigma x \, {}^{n}C_{x} p^{x} q^{n-x}$ $\mu = np$	$V = \Sigma x^2 p(x) - \mu^2$ $\Sigma x^2 p(x) = n(n-1)p^2 + np$ $V = npq$	3 1
2(c)	$\mu = 2000 \quad \sigma = 60$ $z = \frac{x-\mu}{\sigma} = \frac{x-2000}{60}$ (i) $P(x > 2100)$ $z = \frac{2100-2000}{60} = 1.67$ $P(z > 1.67) = 0.5 - P(0 < z < 1.67)$ $= 0.05$ $9500 \times 0.05 = 125$ bulbs (ii) $P(x < 1950)$ $z = \frac{1950-2000}{60} = -0.83$ $P(z < -0.83) = P(z > 0.83) = 0.5 - P(0 \le z \le 0.83)$ $= 0.20$ $9500 \times 0.20 = 500$ bulbs	1 2 1 2
3(a)	Marginal distribution of X x_i: 1, 5 $f(x_i)$: 0.50, 0.50 Marginal distribution of Y y_j: −4, 2, 7 $g(y_j)$: 0.38, 0.38, 0.25 $E(X) = \Sigma x_i f(x_i)$ $= 3$ $E(Y) = \Sigma y_j g(y_j)$ $= 0.99$	1 1 1

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Q NO.	SOLUTION	MARKS
	$E(XY) = \sum x_i y_j f(x_i, y_j)$ $= \boxed{1.50}$ $\sigma_x^2 = E(x^2) - \mu_x^2$ $E(x^2) = \sum x_i^2 f(x_i)$ $= 13$ $\sigma_x^2 = 13 - 9$ $\sigma_x^2 = 4$ $\boxed{\sigma_x = 2}$ $E(Y^2) = \sum y_j^2 g(y_j)$ $= 19.85$ $\sigma_y^2 = E(y^2) - \mu_y^2$ $= 18.87$ $\boxed{\sigma_y = 4.34}$ $cov(X,Y) = E(X,Y) - \mu_x \mu_y$ $= \boxed{-1.47}$ $\rho(X,Y) = \frac{cov(X,Y)}{\sigma_x \sigma_y} = \boxed{-0.07}$	-2- -1- -1-
3b	$t = \left[\frac{\bar{x} - \mu}{s}\right]\sqrt{n}$ $\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i = 2.583$ $s^2 = \frac{1}{(n-1)}\sum [x_i - \bar{x}]^2$ $= 9.5309$ $s = 3.0872$ $t = 2.8983$ $t_{0.5}(11) = 2.201$ $t = 2.90 > 2.201$ Conclusion: Will not increase the blood pressure	-2- -2- -2- -1-
3c	$n = 100$ $\bar{x} = 160$ $\sigma = 10$, $\mu = 165$ μ_0 : The mean height of students is 165 ($\mu_0 = 165$) μ_1 : The mean height in the population is more than ($\mu_1 > 165$)	-2-

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Q NO.	SOLUTION	MARKS
	$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = -5$ -5 is not lie in the rejection region	-3-
	$\therefore \mu_0$ is rejected and μ_1 is accepted	-1-
4a	A compound proposition which is true for all positive truth values of its components is called tautology	

P	Q	R	P∨Q	P→R	Q→R	(P→R)∧(Q→R)	A∧B	C→R
0	0	0	0	1	1	1	0	1
0	0	1	0	1	1	1	0	1
0	1	0	1	1	0	0	0	1
0	1	1	1	1	1	1	1	1
1	0	0	1	0	1	0	0	1
1	0	1	1	1	1	1	1	1
1	0	0	1	0	0	0	0	1
1	0	1	1	1	1	1	1	1

-7-

4b $[(\neg P \vee Q) \to R] \wedge [R \to (S \vee T)] \wedge [\neg S \wedge \neg U] \wedge [\neg U \to \neg T]$ -1-

Syllogism

$= [(\neg P \vee Q) \to (S \vee T)] \wedge \neg S \wedge [\neg U \wedge (\neg U \to \neg T)]$ [M.P] -1-

$= [(\neg P \vee Q) \to (S \vee T)] \wedge [\neg S \wedge \neg T]$ [De-Morgan's Law] -1-

$= [(\neg P \vee Q) \to (S \vee T)] \wedge \neg [S \vee T]$ [M.T] -1-

$= \neg [\neg P \vee Q]$ [De Morgan's] -1-

$= P \wedge \neg Q$ [By conjuctive] -2-

$= P$

4c P: n is an odd integer -1-

Q: n+9 is an even integer

(i) Direct proof:

S.T $P \to Q$ is true

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Q NO.	SOLUTION	MARKS

Hypothesis :- Assume that p is true i.e n is odd

$n = 2k+1$

Analysis : $n+9 = 2k+1+9$

$n+9 = 2k+10$ divisible by 2

$n+9$ is even integer

q is true — 2

Proof by contradiction

Hypothesis : Assume $p \to q$ is false

i.e p is true and q is false

Analysis : Take q is false

$n+9$ is an odd integer

$n+9 = 2k+1$

$n = 2k+1-9$

$n = 2k-8$ is divisible by 2

n is an even integer

i.e p is false — 3

Hence our assumption is wrong

Conclusion :- $p \to q$ is true

(a) $[\sim p \wedge (\sim q \vee r)] \vee [(q \wedge r) \vee (p \wedge r)] \leftrightarrow r$

LHS $[\sim p \wedge (\sim q \vee r)] \vee [q \wedge r] \vee (p \wedge r)$ [Absorption Law]

$= [(\sim p \wedge \sim q) \vee r] \vee [q \wedge r] \vee [p \wedge r]$ [De-Morgan's Law]

$= [\sim (p \vee q) \vee r] \vee [q \wedge r] \vee [p \wedge r]$ [Distribution Law]

$= [\sim (p \vee q) \vee r] \vee [(q \vee p) \wedge r]$ r is common

$[\sim (p \vee q) \vee (q \vee p)] \wedge r$ [commutative Law]

$[\sim (p \vee q) \vee (p \vee q)] \wedge r$ [Inverse Law]

$[T_0] \wedge r$ [Identity Law] — 7

$= r \to$ RHS

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Q NO.	SOLUTION	MARKS
5b)	S : Set of all triangles $p(x)$: x has 2 equal sides $q(x)$: x is isoceles $r(x)$: x has 2 equal angles a : Δ^{le} ABC	-2- -1-
	$\forall x \in S$, $p(x) \to q(x)$ $q(x) \to r(x)$ $\sim r(a)$ $\therefore \sim p(a)$	
	$[p(x) \to q(x)] \wedge [q(x) \to r(x)] \wedge \sim r(a)$ $\Rightarrow [p(a) \to q(a)] \wedge [q(a) \to r(a)] \wedge \sim r(a)$ Syllogism $\Rightarrow [p(a) \to r(a)] \wedge \sim r(a)$ Modus ponen $\Rightarrow \sim p(a)$ $\therefore$ It is valid	-4-
5c)	p : m and n are both odd q : $m+n$ is even and mn is odd	-2-
	Hypo : Assume that m and n are odd $m = 2k+1$, $n = 2l+1$, $m, n \in \mathbb{Z}$ $m+n = (2k+1)+(2l+1)$ $m+n = 2k+2l+2$ which is divisible by 2 $m+n$ is Even	-2-
	$mn = (2k+1)(2l+1)$ $= 4kl + 2k + 2l + 1$, which is not divisible by 2 mn is odd	-2-
	Conclusion $p \to q$ is true	
6a)	$f(0) = 1$, $f(-1) = 5$ $(x = -1 < 0)$ $f(5/3) = -5 = 0$ $(x = 5/3 > 0)$	-2-

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Q NO.	SOLUTION	MARKS
	$f(a) = b \Rightarrow a = f^{-1}(b)$ Let $f^{-1}(0) = x$ $f(x) = 0$ $3x - 5 = 0$ $x = 5/3$ $-3x + 1 = 0$ $x = 1/3$ $\quad f^{-1}(0) \neq 1/3 \ (\because \frac{1}{3} \leq 0)$ $f^{-1}(0) = 5/3 \quad (\because 5/3 > 0)$ To find $f^{-1}(-1)$ $f^{-1}(-1) = x$ $f(x) = -1$ $x = 4/3 > 0$ $-3x + 1 = -1$ $x = 2/3 \neq 0$ $f^{-1}(-1) = 4/3$ $f^{-1}(-6) = x$ $f(x) = -6$ $3x - 5 = -6$ $x = -1/3 \quad (-1/3 \neq 0)$ $f^{-1}(-6) \neq 0$ $-3x + 1 = 6$ $-3x = -7$ $x = 7/3 \quad 7/3 \neq 0$	-2- -2- -1-
6b	$g(ax+b) = 9x^2 - 9x + 3$ $1 - (ax+b) + (ax+b)^2 = 9x^2 - 9x + 3$ $1 - ax - b + a^2x^2 + b^2 + 2axb = 9x^2 - 9x + 3$ $a^2x^2 + x(2ab - a) + (1 - b + b^2) = 9x^2 - 9x + 3$ equating the co-efficient of x^2, x and constant $a = 3, \quad b = -1$ $a = -3, \quad b = 2$	-1- -2- -1- -2-
6c	Graph Isomorphism! It is an equivalence relation on graph and as such it partitions the class of all graphs into equivalence classes fig (i) vertices: $\lvert V_1 \rvert = 6$ Edges: $\lvert E_1 \rvert = 9$ Degree (a, b, c, d, e, f) = 3	-2- 2

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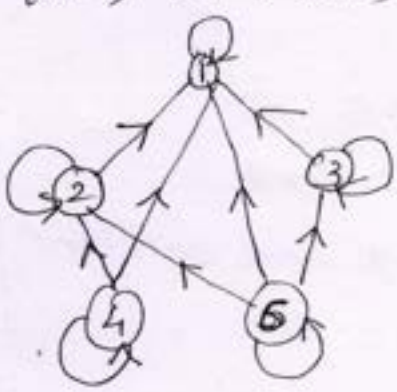
Q NO.	SOLUTION	MARKS
	fig (2) $\lvert V_2\rvert = 6$, $\lvert E_2\rvert = 9$ $\deg(u, v, w, x, y, z) = 3$	2
4a	$\{(h \circ g) \circ f\}(x)$ $(h \circ g) \circ f(x) = (h \circ g)(f(x))$ $= h \circ g(y)$ $\quad y = f(x)$ $= h\,g(y)$ $= h(z)$ LHS $\quad z = g(y)$	4
	$h \circ (g \circ f) = h(g \circ f(x))$ $= h(g(f(x))$ $\quad y = f(x)$ $= h(g(y))$ $= h(z)$ $\quad z = g(y)$ $=$ RHS	3
4b	$A = \{1, 2, 3, 4, 6\}$ $R = \{(1,1)\ (2,1)\ (3,1)\ (4,1)\ (6,1)\ (2,2)\ (4,2)$ $(6,2)\ (6,3)\ (6,6)\ (3,3)\ (4,4)\}$	2
	 	3
	Relation matrix	2

	1	2	3	4	6
1	1	0	0	0	0
2	1	1	0	0	0
3	1	0	1	0	0
4	1	1	0	1	0
6	1	1	1	0	1

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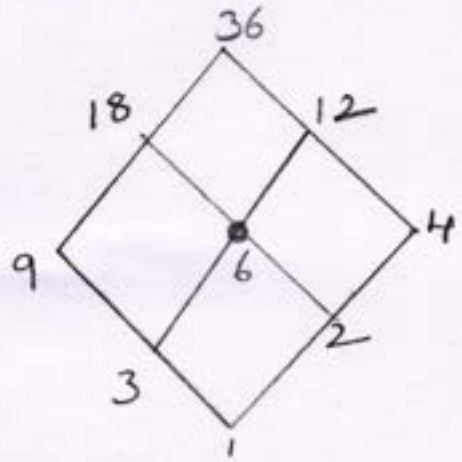
Q NO.	SOLUTION	MARKS
7c	$A = \{1, 2, 3, 4, 6, 9, 12, 18, 36\}$	

$R = \{(1,1)\ \boxed{(1,2)}\ \boxed{(1,3)}\ (1,4)\ (1,6)\ (1,9)\ (1,12)$
$(1,18)\ (1,36)\ (2,2)\ \boxed{(2,4)}\ \boxed{(2,6)}\ (2,12)$
$(2,18)\ (2,36)\ (3,3)\ \boxed{(3,6)}\ \boxed{(3,9)}\ (3,12)$
$(3,18)\ (3,36)\ (4,4)\ \boxed{(4,12)}\ (4,36)\ (6,6)$
$\boxed{(6,12)}\ (6,18)\ (6,36)\ (9,9)\ \boxed{(9,18)}\ (9,36)$
$(12,12)\ \boxed{(12,36)}\ (18,18)\ (18,36),\ (36,36)\}$ — 4



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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-1

Sub: Transformer & Generator **Subcode:** 21EE34

Sem: 3RD **Date:** 10.12.22

Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 75 Minutes

Q-1 (a) Draw and explain the full load phasor diagrams of single phase transformer for lagging, leading an unity power factor. [10M]

b) A 5 KVA ,500/250 V, 50HZ single phase transformer gave the following readings **O.C.Test** : 500V,1A,50W(L.V side open), **S.C Test:** 25V,10A,60W(L.V side shorted). Determine the **i)** Efficiency on full load , 0.8 lagging p.f **ii)** voltage regulation on full load, 0.8 leading p.f. [10M]

OR

Q-2(a) Explain Open & short circuit test on single phase transformer. [10M]

(b) Explain Practical transformer on no load. [10M]

Q-3(a) Explain the conversion of 3 phase supply to 2 phase with necessary diagram. [10M]

(b) Write short notes on star- delta and star - star connection [10M]

OR

Q-4 (a) Explain equivalent circuit of a transformer referred to primary and secondary. [10M]

(b) A 15KVA,2200/110V transformer has R1=1.75 ,R2=0.0045 .The leakage reactance are X1=2.6 ,X2=0.0075 . Calculate Equivalent resistence, reactance,impedence referred to primary and secondary and full load copper loss. [10M]

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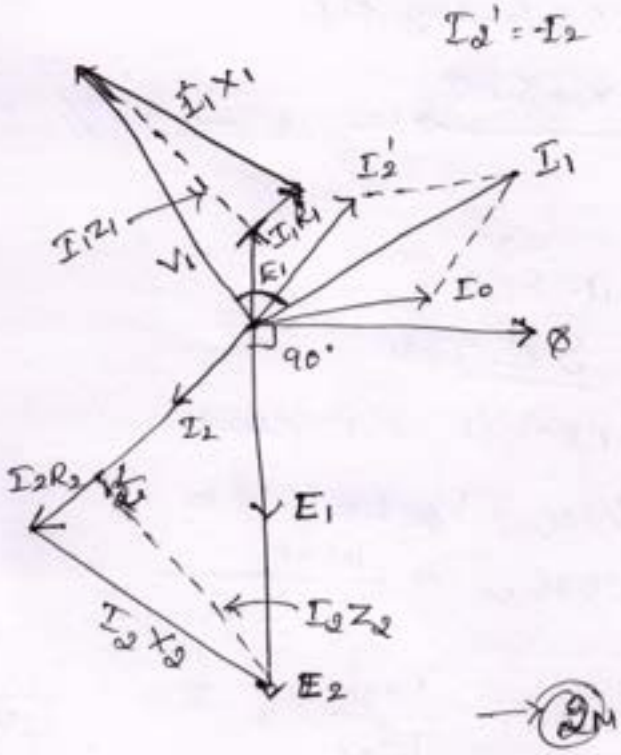
Transformers & Generators (21EE34)

First IA

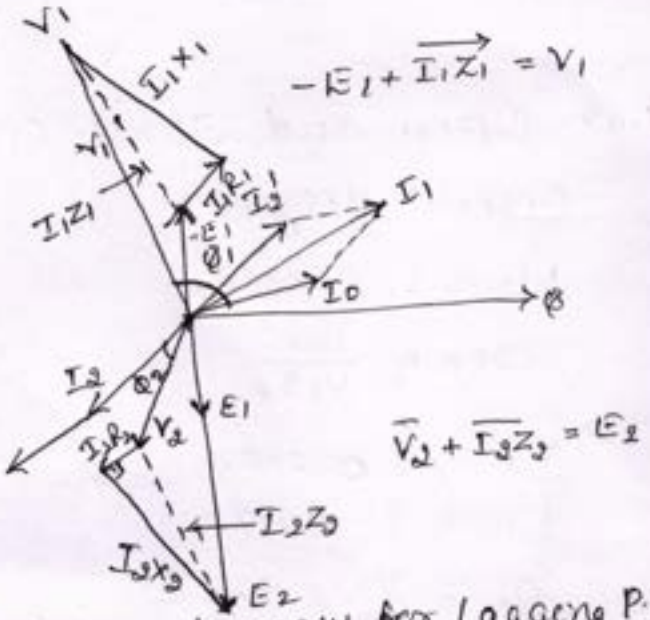
Scheme of Evaluation

1. a) Phasor diagram of single phase transformer



→ (2M)

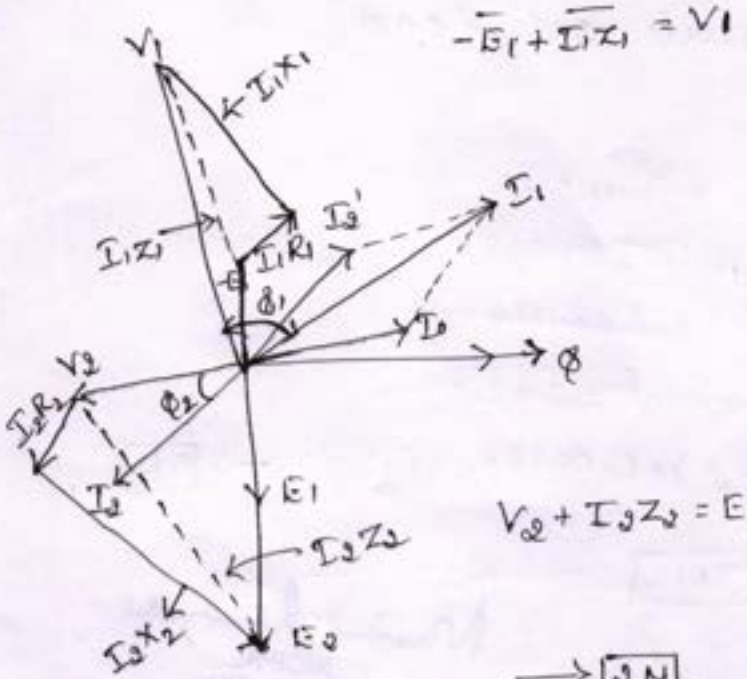
Phasor diagram for cl pf



Phasor diagram for lagging P.f

→ (2M)

$-\bar{E}_1 + \overline{I_1Z_1} = \bar{V}_1$



$V_2 + I_2Z_2 = E_2$

→ [2M]

Phasor diagram for a leading P.f

Explanation of cl pf, Lagging P.f and leading P.f → [4M].

→

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1.b) $\cos\phi_0 = 0.1$ $\quad I_1(F.L) = 10A$

$P_i = 50W$ $\quad W_{SC} = 60W$

$R_{1e} = 0.6\Omega$
$X_{1e} = 2.42\Omega$
$Z_{1e} = 2.5\Omega$ $\longrightarrow$ 3M

ii) η at full load, 0.8 lag PF.

$\%\eta = 97.39\%$ $\longrightarrow$ 4M

iii) Regulation on full load, 0.8 leading PF

$$\%R = \frac{I_1 \times R_{1e}\cos\phi - I_1 X_{1e}\sin\phi}{V_1} \times 100 = -1.95\% \longrightarrow 3M$$

2.a) Open and Short Circuit test.

Circuit diagram

$W_0 = V_0 I_0 \cos\phi_0$

$\cos\phi_0 = \frac{W_0}{V_0 I_0}$

$I_c = I_0 \cos\phi_0$

$I_m = I_0 \sin\phi_0$

$R_0 = \frac{V_0}{I_c}$, $X_0 = \frac{V_0}{I_m}$ $\longrightarrow$ 5M

S.C. Test.

Circuit diagram

$W_{SC} = V_{SC} I_{SC} \cos\phi_{SC}$

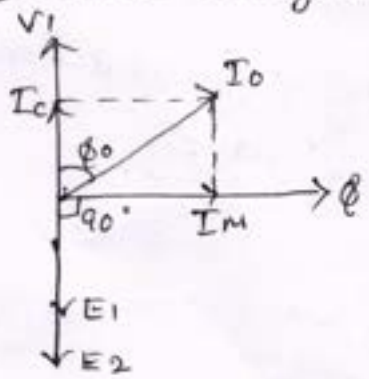
$\cos\phi_{SC} = \frac{W_{SC}}{V_{SC} I_{SC}}$

$R_{1e} = \frac{W_{SC}}{I^2_{SC}}$; $Z_{1e} = \frac{V_{SC}}{I_{SC}}$

$X_{1e} = \sqrt{Z_{1e}^2 - R_{1e}^2}$ $\longrightarrow$ 5M

b) Practical transformer on load.

phasor diagram.



$I_0 = I_m + I_c$

$I_m = I_0 \cos\phi_0$

$I_c = I_0 \sin\phi_0$

$I_0 = \sqrt{I_m^2 + I_c^2}$

$W_0 = V_0 I_0 \cos\phi_0 = P_i$ $\longrightarrow$ 5M.

Explaination $\longrightarrow$ 5M.

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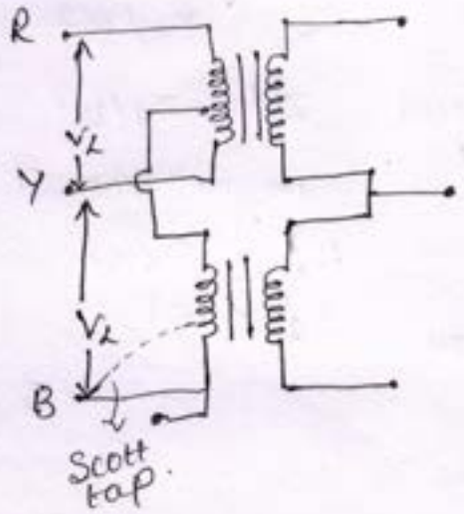
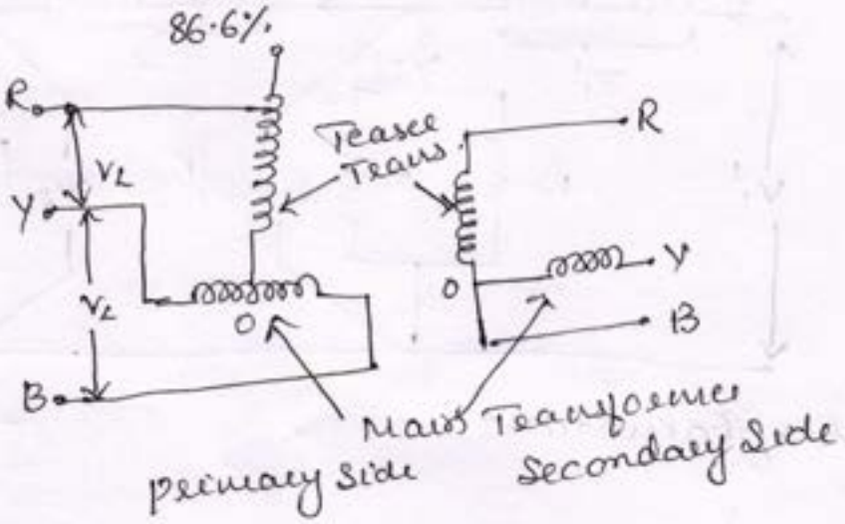
3.a) Conversion of 3-phase supply to 2 phase

Circuit diagram

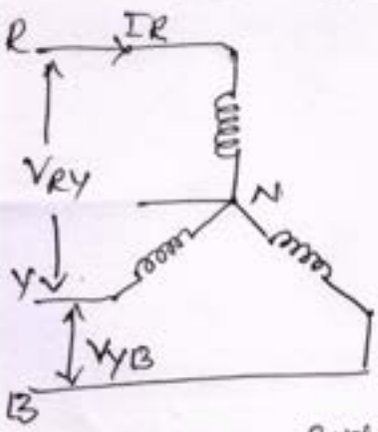




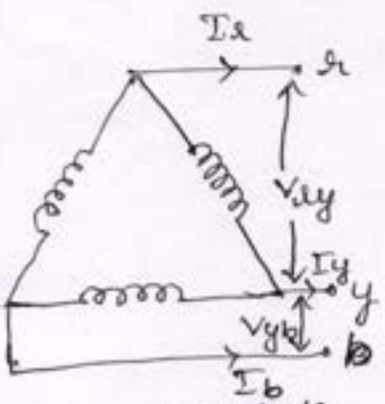
→ 5M.

Explaination: → 5M

by Star-delta connection



Primary side

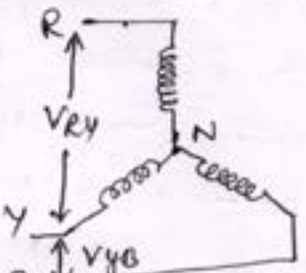


Secondary side

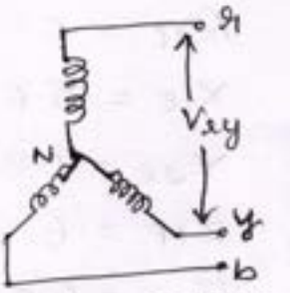
→ 5M

Explaination → 5M

Star-star connection.



Primary side

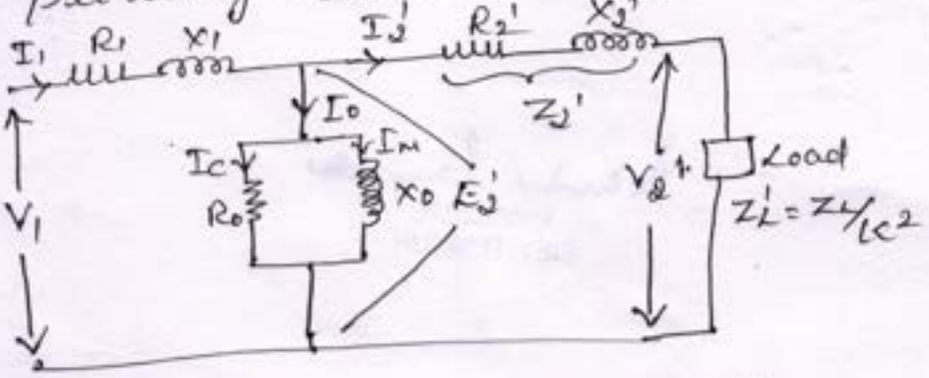


Secondary side

→ 5M

Explaination

4.a) Equivalent circuit of a transformer referred to primary and secondary



Eqt ckt referred to primary

$R_1' = R_1 k^2$

$X_1' = k^2 X_1$

$Z_1' = k^2 Z_1$

$I_1' = I_1/k$

$E_1' = kE_1$

→ 5M

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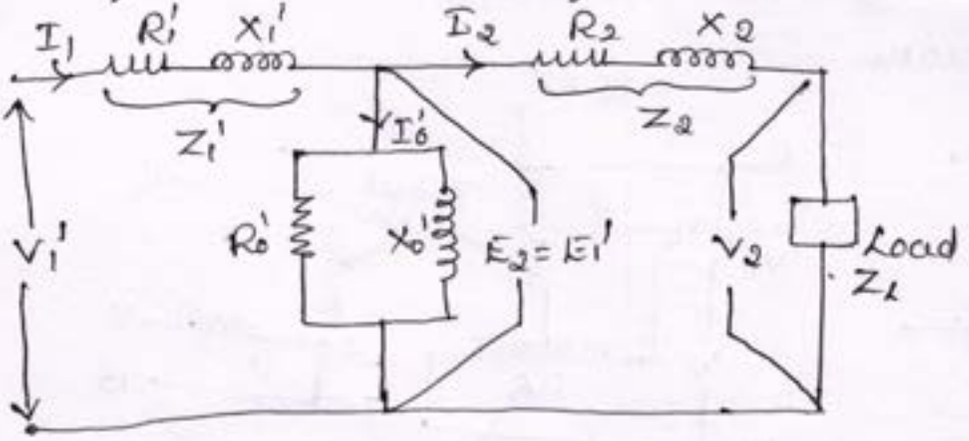
Equivalent ckt referred to secondary



$R_2' = R_2/K^2$

$X_2' = X_2/K^2$

$Z_2' = Z_2/K^2$

$K = N_2/N_1$

$E_2' = E_2/K^2$

$I_2' = KI_2$

Explanation. → 5M

b) $K = 0.05$

$R_{1e} = R_1 + R_2'$

$= R_1 + R_2/K^2 = 3.55\,\Omega$ → 1M

$R_{2e} = 0.00887\,\Omega$ → 1M

$X_{1e} = 5.6\,\Omega$ → 1M

$X_{2e} = 0.014\,\Omega$ → 1M

$Z_{1e} = 6.63\,\Omega$ → 1M

$Z_{2e} = 0.016\,\Omega$ → 1M

I_1 (F.L) $= 6.8\,A$ → 1M

I_2 (F.L) $= 136.36\,A$ → 1M

Total Cu loss $= I_1^2 R_1 + I_2^2 R_2$

$= 458.42\,W$ → 2M.

→ 10M

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-1

Sub: Microcontroller
Sem: 4th sem
Max Marks: 40

Note: **Answer any two full questions**

Subcode: 21EE43
Date:12 /7 /23
Duration: 75 Minutes

Q-1	(a)Explain pin diagram of 8051 microcontoller.	[10M][CO1]
	(b)List difference between Microcontrloer & Microprocessor.	[05M][CO1]
	© Show the content of instruction ADD A #50 MOVA #250	[05M][CO1]
	Or	
Q-2	(a)Explain different Addressing modes of 8051 Microcontroller with example.	[06M][CO1]
	(b)Explain internal architecture of 8051 microcontroller.	[10M][CO1]
	(c)Explain Program status word.	[04M][CO1]
Q-3	(a)Explain how to interface external 64k bytes of RAM memory with 8051.	[10M][CO2]
	(b)Define Microcontroller.List difference between CISC & RISC.	[10M][CO2]
	Or	
Q-4	(a) Explain the following function of pins I/O ports ,EA,PSEN,ALE,RST.	[10M][CO2]
	(b) After adding show the states of CY,Ac,Parity flag.a)**BF and 1B.**	[05M][CO1]
	(c)Explain Stack push and pop.	[05M][CO1]

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Signature of HOD

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Microcontroller.

4th Sem. First Internal Scheme.

1) a Explain pin Diagram 8051 Microcontroller

Block diagram. - 5M

Operation of pin. 5M

10M

1) b) List difference b/w Microcontroller and Microprocessor

5 points 5 x 1 = 5M.

1) c) Show the content of PSW Register after execution of program.

ADD A, #50. MOV A #250 5M.

Add Immediately the 50 to the Content of Accumulator. Now 250 Immediately to Accumulator.

2) a) Addressing Mode. 5 Modes. 5x2 = 10 M.

Immediate Addressing Mode.

Register —"— Examples.

Direct —"—

Register Indirect —"—

Index "— "—

2) b) 8051 Block diagram - 5M.

theory 3M.

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4 c) program status word.

| CY | AC | F0 | RS1 | RS0 | OV | - | P |

2M.

— 2M.

5 a) Interface external 64k bytes. RAM memory

Block diagram — 5M.

theory 5M.

b) Definition Microcontroller — 4M.

Ex. Mobiles

Difference CISC RISC 6 prints 6x1=6M.

4 a) RST. — Reset.

EA — External Access.

ALE — Address latch Enable.

PSEN — program store enable.

example.

10M.

b) BF

1B.

1011	1111	(1)
0001	1011	(1)
1101	1010.	(1)

3M

CY = 0

AC = 1

P = 1 } 2M

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4) c) stack

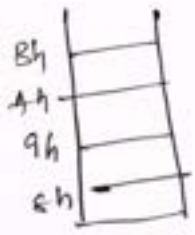
push increment.

SP+1

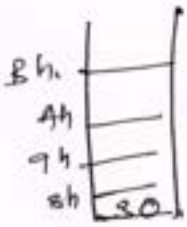
Pop. Decrement

SP-1

Before execution



After execution.



SP = SP+1

SP = 05h.

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INTERNAL ASSESMENT TEST NO-2

Sub: Microcontroller
Sem: 4th sem
Max Marks: 40

Note: **Answer any two full questions**

Subcode: 21EE43
Date:31/8/23
Duration: 75 Minutes

Q-1 (a)Explain Swap, Xchd, Jump,Call [co2][10M]
(b)Explain CALL and RET instruction Execution. [co2][05M]
(c) Explain Assembly Directives. [co2][05M]

OR

Q-2(a)Write a Cprogram to complement The value AAh 800times. [co2][10M]
(b)Write an Assembly language program for addition of two numbers. [co2][05M]
(c)Explain MULAB, DIVAB,ADDA,MOVA R,INC@R [co2][05M]

Q-3(a)Explain timers and counters with TMOD register. [co3][10M]
(b)Explain steps to receive data transmit serially. [co3][05M]
©Explain Serial communication. [co3][05M]

OR

Q-4(a) Write a 8051 Cprogram to turn bit P1.5 ON and OFF 50000times. [co3][10M]
(b) Write a 8051 Cprogram tosend ASCII character a,b,A,B to port 1. [co3][05M]
(c) Write an 8051Cprogram to send values of -4 to +4 Port P1. [co3][05M]

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Microcontroller. 21EE43

Second Internal Scheme and Solution

1) a) SWAP 2M

XCHD.. 2M

JUMP. 2M

CALL. 4M

b) CALL Instructions 3

Sequence and execution 2 5M.

RET Instructions

Sequence and execution

c) Data types in C.

Signed char 5M.

unsigned char

&bit and SFR.

table.

2) a) Complement the value A9h 800 time.

Program. 5M

b) Assembly language program for Addition of two numbers.

5M.

Program.

c) Exp

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2) c) Explain MUL AB, DIV AB, ADDA, MOVA Rn.
INC@ Ri

5 x 2 = 10M

MOVA Rn.

(A) ← Rn.

ADD A, #data.

operation (A) ← (A) + #data..

Inc @ Ri

operation (Ri) ← (Ri) + 1

MUL AB.

Operation. MUL = A * B.

DIV AB.

DIV A ÷ B.

Operation of the Command Result storage.

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3) a)

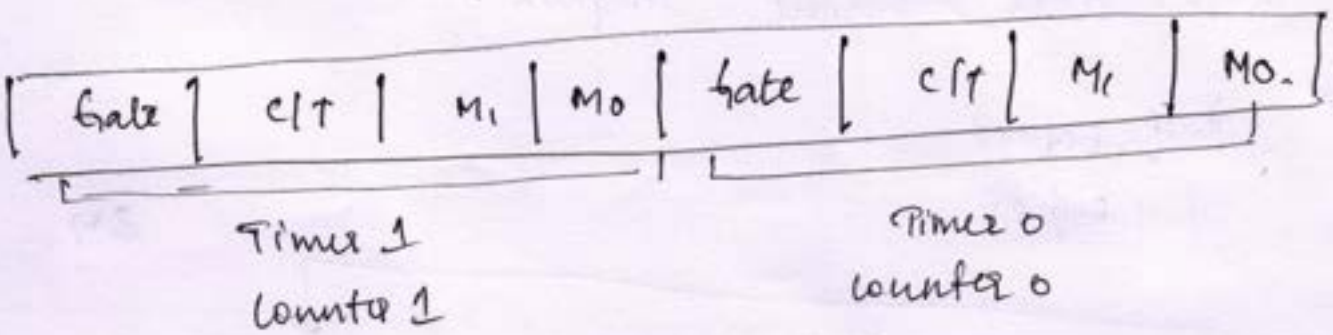
Timers used to generate time delay and counts. and counts event happening outside the microcontroller.

8051 has two timers / counters. 3M

Timer 0 / Counter 0.

Timer 1 / Counter 1 — 1M

TMOD Register — 6M



C/T C/T̄ = 0. Timer mode.

C/T̄ = 1. Counter Mode.

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3)a) Steps to receive data transmit serially

Register to TMOD, TH1, SCON, TR1, TF1.

CLT T1 instruction completed. 5x1=5M

Step by step.

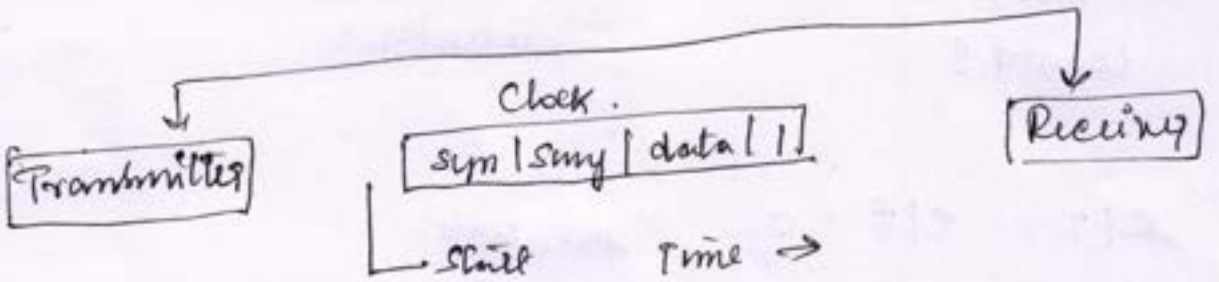
3) c) Transmit → Receiver. 2M

Serial Communication.

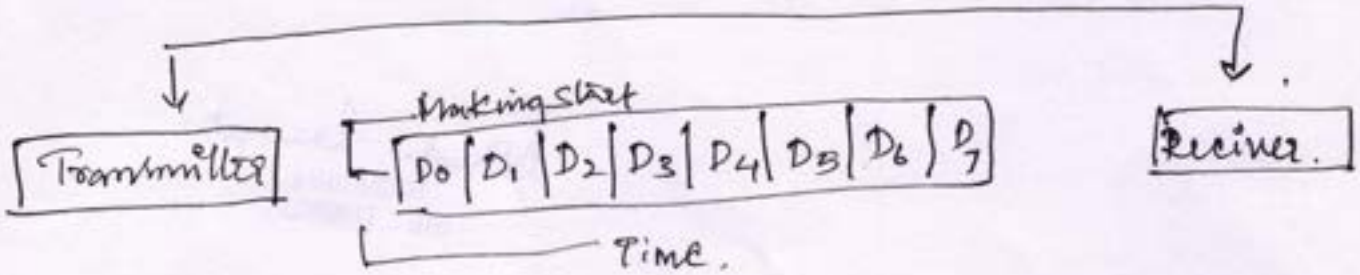
Serial data transmit simplex.

Half Deflect.

Full Deflect. 3M



Synchronous Data transmission



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4) a) Write a 8051 C program to turn bit P1.5 ON and OFF 50,000 times. 10M

```
#include <reg51.h>
sbit portbit = 0x95
void main()
{
unsigned int i;
for(i=0; i<50000; i++)
    {
    Portbit = 1;
     portbit = 0;
    }
}
```

4 b) Write a 8051 C program to Continously Send hex Values for ASCII characters a, b, A, B to port 1. 10M

```
#include <reg51.h>
void main()
{
  while(1)
    {
      unsigned char x[] = "abcABc";
      unsigned char i;
        for(i=0; i<6; i++)
          P1 = x[i]
        }
}
```

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8) Write an 8051 C program to send values of -4 to +4 port P1.

```
#include <reg51.h>                    5M
void main ()
{
  char num [] = { 1, -1, 2, -2, 3, -3, 4, -4 };
    unsigned char i;
      for (i=0; i<8; i++)
      P1 = num [i];
    }
```

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20 YEARS Academic Excellence

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-3

Sub:Microcontroller **Subcode**: 21EE43
Sem: 4th sem Date: 12/09/2023
Max Marks: 60 ***Note:*** **Answer any one full question from 1,2&3**

MODULE 1

Q-1(a) Explain different Addressing modes of 8051 Microcontroller with example. [10M][CO1]
(b) Explain internal architecture of 8051 microcontroller. [10M][CO1]
(c) Explain Assembly directives used in ALP.

MODULE 2

Q-2(a) Explain MOVC MOVX SUBB MULAB DIVAB. [10M][CO2]
(b) Explain SWAP XCHD DJNZ Jump Call . [10M][CO2]

MODULE 3

Q-3 (a)write an 8051 C program to get status of bit P1.0,save it and send it to P2.7continously [07M] [CO3]
(b)Write an 8051 C program to convert packed BCD 0*29 to ASCII and display on P1 & P2. [07M] [CO3]
(c) Write 8051 C program to toggle all the bits P0 and P2 continusly 250 ms delay. [06M] [CO3]

Answer ONE question from each part

MODULE 4

Q-4(a) what is an interrupt and explain types of 8051 interrupt. [08M][CO4]
(b) Compare Interrupt and Polling. Explain steps in executing interrupt. [06M][CO4]
(c) Explain the function of pin RS232 connector. [06M][CO4]

Or

Q-5(a) Write a ALP &C program to transmit serially HELLO at braud rate of 9800. [10M] [CO4]
(b) Write a C program to bring byte of data serially one bit at a time P1.0 [10M] [CO4]

MODULE5

Q-6(a) Explain the control byte of MAX112 serial ADC [10M] [CO5]

(b) Explain the function block diagram of 8255 [6M] [10M][CO5]

Or

Q-7(a) with a block schematic explain features of 8255 PI chip. [10M] [CO5]
(b)Explain the steps to interface ADC 0808 to the 8051 microcontroller. [10M] [CO5]

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Microcontroller 21EE43

Scheme and Solution 3

1 a) Addressing Modes of 8051

5 Modes. 1) Immediate Addressing Mode. 5x2 = 10M

MOV A # 04h.

2) Register Addressing Mode.

Mov A, R0.

3) Direct Addressing Mode.

Mov R0, 40h.

4) Register Indirect Addressing Mode.

Mov A @ R0.

5) Index Addressing Mode.

Mov A @ A + DPTR.

b) Architecture of 8051. 6M

3M

Diagram.

ALU.

A, B.

PSW.

I/O devices

RAM. 3M

PC.

Register

Special function registers.

c) Assembly Directives - 2M

RST.

EA

ALE } 2M

PSEN.

4M

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2) a) MOV C Moving the content. 5x2 = 10M

SUB B. Subtraction with Borrow.

MUL AB. The register content A and B multiplying

DIV AB Division.

2) b) 5x2 = 10M

SWAP.

content will be swap from one mode to another.

XCHD.

Exchange the instruction from lower nibble to higher Nibble.

Jump. and call instructions change the flow of program by changing the contents..

3) a) c program bit P1.0 → P2.7 continously. 7M

```
#include <reg51.h>
void main()
{
for(;;)
{
P1 = 0x55;
P2 = 0xAA.
}
}.
```

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3) b). BCD to ASCII. 7M

program.

3) c) C program toggle P0 and P2 continously 250ms.

program. 6M

4) a) Interrupt:-

4) a) Interrupt 4M

function and definition.

Types of 8051 interrupt. RI/TI. 4M

TF0 INT0.

TF1 INT1.

4) b). Interrupt : polling. 3M

difference points - 3M

steps in Executing interrupt.

Executing from PC.

to RET.

4 c) pin RS232 connector.

Diagram. 2M

purpose. 2M

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5) a). Hello to transmit serially.

program. ALP. 10M.
org 0h.
P1 = 'Hello'
J.

5) b) to transmit a data bit time P1.0

program. 10M.

unsigned char.

6) a)

D7	D6	D5	D4	D3	D2	D1	D0
Select	Set 2	Set 1	Set 0	UN/BID	SGL/DE	PD1	PD0

Table.

6) b) function of Block diagram 8255.

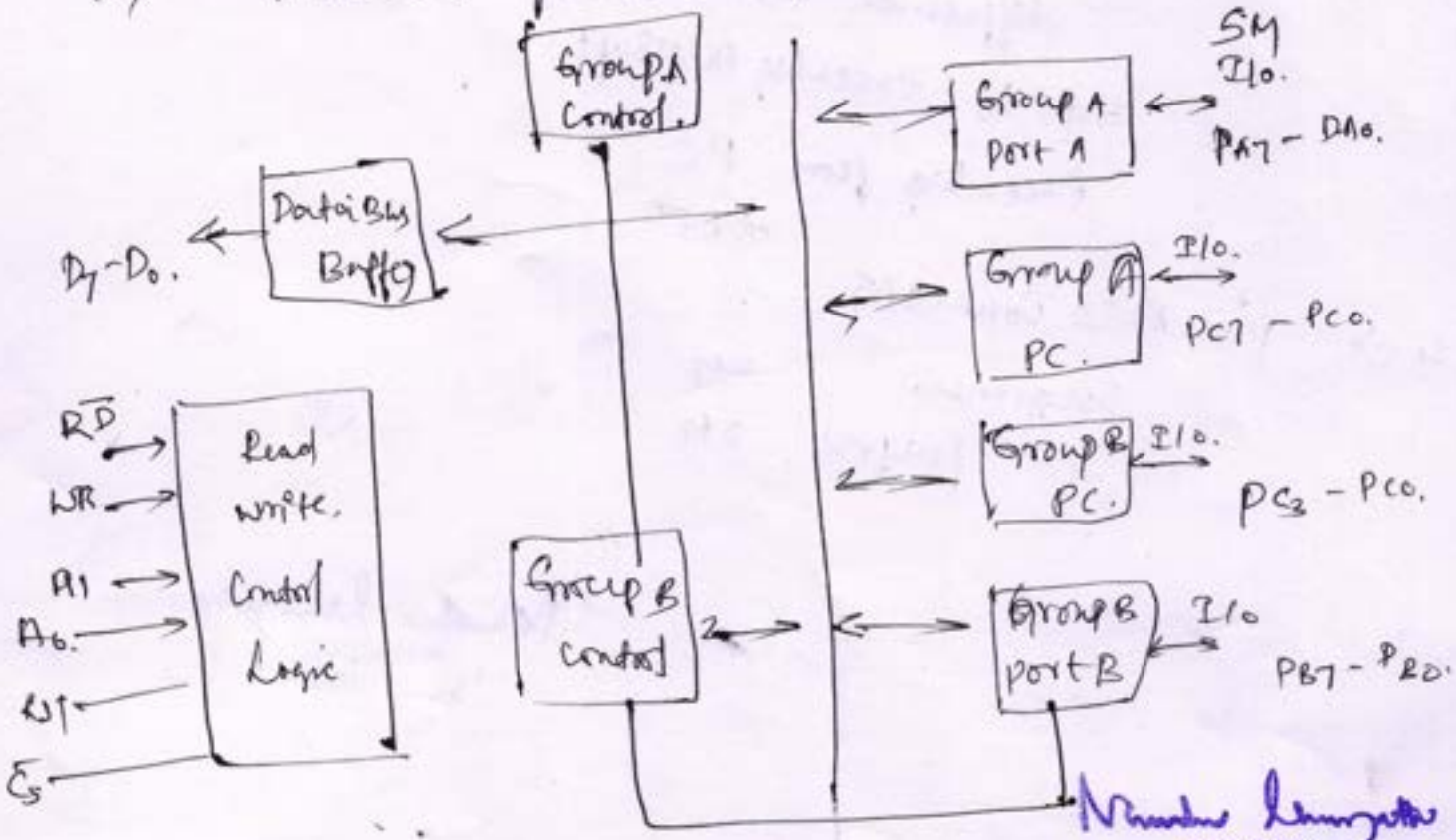

Table. 5M

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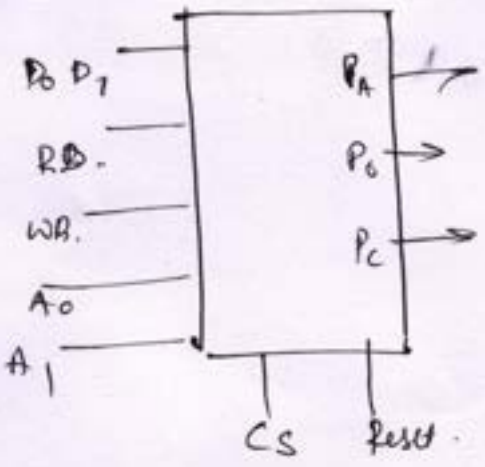
7) a) 8255 PI chip.



8255 port selection.

CS	A_1	A_0	selection
0	0	0	port A
0	0	1	port B
0	1	0	port C.
0	1	1	control reg.
1	X	X	8255 not select.

5M

Modes of operation

Mode 0.
Mode 1 operation 5M
Mode 2.

7) b) Steps to Interface ADC 0808 to the 8051 Microcontroller.

1) Select Analog Channel. A, B, C. Adressing code table.
2) Activate ALE pin
3) Activate SC. SA2 = 10M
4) Monitor EOC.
5) Activate OE.

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Department of Electrical and Electronics

INTERNAL ASSESSMENT – I

Sub: Elctric motors
Sem: IV sem
Max Marks: 40

Sub code: 21EE44
Date: 13/07/23
Duration: 90 Minutes

Note: Answer any two full questions

MODULE-I

1. a) Derive the torque equation of a D.C Motor. **6M (CO1)**

b) What are the applications of D.C shunt motor, Series motor and compound motor. **6M (CO1)**

c) A 4 pole D.C Shunt motor takes 22amp from 220v supply. The armature and shunt field resistances are 0.5Ω and 100Ω respectively. The armature is lap connected with 300 conductors if the flux per pole is 20mwb, calculate the speed and the torque developed. **8M (CO1)**

OR

2.a) Draw the power flow diagram of a DC motor and derive the condition for maximum efficiency. **8M(CO2)**

b) Explain the characteristics of D C shunt motor. **6M(CO1)**

c) Briefly explain the losses in DC Motor. **6M(CO2)**

MODULE-II

3.a) With a neat sketch, explain the working of three point starter. **10M(CO1)**

b) With a neat sketch, explain the flux control method and potential divider control methods for DC shunt motor.

OR

4. a) With a neat sketch, explain the Ward Leonard method of speed control of DC motor. **10M(CO1)**

b) A 230v dc shunt motor runs at 800rpm and takes armature current of 50A. Find resistance to be added to the field circuit to increase the speed from 800rpm to 1000 rpm at an armature current of 80A. Assume flux proportional to field current. Armature resistance=0.15Ω and shunt field resistance=250Ω. **10M(CO1)**

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B.H Rao
Signature of HOD

13/07/23

Scheme of evaluation

Electric Motors (18EE44)

IA - 1

Module - 1

1. a) Derivation $T_a = 0.159 \phi Z I_a (P/A)$ → 6M

b) Applications of DC series Motor
DC Shunt Motor
DC compound Motor
} Each 2M × 3 → 6M.

c) $I_a = 19.8$ A → 1M
$I_{sh} = 2.2$ A → 1M
$E_b = 210.1$ V → 2M
$N = 2101$ rpm → 2M
$T_a = 18.9$ Nm → 2M
} → 8M.

2. a) Power flow diagram of D.C. Motor. → 3M.

Derivation condition for maximum efficiency

$I^2R_a = P_i = P_{cu}$ → 5M.

b) Characteristics of D.C. shunt Motor.

a) Ta Vs Ia characteristics
b) N Vs Ia —"— —"—
c) N Vs Ta —"— —"—
} Each 2M × 3 → 6M.

c) Losses in a DC Motor.

Iron Losses $W_i = W_e + W_h$
Copper losses $W_{cu} = I_a^2 R_a$ (Rotor + Stator)
Mechanical losses & Stray Losses + F & W)
} Each 2M × 3 → 6M

3. a) Three point Starter.

Diagram → 4M
working (Explanation) → 6M
} → 10M

b) Flux control → Circuit diagram → 2M
Graph of N Vs I_{sh} → 2M

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Explaination → 1M.

Potential Divider Method :—

Circuit diagram → 2M
Graph of N Vs V → 2M
Explaination → 1M

} → 10M.

4. a) Ward Leonard Method.

Circuit diagram → 5M
Explaination → 5M

} → 10M.

b) $I_{sh1} = 0.92A$
$E_{b1} = 222.5V$
$E_{b2} = 218V$
$I_{sh2} = 0.721A$
$R_x = 69\Omega$.

} Each 2M x 5 = 10M.

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Department of Electrical & Electronics Engineering

ELECTRIC MOTORS (21EE44)

SECOND-INTERNALS

IV Semester
Max Marks: 40

Duration:90Minutes
Date:16.08.23

Note: Answer any two full questions

MODULE I

1. a) Discuss the torque-slip characteristics of a three phase induction motor including motoring, generating and braking regions. **10M (CO2)**

b) Explain briefly Field's test for determination of efficiency of DC series machines. **10M (CO2)**

OR

2. a) Explain back to back test as two identical DC machines and calculate the efficiency of the machine as generator and motor. **10M (CO2)**

b) Hopkinson's test on two machines gave the following results for full load: Line voltage= 230V, Line current excluding field current =50A, motor armature current=380A, field currents 5A and 4.2 A. The armature resistance of each machine is 0.002Ω. Calculate the efficiency of each machine. **10M (CO2)**

MODULE II

3.a) Define Slip. Derive the Torque equation of three phase induction motor and obtain the condition for maximum efficiency. **10M (CO2)**

b)Describe Swinburne's test with the help of neat diagram to find out the efficiency of a DC machine. What are the main advantages and disadvantages of this test. **10M (CO2)**

OR

4a) A 400V, 4 pole, 3 phase 50Hz star connected induction motor has a rotor resistance and reactance per phase equal to 0.01Ω and 0.1Ω respectively. Determine **i)** Starting torque **ii)** Slip at which maximum torque will occur **iii)** Speed at which maximum torque will occur **iv)** Maximum torque **v)** full load torque if full load slip is 4%. Assume ratio of stator to rotor turns as 4. **10M (CO2)**

b) With a neat sketch explain the construction and working of Universal motor with torque slip characteristics. **10M (CO2)**

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Scheme of Evaluation 16.08.23

Electric Motors (21EE44)

IA - II

Module - 1

1) a) Torque Slip characteristics of a 3-ϕ I.M including motoring, generating & braking regions.

Graph → Torque Vs Slip characteristics. → 5M

S>0, S<0, S=0.

Explanation of motoring, Generating & braking regions. → 5M.

b) Field Test of series Motor

Circuit diagram → 4M

procedure → 4M

Calculation of efficiency → $\eta_m = \frac{V_1 I_1 - [I_1^2(R_a+R_{se})+W_s}{V_1 I_1}$ → 1M

$$\eta_g = \frac{V_2 I_2}{V_2 I_2 + [I_2^2 R_a + I_1^2 R_{se} + W_s]} \rightarrow 1M$$

2.a) Back to back Test [Hopkinson's Test] :-

Circuit diagram → 3M

procedure → 3M

Calculation of efficiency $\eta_m = \frac{V(I_1+I_2) - [(I_1+I_2-I_4)^2 R_a + VI_4 + W_s/2}{V(I_1+I_2)}$ → 2M

$$\eta_g = \frac{VI_2}{VI_2 + [(I_1+I_3)^2 R_a + VI_3 + \frac{W_s}{2}]} \rightarrow 2M$$

b) Generator:

Arm. cu loss = $I_a^2 R_a$ = 2178W

Fld cu loss = VI_{sh} = 1250W } → 2M

Motor: Arm. cu loss = $I_a^2 R_a$ = 2888W

Fld. cu loss = VI_{sh} = 1050W } → 2M

P = VI = 12500W

Gen:- Total loss = 7145W

G o/p = 82500W

G i/p = 89645W

η_g = 92.02 % } → 3M

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Motor : Total loss = 7655 W
M.I/P = 96050 W
M.O/P = 88395 W
η_m = 92.03 %. → 3M

3.a) Torque eqn :-

Derivation $T = \frac{3}{2\pi n_s} \times \frac{S E_2^2 R_2}{(R_2^2 + (SX_2)^2}$ N-m. → 7M

Condition for η_{max} is $S_m = R_2/X_2$ → 2M

Definition of Slip → 1M

b) Swinburne's Test.

Circuit diagram → 3M
Procedure → 3M.
Advantages → 2M
Disadvantages → 2M. → 10M.

4.a) N_s = 1500 rpm

i) T_{sl} = 63.03 N-m → 2M
ii) S_m = 10 %. → 2M
iii) N = 1350 rpm → 2M
iv) T_m = 318.16 N-m → 2M
v) $T_{f.l}$ = 219.52 N-m → 2M → 10M.

b) Universal Motor.

Circuit diagram (block) → 2M
Connection diagram of compensated & non compensated type of universal motor. → 4M
Explaination → 2M
Torque - slip Characteristics. → 2M → 10M.

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering
IV semester CIE III Internal Assessment Test: 14.09.23

ELECTRIC MOTORS (21EE44)

Max Marks: 60 **Duration:120** Minutes

Note: **Answer three full questions selecting one full question from each module.**

MODULE – I

1. a) Derive the torque equation of a D.C Motor. **6M (CO1)**
b) What are the applications of D.C shunt motor, Series motor and compound motor. **6M (CO1)**
c) A 4 pole D.C Shunt motor takes 22amp from 220v supply. The armature and shunt field resistances are 0.5Ω and 100Ω respectively. The armature is lap connected with 300 conductors if the flux per pole is 20mwb, calculate the speed and the torque developed. **8M (CO1)**

OR

2.a) With a neat sketch explain the working of three point starter. **10M(CO2)**
b)With a neat sketch explain the back to back test on two identical machines and calculate the efficiency of a machine as a generator and motor. **10M(CO2)**

OR

3. a) Discuss the torque-slip characteristics of a three phase induction motor including motoring, generating and braking regions. **10 M (CO2)**
b) Explain briefly Field's test for determination of efficiency of DC series machines. **10M (CO2)**

Module II

4. a) Name the different methods of starting of squirrel cage induction motor. Explain the star delta starter of a three phase squirrel cage induction motor with a suitable diagram. **10M(CO3)**
b) Explain. any two methods of speed control of a three phase induction motors. **10M(CO3)**

OR

5. a) Explain with double revolving field theory of single phase induction motor diagram. **10M(CO4)**
b) Explain with a neat diagram, the working of a shaded pole single phase Induction motor. **10M(CO4)**

Module III

6.a) With a neat sketch explain the construction and working principle of a A.C.Servomotor. **10M(CO5)**
b) With a neat sketch explain the construction and working principle of a Linear Induction motor. **10M(CO5)**

OR

7. a) Explain the grid connected stand alone operation of induction generator. **10M(CO4)**
b). Explain with a neat diagram, the working of a capacitor start and capacitor start capacitor run single phase induction motor. **10M (CO4)**

Signature of Staff **Signature of HOD** **Signature of Principal**

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Scheme of Evaluation 14.09.23

Electric Motors (21EE44)

IA - III.

Module - 1

1. a) Derivation :

Torque eqn of DC Motor

$T_a = 0.159 \phi Z I_a (P/A)$. → 6M

b) Applications of series, Shunt & Compound Motors (Each 2M) → 6M

c) $I_a = 19.8$ A → 1M
$I_{sh} = 2.2$ A → 1M
$E_b = 210.1$ V → 2M
$N = 2101$ rpm → 2M
$T_a = 18.9$ Nm → 2M
→ 8M.

2. a) Three point Starter

Diagram → 3M
construction → 3M
Operation → 4M.

b) Back to back Test [Hopkinson's Test]

Circuit diagram → 3M
Procedure → 3M

$$\eta_m = \frac{V(I_1 + I_2) - [(I_1 + I_2 - I_4)^2 R_a + VI_4 + W_{S/2}}{V[I_1 + I_2]}$$ → 2M.

$$\eta_g = \frac{VI_2}{VI_2 + [(I_2 + I_3)^2 R_a + VI_3 + W_{S/2}}$$ → 2M.

3. a) Torque slip characteristics of 3-ϕ I.M

Graph of Torque Vs Slip. ($S>0$, $S=0$, $S<0$). → 5M

Explanation of all regions → 5M.

b) Field's Test - Circuit diagram → 4M

Explanation → 6M

Calculation of η of motors → 4M

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4.a) Starting methods of Squirrel cage I.M.

1) Star-delta Starter
2) Autotransformer starter
3) Stator resistance starter
4) Rotor resistance starter
5) Direct on-Line starter

→ 2M

Star-delta starter → diagram → 4M
Explanation → 4M

b) Supply frequency control or V/f control
Supply voltage control
Controlling number of poles

Any 2 methods. Each 5M

5.a) Double revolving field Theory diagram → 4M
Explanation → 6M.

b) Shaded pole 1-ϕ I.M. Diagram → 2M
Explanation → 4M, construction → 3M.

6.a) A.C. Servo Motor

Diagram → 3M
Construction → 3M
Working → 3M
Application → 1M

b) Linear I.M
Diagram → 4M
working → 6M, $S = \frac{V_s - V}{V_s}$

7.a) Grid connected Stand alone operation of induction generation

Diagram → 4M
working (Explanation) → 6M.

b) Capacitor start I.M
Diagram & explanation → 5M

Capacitor start capacitor run 1-ϕ I.M
Diagram & Explanation → 5M.

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, NOVEMBER 2022

Semester : V **Subject: POWER ELECTRONICS** **Sub Code: 18EE-53**
Max Marks: 40 Date: 12-11-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) With neat circuit diagram and input, output waveforms explain the control characteristics of power devices [CO1] 07 Marks

b) With neat circuit diagram and input, output waveforms explain the different types of power electronics converter circuits. [CO1]08 Marks

c) Discuss the major industrial applications of power electronic converter circuits [CO1]05 Marks

2 a) With the help of neat block diagram, explain briefly peripheral effect associated with power converters [CO1]06 Marks

b) With the help of neat wave form, explain the reverse-recovery characteristics of a power diode and also obtain an expression for peak reverse current [CO1]08 Marks

c) The reverse recovery time of a diode is 5μS and rate of fall of diode current is 80 A/μS. Calculate i) the storage charge Q_{RR} ii) peak reverse current I_{RR} [CO1]06 Marks

3 a) Briefly explain the different types of power diodes and its applications [CO1]06 Marks

b) With neat circuit diagram and waveforms explain the freewheeling diode with RL-load. [CO1]08 Marks

c) With circuit diagram and wave forms explain the operation of single phase full wave rectifier with R- load [CO2]06 Marks

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, NOVEMBER 2022

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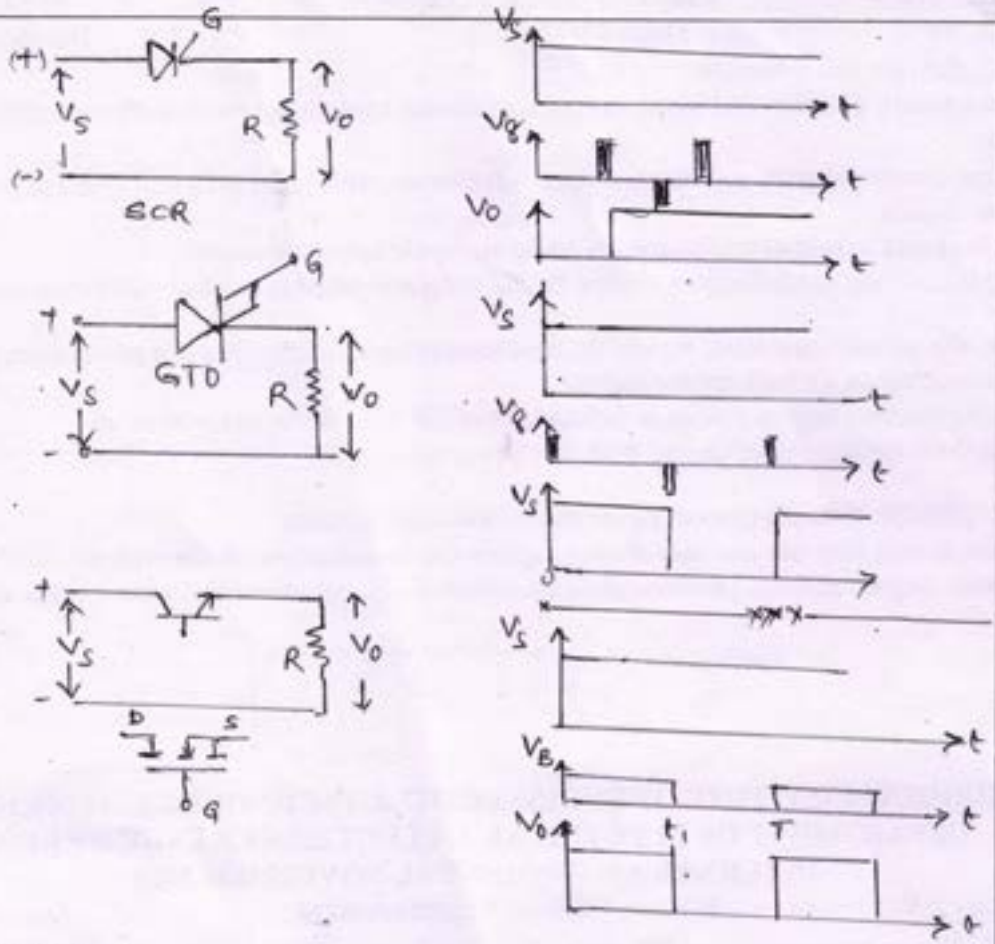
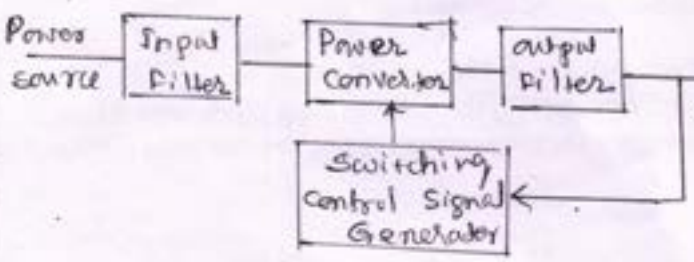
Course Title: **Scheme & Solution** **Course Code:**

Question Number	Solution	Marks Allocated
1 a)		2 2 3
b)	i) Diode Rectifier ii) Controlled Rectifier iii) AC - AC Converters iv) DC to DC Converter v) DC to AC Converters	2 4 2
c)	Power supplies, UPS, Motor control, Satellite power supplies, Air craft power systems, Industrial: Textile mills, Cement mills, Washing machines etc	5 Marks
2 a)		3 Explanation (3)

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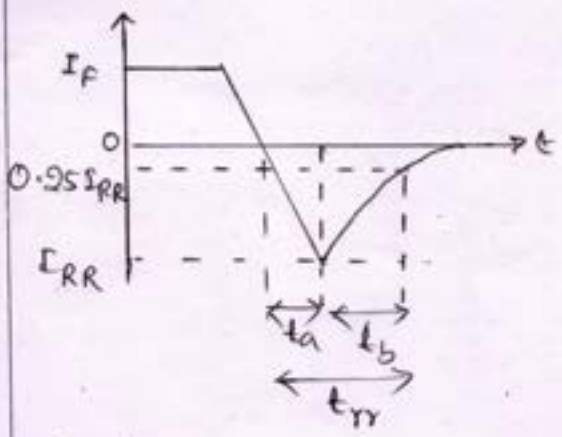
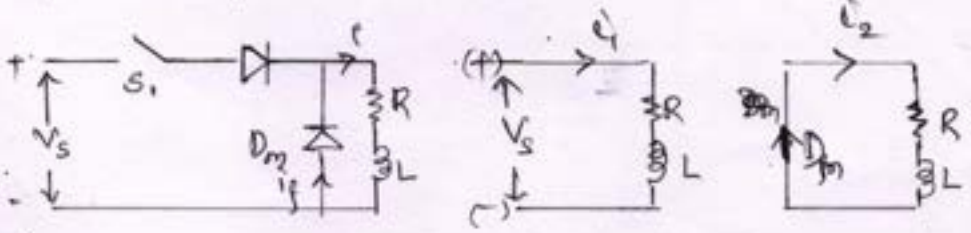
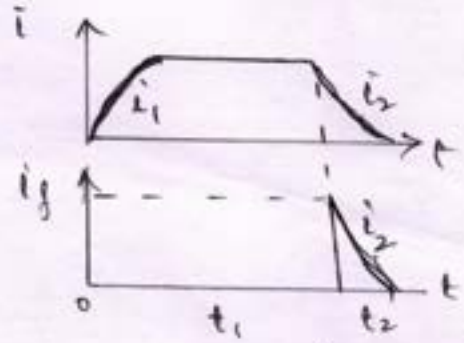
Question Number	Solution	Marks Allocated
2 b)	 $t_{rr} = t_a + t_b$	③
	Explanation	5
c)	i) $Q_{RR} = t_{rr}^2 \frac{di}{dt} \frac{1}{2}$ ii) $I_{RR} = \sqrt{2 Q_{RR} \frac{di}{dt}} = 400\,A_p$ $= 1000\,\mu C$.	2+3
3 a)	i) General Purpose Diodes t_{rr} = 25US, 1-3500A, 50-3000V	②
	ii) Fast Recovery diodes t_{rr} : 0.1US to 5US, 100A, 3000V	②
	iii) Schottky diodes t_{rr} = Nano seconds	①
b)		④
	 $i_1(t) = \frac{V_s}{R}(1 - e^{-t_1 \frac{R}{L}})$ $i_2(t) = I_1 e^{-t \frac{R}{L}}$	④
	Explanation	4
c)	Full wave rectifier circuit	⑤
	Explanation	4

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Email: info@shrideviengineering.org, principal@shrideviengineering.org | Website: www.shrideviengineering.org
(Approved by AICTE, New Delhi, Recognised by Govt. of Karnataka and Affiliated to Visvesvaraya Technological University, Belagavi)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - II, DECEMBER 2022

Semester : V **Subject: POWER ELECTRONICS** **Sub Code: 18EE-53**

Max Marks: 40 Date: 17-12-2022 Duration: 1½ Hours

NOTE: Answer any two full questions

1 a) With neat circuit diagram explain the SCR V-I characteristics. [CO4] 06 Marks

b) Using two transistor model explain the turn ON mechanism of a SCR and derive an expression for anode current interms of transistor parameters. [CO4]08 Marks

c) Explain the turn-ON and turn-OFF characteristics of an SCR [CO4]06 Marks

2 a) With the help of neat circuit diagram, explain the SCR protection [CO4]06 Marks

b) Explain i) Static equalization of an SCR and ii) Dynamic equalization of an SCR [CO4]08 Marks

c) How many SCRs are required in a series string to withstand a DC voltage of 3500 Volts in steady state? If the SCRs have a steady state voltage rating of 1000 Volts and the steady state de rating factor is 30%. Assuming the maximum difference in the leakage current of the SCRs to be 10mA. Calculate the value of voltage sharing resistance to be used. Draw the circuit showing the SCRs and the voltage sharing resistance. [CO4]06 Marks

3 a) Explain the R and RC triggering circuits [CO4]10 Marks

b) With neat circuit diagram and waveforms explain the synchronized UJT triggering circuits. [CO4]10 Marks

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Email: info@shrideviengineering.org, principal@shrideviengineering.org | Website: www.shrideviengineering.org
(Approved by AICTE, New Delhi, Recognised by Govt. of Karnataka and Affiliated to Visvesvaraya Technological University, Belagavi)

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - II, DECEMBER 2022

Semester : V Subject: POWER ELECTRONICS Sub Code: 18EE-53

Max Marks: 40 Date: 17-12-2022 Duration: 1½ Hours

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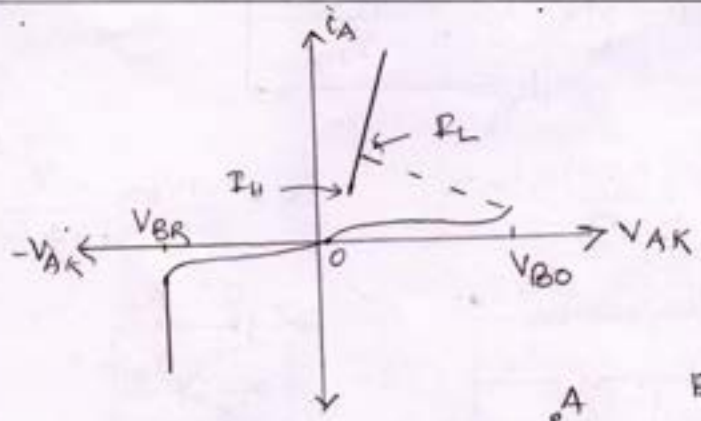
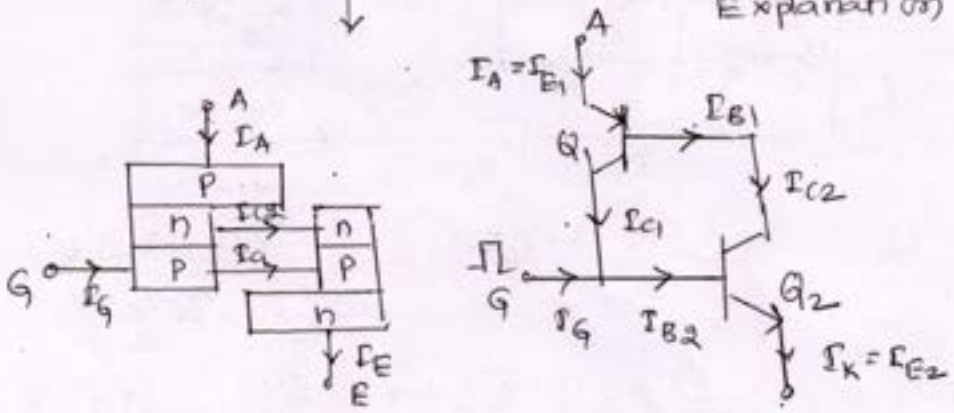
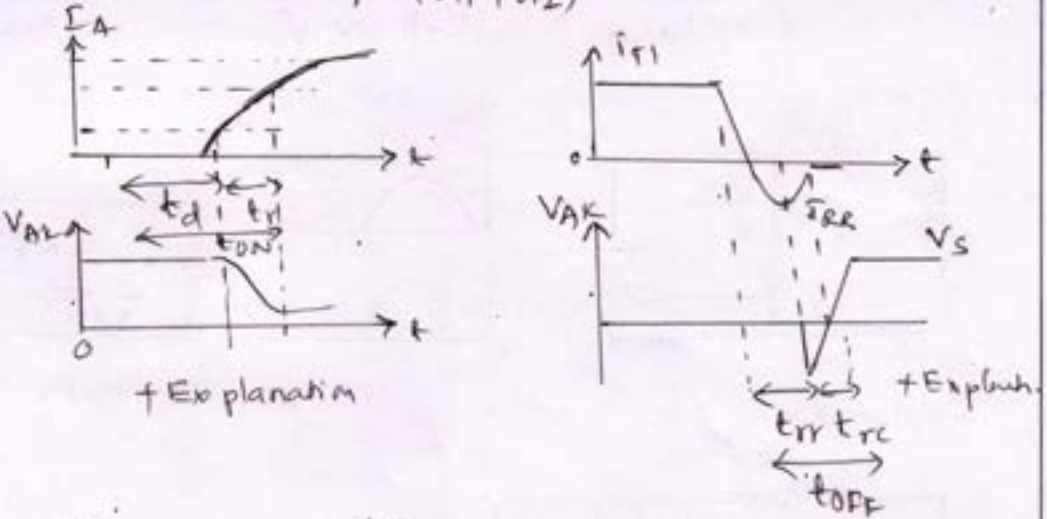
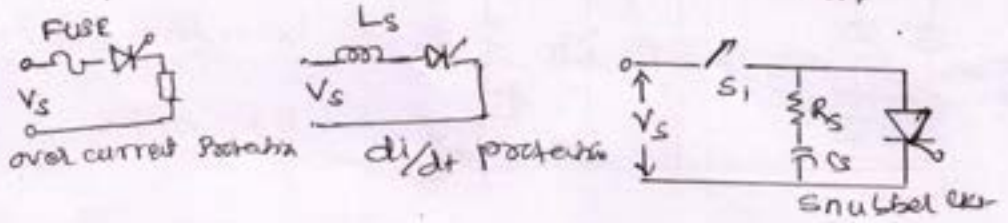
Course Title: POWER ELECTRONICS **Scheme & Solution** **Course Code:** 18EE53

Question Number	Solution	Marks Allocated
1 a)	 Explanation	2 4
b)	 $I_A = \frac{\alpha_2 I_G + (I_{CBO1} + I_{CBO2})}{1 - (\alpha_1 + \alpha_2)}$ + Explanation	3+2 5
c)	 + Explanation + Explanation	3+3
2 a)		2+2+2

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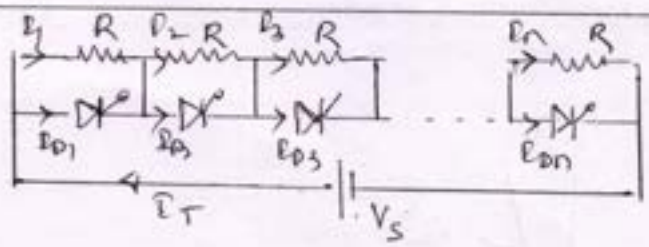
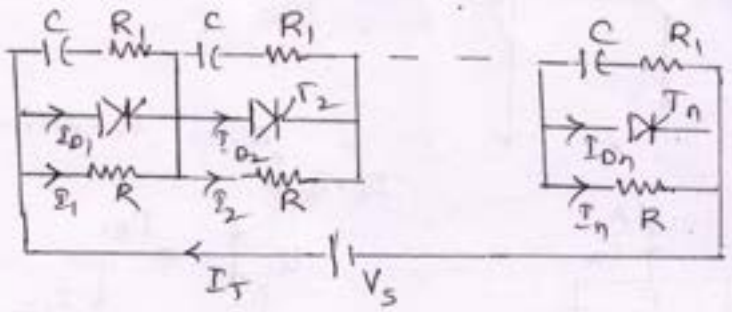
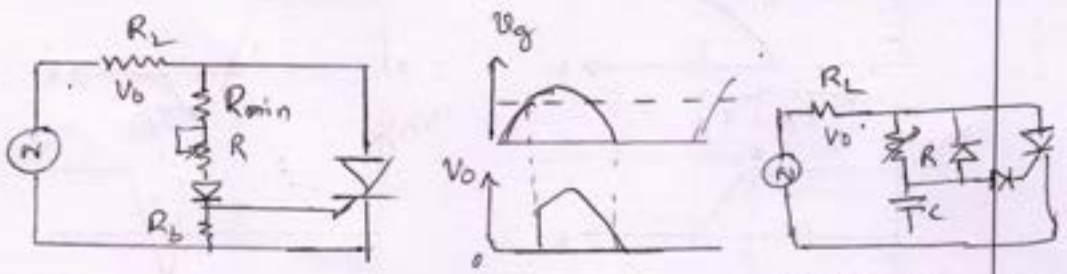
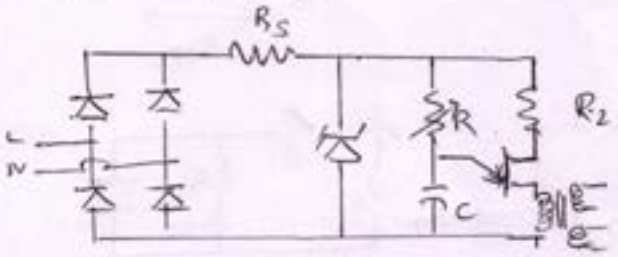
Question Number	Solution	Marks Allocated
2 b)		2
	$V_{D1} = \frac{V_s + (n_s-1)\Delta I_R R}{n_s}$ $\quad R = \frac{nV_{D1} - V_s}{(n_s-1)\Delta I_D}$	2
ii)		2
	$V_{D1} = \frac{V_s + (n_s-1)}{n_s}\left(\frac{\Delta Q}{C_1}\right)$ $\quad C_1 = \frac{(n_s-1)\Delta Q}{n_s V_{D1} - V_s}$	2
c)	$DRF = 1 - \frac{V_s}{n_s V_{D1(M)}}$ $\quad 0.3 = 1 - \frac{3500}{n_s(1000)}$ $\quad n_s = 5$	3
	$R = \frac{n_s V_{D1(M)} - V_s}{(n_s-1) I_{D(M)}} = \frac{5 \times 1000 - 3500}{(5-1)\ 10 \times 10^{-3}} = 37,500\ \Omega$ $\quad 37.5\ k\Omega$	3
3 a)		
	Explanation	5+5
b)		
	Waveforms + ckt dia	5+5
	Explanation	05

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT -III, JANUARY- 2023

Semester : V **Subject: POWER ELECTRONICS** **Sub Code: 18EE-53**
Max Marks: 40 Date: 24-01-2023 Duration: 1½ Hours

NOTE: Answer any two full questions

1 a) Explain the switching characteristics of BJT with waveforms [CO3] 06 Marks

b) What is a MOSFET? Draw static & switching characteristics of a MOSFET & explain the operation of MOSFET as a switch [CO3] 08Marks

c) In the circuit of BJT used as a switch, the BJT has β in the range 10 to 25. If Vcc=230V, Rc =12Ω, V_{BB}= 15 V, $V_{CE(sat)}$= 1.2 V, $V_{BE(sat)}$= 1.8 V. Calculate a) the value of R_B required to move the transistor into saturation with an ODF of 6 (b) forced β_f (c) power dissipated in the transistor [CO3] 06 Marks

2 a) With the help of a circuit diagram & waveforms explain the principle of on-off control AC controller [CO5] 06Marks

b) With necessary circuit diagram and wave forms, explain the operation of full wave AC voltage controller with RL-load. [CO5] 08Marks

c) Explain why short duration single gate pulses are not suitable for AC voltage controller with inductive loads. [CO5] 06Marks

3 a) Describe briefly the various base drive control methods used in bipolar junction transistor [CO5] 12 Marks

b) A single phase full wave AC voltage controller has a resistive load of R= 10Ω and the input voltage is Vs= 120 volts (rms), 60Hz. The delay angle of thyristor T1 and T2 are equal: $\alpha_1 = \alpha_2 = \frac{\pi}{2}$. Determine a) the rms output voltage V_0 (b) the input p.f (c) the average current of thyristor and (d) the rms current of thyristor I_R [CO5] 08Marks

4 a) With the help of a neat circuit diagram, explain the principle of working of a step-down chopper [CO5] 07Marks

b) With the help of a neat circuit diagram, explain the principle of working of a step-up chopper [CO5] 06Marks

c) Explain the classification of Choppers [CO5] 07Marks

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT -III, JANUARY- 2023

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3 a) Describe briefly the various base drive control methods used in bipolar junction transistor [CO5]12 Marks

b) A single phase full wave AC voltage controller has a resistive load of R= 10Ω and the input voltage is Vs= 120 volts (rms), 60Hz. The delay angle of thyristor T1 and T2 are equal: $\alpha_1 = \alpha_2 = \frac{\pi}{2}$. Determine a) the rms output voltage V_0 (b) the input p.f (c) the average current of thyristor and (d) the rms current of thyristor I_R [CO5] 08Marks

4 a) With the help of a neat circuit diagram, explain the principle of working of a step-down chopper [CO5] 07Marks

b) With the help of a neat circuit diagram, explain the principle of working of a step-up chopper [CO5] 06Marks

c) Explain the classification of Choppers [CO5] 07Marks

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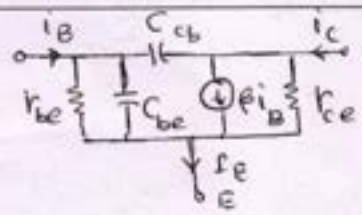
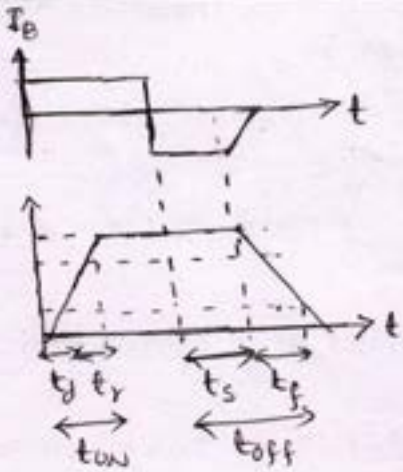
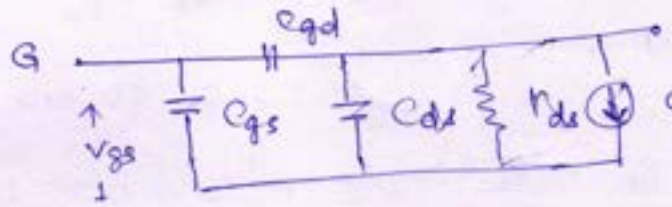
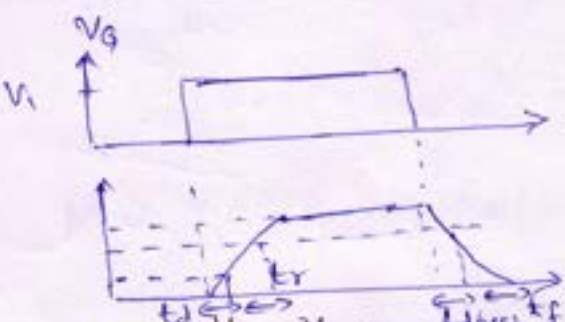
Sub: POWER ELECTRONICS Scheme & Solution Sub Code: 18EE53

Question Number	Solution	Marks Allocated
1 a)	 	1+2 2 03
	Explanation	
b)	Metal - oxide Semiconductor Field Effect Transistor   + Explanation	2 2+2
c)	a) $R_B = \frac{V_{BB} - V_{BE(sat)}}{I_B}$; $I_B = ODF \times I_{BS}$; $I_{BS} = \frac{I_{CS}}{\beta}$	
	$I_{CS} = \frac{V_{CC} - V_{CES}}{R_C} = \frac{230 - 1.2}{1\Omega} = 19.067$ Amp	
	$I_{BS} = \frac{19.067}{10} = 1.9067$ $I_B = ODF \times I_{BS} = 6 \times 1.9067 = 11.44$ A	
	$R_B = \frac{15 - 1.8}{11.44} = 1.154\ \Omega$	3
	b) $\beta_f = \frac{I_{CS}}{I_B} = \frac{19.067}{11.44} = 1.667$	1
	c) Power loss $P_T = V_{BES} I_{BS} + V_{CES} I_{CS} = 29.31$ Watts	2

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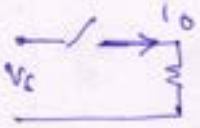
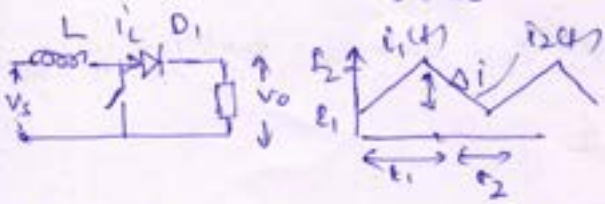
Q.No.	Solution	Marks Allocated
2 a)	Circuit Diagram ; Waveforms	02
	$V_{O(rms)} = \sqrt{K}\, V_{S(rms)}$: $I_A = K\frac{I_m}{\pi}$; $I_R = \sqrt{K}\frac{I_m}{2}$	02
	Explanation	02
b)	Circuit Diagram ; Wave forms	03
	$V_{O(rms)} = V_{S(rms)}\sqrt{\frac{1}{\pi}(\pi - \alpha + \frac{\sin 2\alpha}{2})}$ + Explanation	03+02
c)	Wave forms + Explanation	02 +04
3 a)	Base Drive Control } i) Turn-on control ii) Turn-off control	3+3
	Explanation iii) Proportional base control iv) Anti-saturation control	3+3
b)	$I_{CS} = \frac{V_{CC} - V_{CE(sat)}}{R_C} = \frac{220 - 1.2}{12} = 18.06$; $I_{BS} = \frac{I_{CS}}{\beta_F} = 1.8$	
	a) $V_{O(rms)} = V_{S(rms)}\sqrt{\frac{1}{\pi}(\pi - \alpha + \frac{\sin 2\alpha}{2})} = 84.85$ Volts	(2)
	b) $P.f = \frac{P_O}{V_S I_S} = \frac{P_O}{V_S I_O} = \frac{P_O^2 R}{V_S I_O} = \frac{(8.485)^2 10}{120(8.485)} = 0.707$ (Lag)	(3)
	c) $I_A = \frac{V_m}{2\pi}[\cos\alpha + 1] = \frac{\sqrt{2}V_S}{R}(\cos 90 + 1) = 2.7$	(2)
	d) $I_R = \frac{I_m}{2}\sqrt{\frac{1}{\pi}(\pi - \alpha + \frac{\sin 2\alpha}{2})} = 5.99 \approx 6$ Amp	(3)
4 a)	 $V_L = KV_S$; $I_A = \frac{V_O}{R}$; $V_{O\,rms} = \sqrt{K}\,V_S$; $P_i = K\frac{V_S^2}{R}$; $R_i = \frac{R}{K}$ + explanation	(2)+(2)
b)	 $V_O = V_S\left(\frac{1}{1-K}\right)$ + Explanation	(2)+(2)+2
c)	Explanation about class A, class B, class C, class D, class E	07

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, NOVEMBER 2022

Semester : V **Subject: SIGNALS & SYSTEMS** **Sub Code: 18EE-54**
Max Marks: 40 Date: 12-11-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Distinguish between [CO 1] 08 Marks
- i) Continuous time & Discrete time signals
- ii) Even & Odd signals
- iii) Periodic & Non periodic signals
- iv) Energy & Power signals

b) Find and sketch the even and odd components of the signal x(t) = $\begin{cases} t & 0 \le t \le 1 \\ 2-t & 1 \le t < 2 \end{cases}$ [CO2] 08 Marks

c) Find the even & odd components of each of the following signals. x(t) = cost + sint + sint cost [CO2]04Marks

2 a) Find the even & odd components of x[n] = {3, 2, 1, 4, 5} [CO2]10 Marks

b) Determine whether the signal is periodic or not, if periodic find the fundamental period T.

i) x[n] = cos $\left(\frac{\pi n}{2}\right) + \sin \frac{\pi n}{4}$ ii) x(t) = cos(2πt)sin(4πt). [CO2] 10 Marks

3 a) Test whether the given signal is energy signal or power signal i) x(t)= $e^{2t}u(-t)$. ii) x(t)= $e^{t-1}u(-t)$.
iii) x(t)= $e^{1+2t}u(1-t)$. [CO] 10 Marks

b) Sketch the waveforms for the following signals
i) x1(t)=u(t + 2)-2u(t) +u(t -2) (ii) x2(t)= r(t + 1)-r(t) +r(t -2) [CO2] 10 Marks

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, NOVEMBER 2022

Semester : V **Subject: SIGNALS & SYSTEMS** **Sub Code: 18EE-54**
Max Marks: 40 Date: 12-11-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Distinguish between [CO 1] 08 Marks
- i) Continuous time & Discrete time signals
- ii) Even & Odd signals
- iii) Periodic & Non periodic signals
- iv) Energy & Power signals

b) Find and sketch the even and odd components of the signal x(t) = [CO2] 08 Marks

c) Find the even & odd components of each of the following signals. x(t) = cost + sint + sint cost [CO2]04Marks

2 a) Find the even & odd components of x[n] = {3, 2, 1, 4, 5} [CO2]10 Marks

b) Determine whether the signal is periodic or not, if periodic find the fundamental period T.

i) x[n] = cos — — (t) = cos(2πt)sin(4πt). [CO2] 10 Marks

3 a) Test whether the given signal is energy signal or power signal i) x(t)= . ii) x(t)= .
iii) x(t)= . [CO] 10 Marks

b) Sketch the waveforms for the following signals
i) x1(t)=u(t + 2)-2u(t) +u(t -2) (ii) x2(t)= r(t + 1)-r(t) +r(t -2) [CO2] 10 Marks

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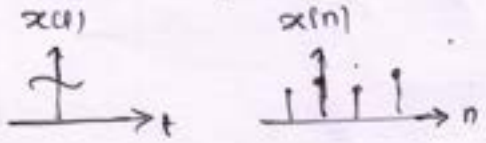
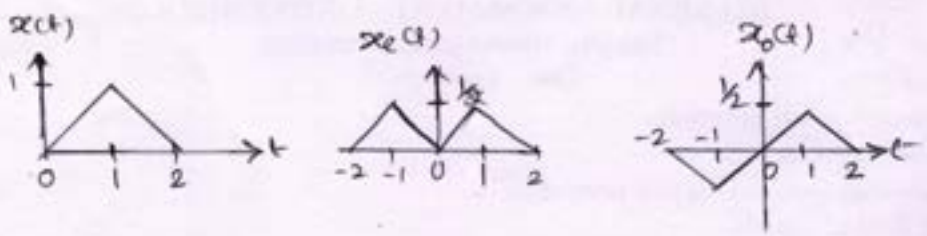
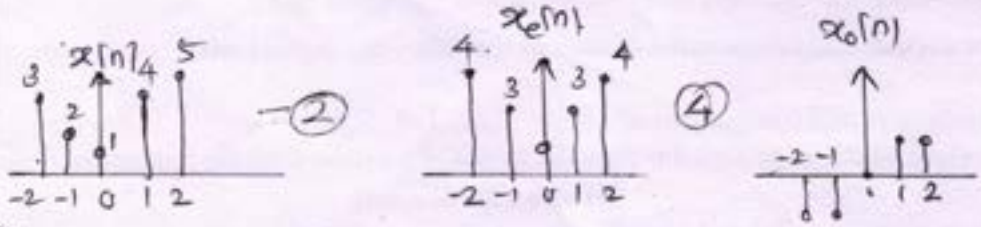
Course Title: **Scheme & Solution** **Course Code:**

Question Number	Solution	Marks Allocated
1 a)	i) 	1
	ii) $x_e(t) = \frac{x(t)+x(-t)}{2}$ $x_o(t) = \frac{x(t)-x(-t)}{2}$	2
	iii) $x(t) = x(t+T)$ for all T periodic $x(t) \neq x(t+T)$ for all T Non periodic	1
	iv) A Signal which is completely described by the mathematical model is called "Deterministic" signal A signal which cannot be developed by the mathematical model is called 'Random signal'	2
	v) Finite energy - Energy signal Signal have finite average power - Power signal	2
b)		2+4+4
c)	$x_e(t) = \cos t$ $x_o(t) = \sin t + \sin t \cos t$	2+2
2 a)		4
b)	(i) $N_1 = 4$ $N_2 = 8$ $N = 2N_1 = 1N_2 = 8$ samples periodic	5
	ii) $T_1 = 1$ sec $T_2 = \frac{1}{2}$ $T = T_1 = 2T_2 = 1$ sec periodic	5

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Question Number	Solution	Marks Allocated

3a) i) $E = \int_{-\infty}^{0} |x(t)|^2 dt = \int e^{4t} dt = \frac{1}{4} < \infty$ Energy signal

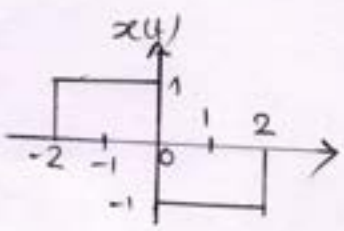
ii) $E = \int_{-\infty}^{0} e^{2t-2} dt = e^{-2} \int_{-\infty}^{0} e^{2t} dt = \frac{1}{2} e^{-2} = 0.068J$

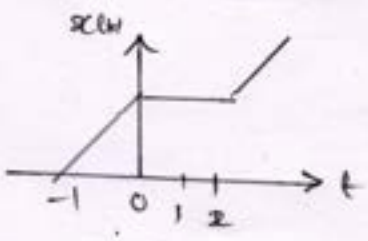
Energy signal

iii) $\int_{-\infty}^{1} e^{2+4t} dt = e^2 \int_{-\infty}^{1} e^{4t} dt = \frac{e^2}{4} [e^4 - e^{-\infty}] = \frac{1}{4} e^6$

$= 100.86J$ E-signal

b)





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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT -II, DECEMBER 2022

Semester : V **Subject: SIGNALS & SYSTEMS** **Sub Code: 18EE-54**

Max Marks: 40 Date: 17-12-2022 Duration: 1½ Hours

NOTE: Answer any two full questions

1 a) The trapezoidal pulse shown in figure, find total energy of x(t) [CO1]06 Marks

b) The trapezoidal pulse shown in figure is applied to a differentiator defined by y(t) =dx(t)/dt

i) Find the resultant output of the differentiator
ii) Find the total energy of y(t) [CO1]06 Marks

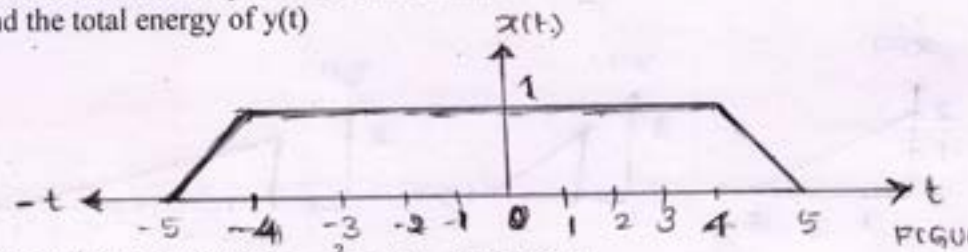


FIGURE Q 1@5 10

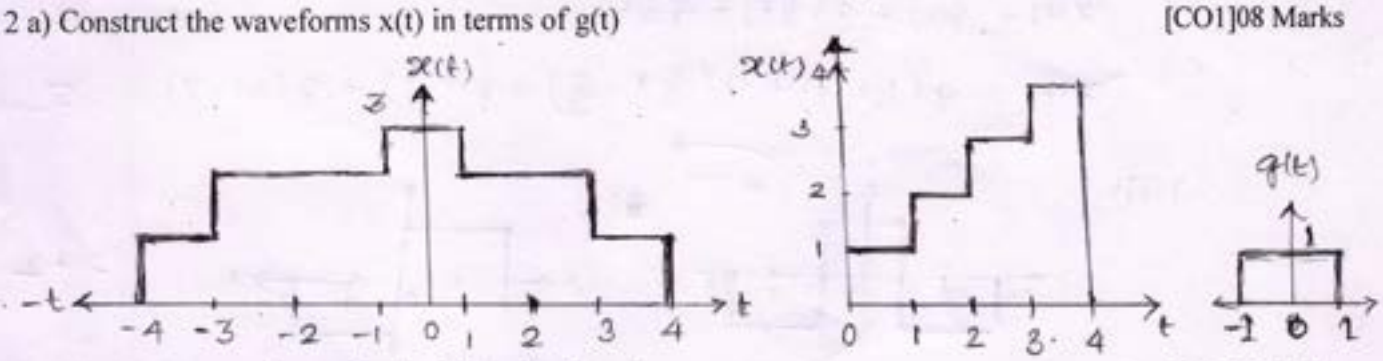
c) The continuous time signal $x(t) = -\frac{2}{3}t + 2 \quad 0 < t < 3$

$= 0$ elsewhere [CO1]08 Marks

Sketch the following signals i) $y_1(t) = x(2t-2)$ ii) $y_2(t) = x[\frac{1}{2}(t-2)]$ iii) $y_3(t) = x(-0.5t - 1)$

iv) $x_e(t)$ and $x_o(t)$

2 a) Construct the waveforms x(t) in terms of g(t) [CO1]08 Marks



b) Sketch the waveforms for the following signals [CO1]08 Marks

i) $x_1(t) = u(t+2) - 2u(t) + u(t-2)$ ii) $x_2(t) = -u(t+3) + 2u(t+1) - 2u(t) - 2u(t-1) + u(t-3)$

iii) $x_3(t) = r(t+1) - r(t) + r(t+2)$ iv) $x_4(t) = r(t+2) - r(t+1) - r(t-1) + r(t-2)$

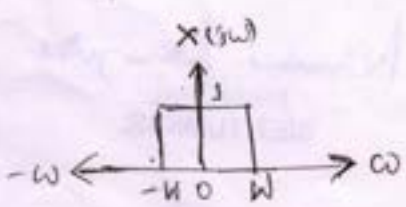
c) Consider the system whose output is $y(t) = \cos w_c t + x(t)$ [CO1]04 Marks

Determine whether it is i) memory less ii) causal iii) linear iv) time invariant v) stable

3 a) find the Fourier Transform of $x(t) = e^{-at} u(t)$ [CO4]06 Marks

b) Consider rectangular pulse depicted in figure and defined as $x(t) = \begin{cases} 1 & -T, < t < T \\ 0 & |t| > T \end{cases}$ [CO4]06 Marks

c) Find the inverse Fourier transform of the rectangular spectrum depicted in figure [CO4]08 Marks



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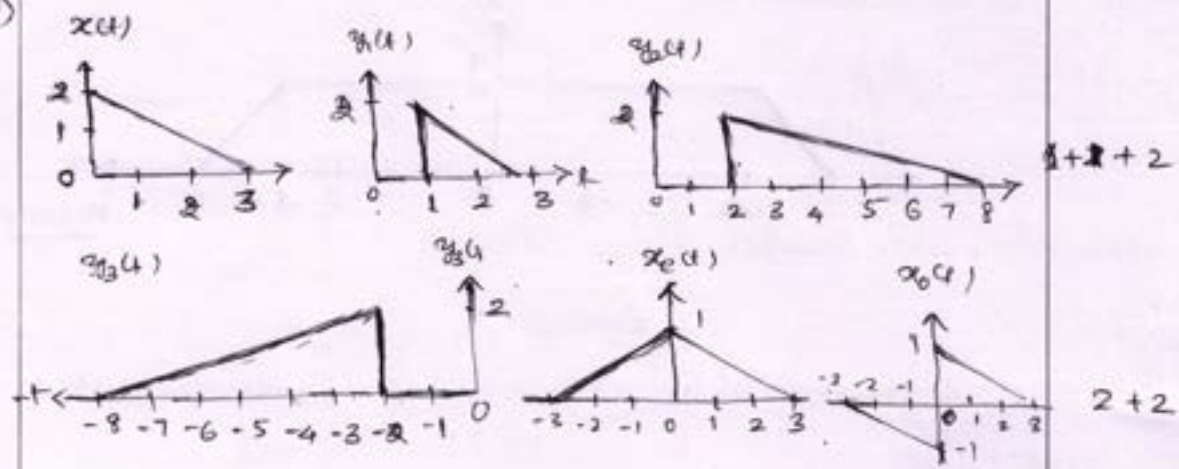
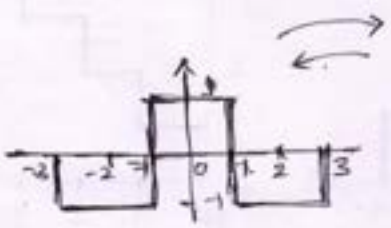
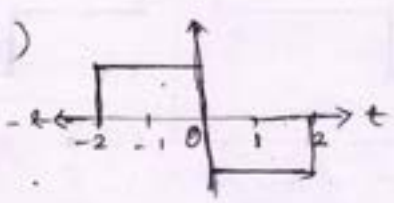
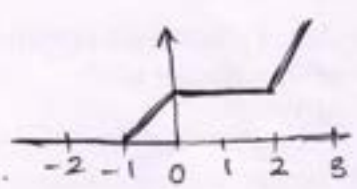
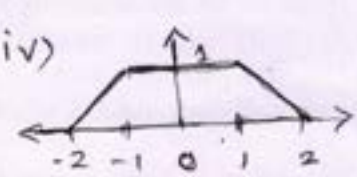
Course Title: SIGNALS & SYSTEMS **Scheme & Solution** **Course Code:** 18EE54

Question Number	Solution	Marks Allocated
1 a)	$x(t) = \begin{cases} t+5 & -5 \le t \le -4 \\ 1 & -4 \le t \le 4 \\ t-5 & 4 \le t \le 5 \end{cases}$ $E = \frac{26}{3}$ Joules $= 8.66$	2 + 4
b)	i) $\frac{d}{dt}(t+5) + \frac{d}{dt}(1) + \frac{d}{dt}(-t+5)$ $y(a) = \begin{cases} 1 & -5 \le t \le -4 \\ -1 & 4 \le t \le 5 \end{cases}$	3
	ii) $E = \int_{-5}^{-4} 1^2 dt + \int_{4}^{5} 1^2 dt = (t)_{-5}^{-4} + (t)_{4}^{5} = 2$ Joules	3
c)		2 + 2
		2 + 2
2 a)	$x(t) = g(t) + g\left(\frac{1}{3}t\right) + g\left(\frac{1}{4}t\right)$	3
	$x(t) = g\left(\frac{1}{2}t - 1\right) + g\left(\frac{2}{3}t - \frac{5}{3}\right) + g(t-3) + g(2t-7)$	5
b) ii)		2 + 2
i)		
iii)		2 + 2
iv)		
c)	i) Memoryless (Static) ii) Causal iii) Linear iv) Time invariant v) Stable	4
3 a)	$X(j\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt = \int_{-\infty}^{\infty} e^{-at} u(t) e^{-j\omega t} dt = \int_{0}^{\infty} e^{-(a+j\omega)t} dt$ (3)	
	$\frac{e^{-(a+j\omega)t}}{-(a+j\omega)} = \frac{e^{-\infty} - e^{0}}{-(a+j\omega)} = \frac{1}{a+j\omega}$ (3)	

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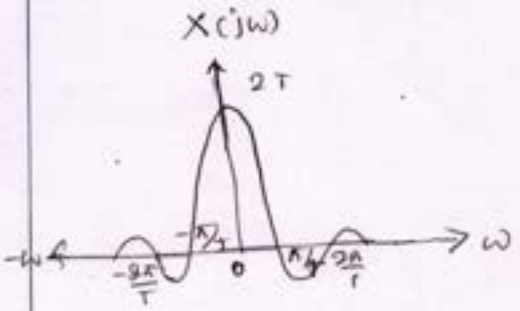
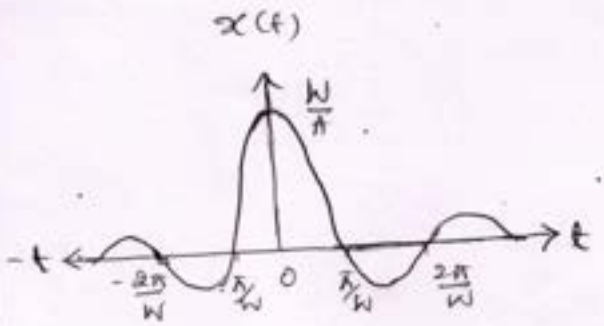
Course Title: **Scheme & Solution** **Course Code:**

Question Number	Solution	Marks Allocated
b)	$X(j\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt = \int_{-T}^{T} 1 \cdot e^{-j\omega t} dt = \left[\frac{e^{-j\omega t}}{-j\omega} \right]_{-T}^{T}$	2
	$X(j\omega) = \frac{2}{\omega} \sin \omega T$ for $\omega \neq 0$	2
	$X(j\omega) = 2T$ for $\omega = 0$	
	$X(j\omega)$  $X(j\omega) = 2T \operatorname{Sinc} \omega T$	2
c)	$x(t) = \begin{cases} \frac{\sin Wt}{\pi t} & \text{for } t \neq 0 \\ \frac{W}{\pi} & \text{for } t = 0 \end{cases}$	6
	$x(t)$ 	(2)

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT -III, JANUARY- 2023

Semester : V | **Subject: SIGNALS & SYSTEMS** | **Sub Code: 18EE-54**

Max Marks: 40 | Date: 24-01-2023 | Duration: 1½ Hours

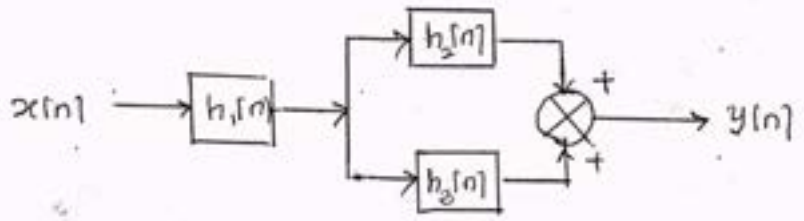
NOTE: Answer any two full questions

1 a) Determine the convolution sum of two sequences x[n] = {3, 2, 1, 2} h[n] ={1, 2, 1, 2}. [CO2] 10 Marks

b) Evaluate the discrete time convolution sums $y[n] = \beta^n u[n] * \alpha^n u[n] \quad |\beta| < 1 ; |\alpha| < 1$ [CO1] 10Marks

2 a) Determine graphically, the output of an LTI system whose impulse response is h(t) = 3u(t-1) -3 u(t-3) and input is x(t) = u(t + 1) – 2u(t - 1) + u(t - 3) [CO3] 08 Marks

b) Compute y[n] in the figure, given $h_1[n] = (½)^n u[n]$, $h_2[n] = u[n-2]$ and $h_3[n] = \delta[n] + \delta[n-1]$ [CO5] 06Marks



c) The impulse response of a LTI system is $h(t) = e^{2t} u(t-1)$. Check whether the system is stable, causal & memory less [CO4] 06 Marks

3 a) Find the step response of a system whose impulse response is given by h(t) = u(t+1) - u(t-1) [CO2] 06Marks

b) Find the step response for the LTI system represented by the impulse response $h[n] = (½)^n u[n]$ [CO3] 06 Marks

c) The differential equation of the system is given as $\frac{dy^2}{dt^2} + 3\frac{dy}{dt} + 2y = x(t)$ with $y(o) = 3, \frac{dy(o)}{dt} = -5$. Determine the total response of the system for a step input. [CO5] 08Marks

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT -III, JANUARY- 2023

Semester : V | **Subject: SIGNALS & SYSTEMS** | **Sub Code: 18EE-54**

Max Marks: 40 | Date: 24-01-2023 | Duration: 1½ Hours

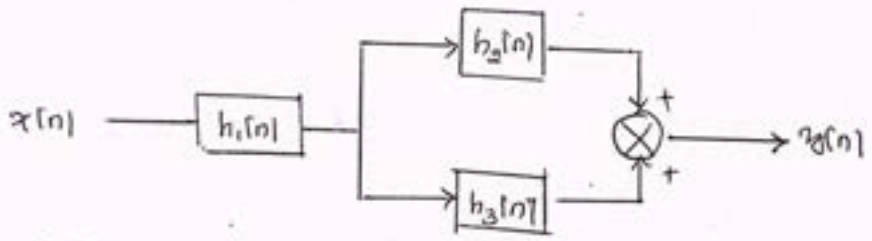
NOTE: Answer any two full questions

1 a) Determine the convolution sum of two sequences x[n] = {3, 2, 1, 2} h[n] ={1, 2, 1, 2}. [CO2] 10 Marks

b) Evaluate the discrete time convolution sums $y[n] = \beta^n u[n] * \alpha^n u[n] \quad |\beta| < 1 ; |\alpha| < 1$ [CO1] 10Marks

2 a) Determine graphically, the output of an LTI system whose impulse response is h(t) = 3u(t-1) -3 u(t-3) and input is x(t) = u(t + 1) – 2u(t - 1) + u(t - 3) [CO3] 08 Marks

b) Compute y[n] in the figure, given $h_1[n] = (½)^n u[n]$, $h_2[n] = u[n-2]$ and $h_3[n] = \delta[n] + \delta[n-1]$ [CO5] 06Marks



c) The impulse response of a LTI system is $h(t) = e^{2t} u(t-1)$. Check whether the system is stable, causal & memory less [CO4] 06 Marks

3 a) Find the step response of a system whose impulse response is given by h(t) = u(t+1) - u(t-1) [CO2] 06Marks

b) Find the step response for the LTI system represented by the impulse response $h[n] = (½)^n u[n]$ [CO3] 06 Marks

c) The differential equation of the system is given as $\frac{dy^2}{dt^2} + 3\frac{dy}{dt} + 2y = x(t)$ with $y(o) = 3, \frac{dy(o)}{dt} = -5$. Determine the total response of the system for a step input. [CO5] 08Marks

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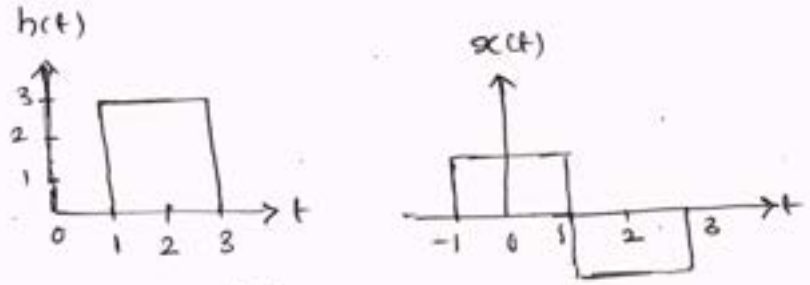
Sira Road TUMKUR-572106

Course Title: Signals & Systems **Scheme & Solution** **Course Code: 18EE54**

Question Number	Solution	Marks Allocated
1 a)	$y[n] = \sum_{k=-\infty}^{\infty} x[k]\, h[n-k]$	2 Marks
	$y[n] = \{3, 8, 8, 12, 9, 4, 4\}$ (↑ at 8)	8 Marks
b)	i) $\sum_{k=-\infty}^{n} x[k]\, h[n-k]$	
	$\sum_{k=0}^{n} \beta^k \alpha^{n-k} = \alpha^n \sum_{k=0}^{n} \left(\frac{\beta}{\alpha}\right)^k$	5 Marks
	$y[n] = \frac{\alpha^{n+1} - \beta^{n+1}}{\alpha - \beta}$ for $\alpha \neq \beta$	
	ii) $y[n] = \alpha^n \sum_{k=0}^{n} \left(\frac{\alpha}{\alpha}\right)^k = \alpha^n \sum_{k=0}^{n} (1)^k$	
	$y[n] = \alpha^n [n+1]$ for $\alpha = \beta$	5 Marks
2 a)		(2)
	i) $y(t) = \int_{-1}^{t-1} 3 \times 1\, d\tau = 3t \quad 0 \le t \le 2$	(2)
	ii) $\int_{t-3}^{1} 3 \times 1\, d\tau + \int_{1}^{t-1} -3 \times 1\, d\tau = 3(\tau)_{t-3}^{1} - 3(\tau)_{1}^{t-1}$	
	$3[1 - t + 3] - 3[t - 1 - 1] = 3 - 3t + 9 - 3t + 3 + 3$	
	$y(t) = 18 - 6t \quad 2 \le t \le 4$	(2)

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Question Number	Solution	Marks Allocated
	iii) $y(t) = \int_{t-3}^{3} -1 \times 3 \, d\tau = -3(\tau)_{t-3}^{3} = -3[3-t+3]$	
	$y(t) = -3[6-t]$ $y(t) = -18+3t$ $4 \le t \le 6$	
	$y(t) = \begin{cases} 3t & 0 \le t \le 2 \\ 18-6t & 2 \le t \le 4 \\ 3t-18 & 4 \le t \le 6 \end{cases}$	(2)
b)	$h[n] = h_1[n] * \{h_2[n] + h_3[n]\}$	
	$= \left(\frac{1}{2}\right)^n u[n] * [u[n-2] + \delta[n] + \delta[n-1]]$	
	$= \left(\frac{1}{2}\right)^n u[n] * u[n]$	(2)
	$y[n] = \sum_{k=-\infty}^{\infty} x[k]\, h[n-k] = \sum_{k=-\infty}^{\infty} \left(\frac{1}{2}\right)^k u(k)\, u(n-k)$	(1)
	$y[n] = \sum_{k=0}^{n} \left(\frac{1}{2}\right)^k = \frac{1-\left(\frac{1}{2}\right)^{n+1}}{1-\frac{1}{2}} = 2\left[1-\left(\frac{1}{2}\right)^{n+1}\right]$ (or) $2-\left(\frac{1}{2}\right)^n$	(3)
c)	Stability: $\int_{-\infty}^{\infty} \lvert h(\tau)\rvert \, d\tau = \int_{1}^{\infty} e^{2\tau} d\tau = \left(\frac{e^{2\tau}}{2}\right)_1^{\infty}$	
	$\frac{e^{\infty} - e^{2}}{2} = \frac{\infty - e^2}{2} = \infty$ UNSTABLE	(2)
	$h(t) = 0$ for $t < 0$ CAUSAL	(2)
	Not Memoryless [Memory] $\because h(t) \neq 0$ for $t \neq 0$	(2)
3 a)	$s(t) = \int_{-\infty}^{t} h(\tau)\, d\tau$ 	
	i) $s(t) = 0$ for $t < -1$	(2)
	ii) For $t < 1$ $s(t) = \int_{-1}^{t} h(\tau)\, d\tau = \int_{-1}^{t} 1 \, d\tau = (\tau)_{-1}^{t}$	
	$s(t) = t - (-1)$ $s(t) = t+1$	(2)

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Question Number	Solution	Marks Allocated

iii) For $t \geq 1$ $\quad s(t) = \int_{-1}^{1} 1\,d\tau = (\tau)_{-1}^{1} = 1-(-1) = 2$ (2)

$$s(t) = \begin{cases} 0 & t < -1 \\ t+1 & -1 < t < 1 \\ 2 & t \geq 1 \end{cases}$$

b) $s[n] = \sum_{k=-\infty}^{\infty} h[k] = \sum_{k=-\infty}^{\infty} \left(\frac{1}{2}\right)^k u(k) = \sum_{k=0}^{n} \left(\frac{1}{2}\right)^k$ (2)

$s[n] = \frac{1-\left(\frac{1}{2}\right)^{n+1}}{1-\frac{1}{2}} = \frac{1-\left(\frac{1}{2}\right)^{n+1}}{\frac{1}{2}} = 2\left[1-\left(\frac{1}{2}\right)^{n+1}\right]$ (2)

$s[n] = 2 - \left(\frac{1}{2}\right)^n$ (2)

3c) $ce^{\lambda t}\left[\lambda^2 + 3\lambda + 2\right] = 0 \qquad (\lambda+1)(\lambda+2)$ (2)

$\lambda_1 = -1 \; ; \; \lambda_2 = -2$

$y(t) = C_1 e^{\lambda_1 t} + C_2 e^{\lambda_2 t} = C_1 e^{-1t} + C_2 e^{-2t}$ (2)

Particular sol $\quad x(t) = u(t) \Rightarrow x(t) = 1$

$y_p(t) = C$

$\frac{dy_p(t)}{dt} = 0$

$\frac{d^2 y_p(t)}{dt^2} = 0$

$\frac{d^2 y_p(t)}{dt^2} + 3\frac{dy_p(t)}{dt} + 2y_p(t) = x(t)$

$0 + 0 + 2C = 1 \quad \therefore C = \frac{1}{2}$

$\therefore y_p(t) = \frac{1}{2}$

$y(t) = y_n(t) + y_p(t)$

$y(t) = C_1 e^{-t} + C_2 e^{-2t} + \frac{1}{2}$ - (1)

Diff

$\frac{dy(t)}{dt} = -C_1 e^{-t} - 2C_2 e^{-2t}$ - (2) (2)

When $t = 0$, eqn (1) $\quad y(0) = C_1 + C_2 + \frac{1}{2} \Rightarrow 3 = C_1 + C_2 + \frac{1}{2}$

$\therefore C_1 + C_2 = \frac{5}{2}$ - (3)

When $t = 0$ eqn (2) becomes $-5 = -C_1 - 2C_2 \Rightarrow -C_1 - 2C_2 = -5$ - (4)

Solve eqn (3) & (4) $\quad C_1 = 0 \quad C_2 = \frac{5}{2}$

$y(t) = \frac{5}{2} e^{-2t} + \frac{1}{2}$ (2)

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INTERNAL ASSESSMENT - 1

Sub: Power System Analysis-1
Sem: VI sem
Max Marks: 40

Sub code: 18EE62
Date:
Duration: 90 Minutes

Note: **Answer any two full questions**

1. a) Define per unit quantity. What are the advantages of P.U.System. **5M**

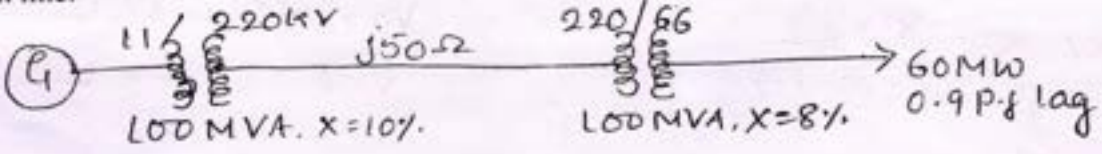
b) Show that per Unit impedance of a two winding transformer on either of its side is equal. **5M**

c) A 100MVA, 33KV, 3-phase generator has a subtransient reactance of 15%. The generator is connected to motors through a transmission line and transformers as shown in fig. The motors have a rated inputs of 30MVA, 20MVA & 50MVA at 30 kV with 20% subtransient reactance. The 3-phase transformers are rated at 11MVA, 32kV Δ / 100kV Y with a leakage reactance 8%. The line has a reactance of 50 ohms. Selecting the generator rating as the base quantities in the generator circuit. Evaluate the corresponding pu values. Hence draw the reactance diagram. **10M**

OR

2. a) Write the procedure to form the reactance diagram from single line diagram. **6M**

b) The one line diagram of a power system is shown in figure. The ratings of the various components are also given. A load of 60MW at 0.9 p.f lagging is tapped from 66kv substation bus which is to be maintained at 60kv. Calculate the terminal voltage of the generator using p.u. method. Select a base of 100 MVA & 220 kv on the transmission line. **14M**



3 .a) Show that a balanced 3 phase generator develops only positive sequence voltages only. **6M**

b) The 3 line voltages of a 3 phase system are $|V_A| = 400V$, $|V_B| = 500V$ & $|V_C| = 600V$. Determine the sequence components of the line & phase voltages. **8M**

c) Derive an expression for relation between sequence components of line and phase values in a three phase star connected system. **6M**

OR

4.a) Derive an expression for symmetrical components in terms of phase voltages. **6M**

b) Derive an expression for relation between sequence components of line and phase values in a three phase delta connected system. **6M**

c) In a 3 phase 3 wire system, the line currents are Ia = $100\angle 0°$ A & Ib= $100\angle -100°$ A. determine the sequence components of line currents. **8M**

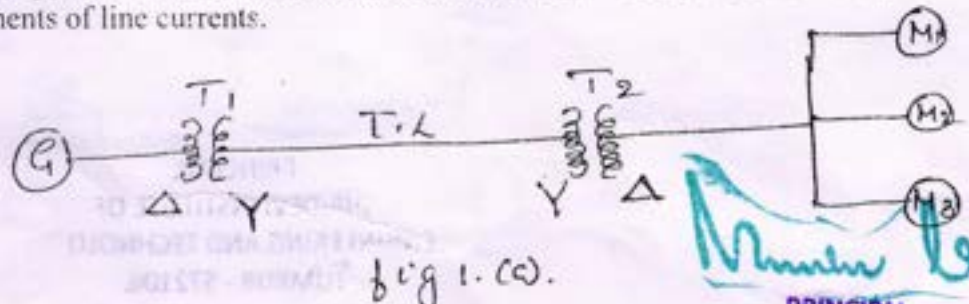


fig 1.(c).

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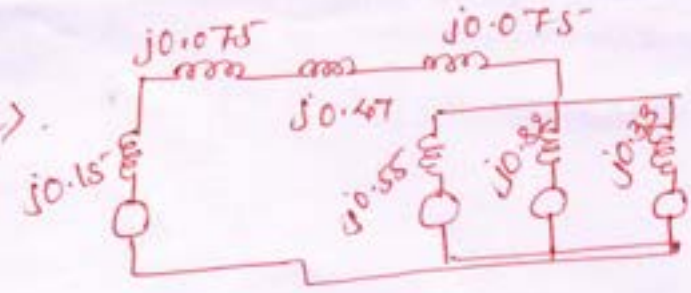
1.c)



$(kV)_B$ for Tx2 Line

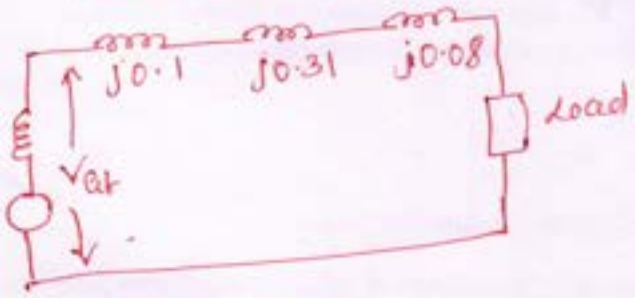
$= 103.125 \angle kV$

$(kV)_B$ M → 33kV.

2. b) $(kV)_B$ on Tx2 L. = 220kV

$(kV)_B$ on Load = 66kV

$(kV)_B$ on G1 = 11kV.



$(I_L)_A = 641.5 \angle -25.84$ A

$(I_L)_B = 874.77$ A

$(I_L)_{pu} = 0.733 \angle -25.84$ pu.

$V_{a1} = 1.112 \angle 6.8$ F pu.

$|V_{a1}| = 12.23$ kV.

(~~V~~)

3. b) $\alpha = 82.82$

$\beta = 53.77$

$V_{A0} = 0$

$V_{A1} = 490.84 \angle 9.27$ V

$V_{A2} = 117.34 \angle -137.4$ V

$V_{a1} = 284.54 \angle -80.73$

$V_{a0} = 67.75 \angle -47.4$ V

4. c) $I_c = 128.56 \angle 180°$ A

$I_{a0} = 0$

$I_{a1} = 108.5 \angle 110°$ A

$I_{a2} = 20.05 \angle -110°$ A.

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Scheme of Evaluation — Apr - 2023

Power System Analysis - 1 (18EE62)

IA - 1

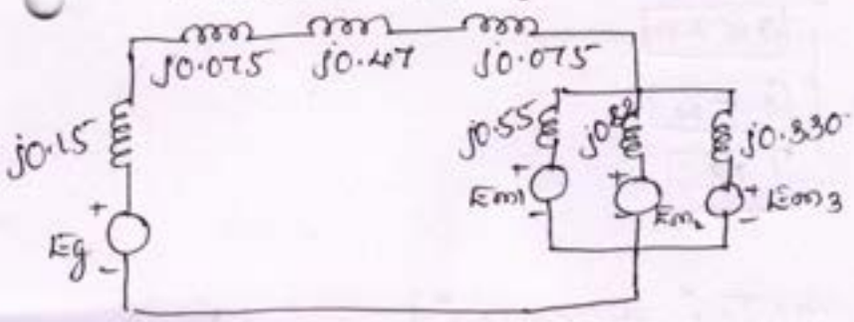
1. a) Definition. ⟶ 1M.
Advantages of p.u. system (Any 4) ⟶ 4M

b) Derivation

$(Z_{eq1})_{pu} = (Z_{eq2})_{pu}$ ⟶ 5M

c) $(kV)_B$ for T$_L$ = 108.125 kV
$(kV)_B$ for M = 33 kV. } 2M

Calculation of reactances ⟶ 4M

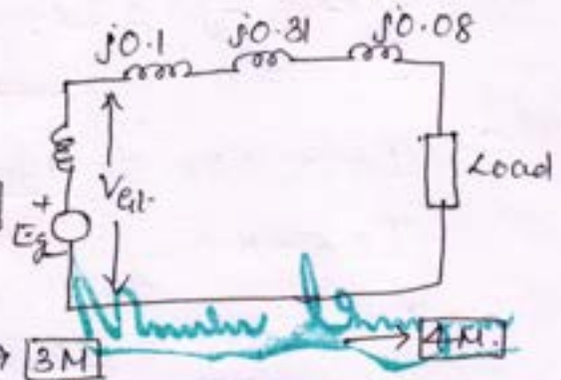


⟶ 4M

2. a) Procedure to form reactance diagram from single line diagram.

1) Step 1
2) Step 2
3) Step 3 } Each 2M ⟶ 6M.

b) $(kV)_B$ for T$_L$ = 220 kV
$(kV)_B$ for Gen = 11 kV
$(kV)_B$ for Load = 66 kV } ⟶ 2M



Calculation of Reactances ⟶ 3M ⟶ 4M.

Calcation of Terminal Vtg.:-

$V_L = 0.909$ pu.
$I_L(A) = 641.5 \angle -25.84$ A ⟶ Each 1M
$(I_L)_B = 874.77$ A
$(I_L)_{pu} = 0.733 \angle -25.84$ ⟶ 5M
$V_{d1} = 1.112 \angle 16.87$ pu.

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2. a) Derivation $\begin{bmatrix} V_{a0} \\ V_{a1} \\ V_{a2} \end{bmatrix} = \begin{bmatrix} 0 \\ V_a \\ 0 \end{bmatrix}$ → 6M

b) $\alpha = 82.82$
$\beta = 55.77$ } → 2M

$V_{a1} = 284.54 \angle -80.73°$ V
$V_{a2} = 67.75 \angle -47.4°$ V
→ 2M

$V_B = 500 \angle 262.92°$ V
$V_C = 600 \angle 124.23°$ V } → 1M

$V_{A1} = 492.84 \angle 9.27°$ V
$V_{A2} = 117.34 \angle -137.4°$ V
$V_{A0} = 0$ } → 3M

c) Derivation:

$V_{A1} = j\sqrt{3}\, V_{a1}$ — 2.5M
$V_{A2} = -j\sqrt{3}\, V_{a2}$ — 2.5M
$V_{A0} = 0$ — 1M.

4. a) $P = 3\{V_{a0} I_{a0}^* + V_{a1} I_{a1}^* + V_{a2} I_{a2}^*\}$ → 6M
Derivation.

b) Derivation:-

$I_{a1} = j\sqrt{3}\, I_{A1}$ → 2.5M
$I_{a2} = -j\sqrt{3}\, I_{A2}$ → 2.5M
$I_{a0} = 0$ → 1M

c) $I_C = 128.56 \angle 130°$ A
$I_{a0} = 0$
$I_{a1} = 108.5 \angle 110°$ A
$I_{a2} = 20.05 \angle -110°$ A
} Each 2M

8M

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Shridevi Institute of Engineering and Technology, Tumkur -06
Department of Electrical and Electronics

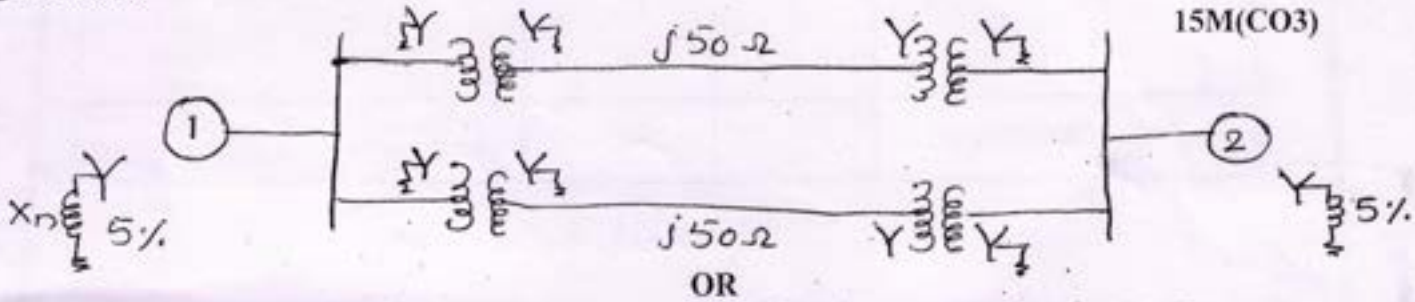
INTERNAL ASSESSMENT – II
Answer any two full questions

Sub: Power System Analysis I
Sem: VI sem
Max Marks: 40

Sub code: 18EE62
Date: 27/06/23
Duration: 90 Minutes

1.a) Draw the zero sequence networks for the following 3-phase transformers.
i) Y - Y ii) Y - Y iii) Δ - Δ iv) Y - Δ v) Y - Δ **5M(CO3)**

b) Draw the positive, negative & zero sequence networks for the power system shown in figure. Choose a base of 50MVA, 220KV in the 50Ω transmission lines and mark all the reactances in p.u.
The ratings of the generators & transformers are:
G1: 25 MVA, 11kV, X" = 20%
G2: 25 MVA, 11kV, X" = 20%
Three phase transformers (each) : 20MVA , 11/220 kV , X=15%.
The negative sequence reactance is equal to positive reactance of machine. The zero sequence reactance of each machine is 8%. Assume that zero sequence reactance of lines are 250% of their positive sequence reactances. **15M(CO3)**



OR

2.a) Draw the positive, negative & zero sequence networks for the power system shown in figure. The ratings are as follows:
G: 300 MVA, 20kV, Xd" = 15%, Xo = 5%, Zn = 0.4 ohms.
M1: 200MVA, 13.2kV, Xd" = 20%, Xo = 5%, Zn = 0.5 ohms
M2: 100 MVA, 13.2kV, Xd" = 20%, Xo = 5%
T1: 300MVA, 230/20kV, x = 10%.T2: Three single phase transformers rated 100MVA, 132/13.2 kV, X = 10%.Transmission line : 100 km, reactance = 0.5ohm/km, Zo = 3Z1.
Select the generator ratings as a base values n the generator circuit. **14 M(CO3)**
b) Define sequence impedances and sequence networks. **6M(CO3)**

3. a) Derive an expression for the fault current, when a double line to ground fault occurs with Fault impedance on an alternator. Assume that alternator is star connected & neutral is grounded with Zn. And also draw the sequence network. **12M (CO4)**

b) A 25MVA, 13.2 kV alternators, with a solidly grounded neutral has a sub transient reactance of 0.25pu. The negative & zero sequence reactance are 0.35 & 0.1pu respectively. Determine the fault current and the line to line voltages at the fault, when a line to ground fault occurs at the terminals of the alternator. **8M(CO4)**

OR

4.a) Derive an expression for the fault current, when a line to ground fault occurs on an unloaded generator. Assume that alternator is star connected & neutral is grounded with Zn. And also draw the sequence network. **10M(CO4)**
b) Derive an expression for complex power interms of symmetrical components. **10M(CO3)**

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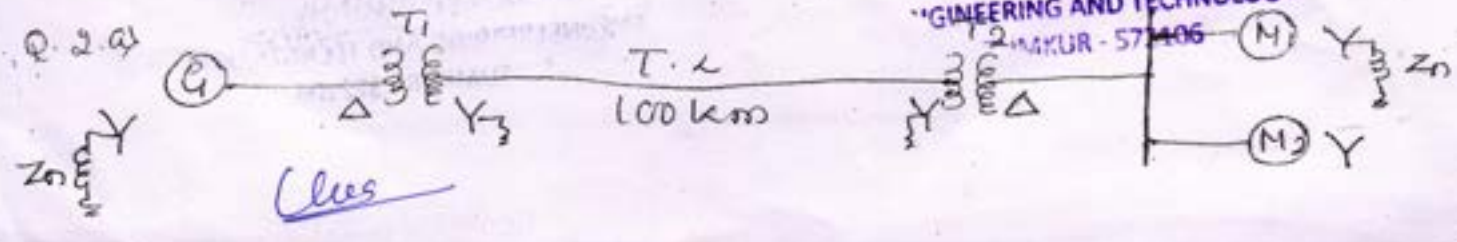


27/06/23

Scheme of Evaluation

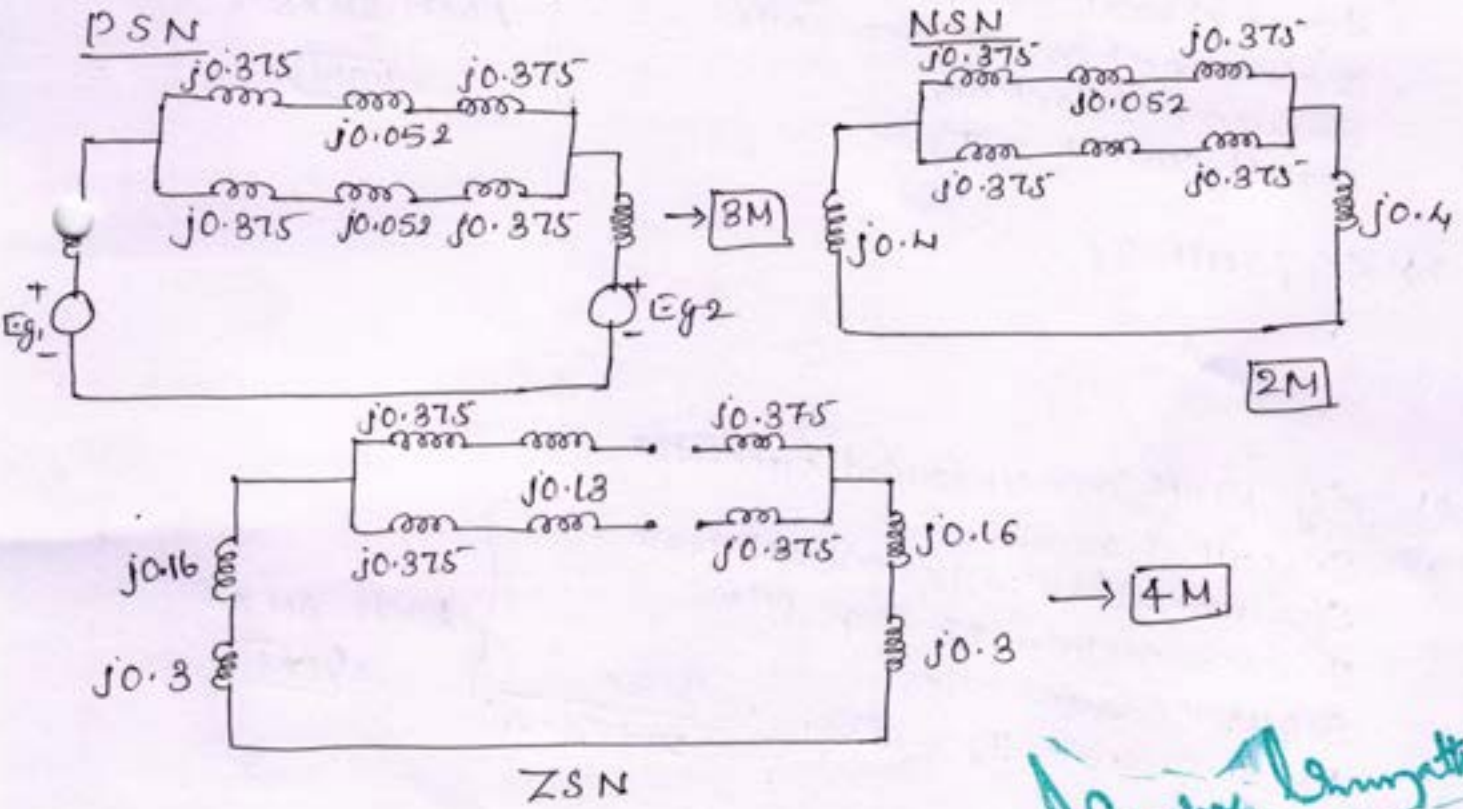
Power System Analysis - I (18EE62

IA - II

1. a) Configurations Each 1M → 5M

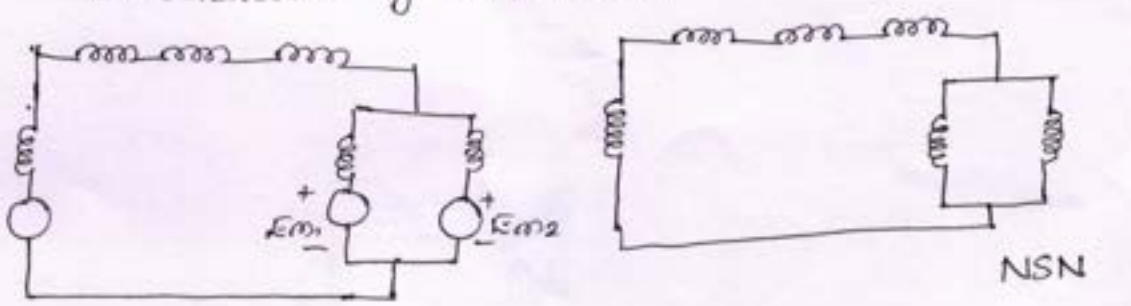
b) $(kV)_B$ for G_1 = 11kV
$(kV)_B$ for G_2 = 11kV } 2M

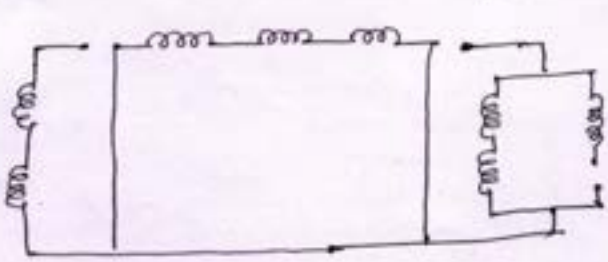
Calculation of Reactances → 4M



2. a) $(kV)_B$ for T-2 s/c =
$(kV)_B$ for M s/c =

Calculation of Reactances.





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2.b) Definitions:

Positive Sequence Impedance
Negative " "
Zero " "
} → 3M

positive Sequence Network
Negative " "
Zero " "
} → 3M

3.a) LLG fault with Z_f

Circuit diagram
Symmetrical Component relations
Interconnection of Seq. N/W
Sequence Quantities
Fault current. I_f =

} Each 2M x 5 = 10M

b) LG fault I_f =

4. a) LG fault on unloaded Generator.

Circuit diagram.
Symmetrical Component relations
Interconnection of Seq. N/W
Sequence Quantities
Fault current $I_f = 3I_{a1} = \frac{3E_a}{Z_1+Z_2+Z_0}$.

} Each 2M x 5 = 10M

b) P. Derivation

$P = 3\{V_{a0}I_{a0}^* + V_{a1}I_{a1}^* + V_{a2}I_{a0}^*\}$ → 10M

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(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering
CIE III Internal Assessment Test

Power System Analysis I(18EE62)

VI Semester
Max Marks: 40

Duration: 90 Minutes
date: 08.07.23

NOTE: Answer two full questions

1.a) Derive an expression for the fault current when an LLG fault occurs on an unloaded generator through a fault impedance Zf. Draw the inter connection of sequence networks. **10M(CO4)**

b) A 400V star connected neutral grounded three phase generator is subjected to various types of faults. The fault currents for various types of faults are

i) Three phase---120amperes
ii) L-L Fault ----150amperes
iii)L-G Fault---250amperes
determine the sequence impedances. **10M(CO4)**

OR

2.a) Derive an expression for the fault current when an LL fault occurs on power system through a fault impedance Zf. Draw the inter connection of sequence networks. **10M (CO4)**

b) Write a short notes on series type of faults. **10M (CO4)**

3. a) Derive the Swing equation of a synchronous machine with usual notation. Also draw the Swing curve. **10M (CO4)**

b) a) Derive the power angle equation of a salient pole synchronous machine connected to an infinite bus. **10M (CO5)**

OR

4) A 30MVA, 13.8kV, 3 phase alternator has a Xd=15%, X2=15% & X0=5% respectively. The alternator supplies two motors over a transmission line having transformers at both ends as shown in figure. The motors have rated inputs of 20MVA & 10MVA. Both 12.5kV with Xd=20%, X2=20% & Xo=5% respectively. Current limiting reactors of 2.0Ω each are in the neutral of the alternator and a large motor. Th e 3 phase transformers are both rated 35 MVA, !3.2 delta – 115 Y kV, with leakage reactance of 10% . Series reactance of the line is 80Ω. The zero sequence reactance of the line is 200Ω. Determine the fault current when L-G fault takes place at the point P. Assume Vf=120kV. **15M (CO4)**

b) Define the following terms as applicable to a power system
i). Stability ii) Steady state stability iii) Dynamic stability. iv) Transient stability **5M(CO5)**

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Scheme of Evaluation

08.07.23

Power System Analysis - I

IA - III

1. a) LLG fault on an unloaded Generator thro Z_f.

Circuit diagram
Sym. Components relations.
Interconnection of Seq. NIw
Sequence quantities
Fault current $(I_f) = 3I_{a0}$

→ Each 2M × 5 = 10M.

b) $= -3 I_{a1} \left(\frac{Z_2}{Z_0 + Z_2 + 3Z_f} \right)$.

b)

2. a) LL fault on Power System thro Z_f

Circuit diagram
Sym. Comp. relations
Interconnection of Seq. NIws.
Sequence Quantities
Fault Current $|I_f| = \sqrt{3} I_{a1} = \sqrt{3} \frac{V_{th}}{Z_1 + Z_2 + Z_f}$.

Each 2M × 5 = 10M

b) Series types of faults:
i) One conductor open fault → 4M
ii) Two conductors open fault → 3M
iii) Three " " " → 3M

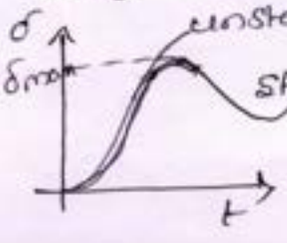
3. a) Swing Equation

Derivation → $\frac{GH}{180 \cdot f} \frac{d^2\delta}{dt} = P_a = P_s - P_e$

$\frac{H}{180 \cdot f} \times \frac{d^2\delta}{dt^2} = P_a = P_s - P_e$.

→ 8M

Swing curve



→ 2M

3. b) Power angle equation

Derivation:

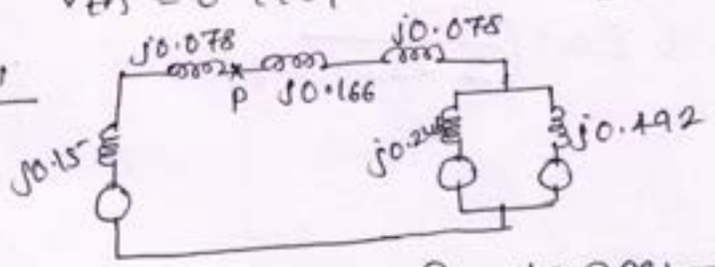
$$P = \frac{|V||E|}{X_d}\sin\delta + \frac{|V|^2(X_d - X_q)}{2X_dX_q}\sin 2\delta \longrightarrow 8M$$

Power angle curve $\longrightarrow$ 2M.

4. a) $(kV)_B$ for T2D Line = 120.22 kV $\}$ $\rightarrow$ 1M
$(kV)_B$ for M slc = 18.8 kV.

$V_{th} = 0.9981$ pu. $\longrightarrow$ 1M

PSN



$Z_{1th} = j0.1461$ pu.

$\longrightarrow$ 4M

Calculation of Reactances $\longrightarrow$ 3M

NSN. Same. $\rightarrow$ $Z_{2th} = j0.1461$ pu.

Zero seq NW. $Z_{0th} = j0.067$ $\longrightarrow$ 5M

LG fault $I_f = \frac{V_{th}}{Z_{1th} + Z_{2th} + Z_{0th}} = 8.33$ pu. $\rightarrow$ 1M

4. b) Definitions : 5M.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
DEGREE :UG	AY:2022-2023	SEM V	TITLE: Internal Assessment Test-I	DATE:14-11-2022
SUB NAME /CODE: ELECTRICAL MACHINE DESIGN /18EE55				

Answer two full questions choosing one question from each part

PART-A **Max Marks: 40 Marks**

1.a. Explain Limitations in good design **|CO1|(8Marks) [L2]**

b. What are the desirable properties of conducting material **|CO1|(6 Marks) [L2]**

c. Compare aluminium and Copper wires **|CO1|(6 Marks) [L2]**

OR

2 .a) What are the major consideration to evolve a good design. What are the factors for good design **|CO1|(6 Marks) [L2]**

b. Describe the modern trends in electrical machine design. **|CO1|(6 Marks) [L2]**

c. Describe the classification of insulating material based on their thermal consideration. **|CO1|(8 Marks) [L2]**

PART-B

3. a) List out the desirable properties of magnetic material. **|CO1|(6 Marks) [L2]**

b) Explain the classification of magnetic material related to the value of permeability and distinguish between soft and hard magnetic material **|CO1|(8 Marks) [L2]**

c) Explain the specific loadings of DC machines and what are advantages and disadvantages of higher values of specific loading (Base & q) **|CO2|(6 Marks) [L2]**

OR

4. a) List out the desirable properties of insulating material. **|CO1|(6 Marks) [L2]**

b) What are ferromagnetic material and solid core material **|CO1|(4 Marks) [L2]**

c) Define specific electrical and magnetic loading for DC machines. Derive the output equation of DC machine both as motor and generator. **|CO2|(10 Marks) [L1]**

Tanuja K S
STAFF

G. H Rao
H.O.D

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Scheme and Solution, Internals - I

Electrical machine design.
18EE55

1 a) Explanation of Limitations.
4 limitations — 4X2 = 8 Marks

b) Properties of conducting material
6 points — 6X1 = 6 Marks

c) Comparision of alluminium & copper.
6 points — 6X1M = 6 Marks.

2 a) major consideration of good design
6 points — 6X1/2 = 3 Marks
factors for good design
6 points — 6X1/2 = 3 Marks
} 6 Marks

b) Modern trends in electrical machine
6 points — 6X1 = 6 Marks.

c) classification — 3 Marks
Explanation — 3 Marks
} 6 Marks.

3 a) properties of magnetic material
6 points — 6X1 = 6 Marks

b) explanation of classification of magnetic material — 3M
distinguish b/w soft and hard magnetic material — 3M
} 6 Marks

c) Explanation of specific loading — 2M
advantage — 2M
disadvantages — 2M
} 6 Marks

4 a) properties of insulating material
6 points ——— 6 x 1 = 6 Marks

b) ferromagnetic material — 2M
Solid core material — 2M
} 4 Marks

c) definition of
Electrical loading — 2M
magnetic loading — 2M
o/p eqn/: of Generator — 3M
o/p eqn/: of motor — 3M
} 10 Marks

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
ELECTRICAL MACHINE DESIGN - 18EE55

Max Marks: 40 **Internal Assessment Test-II** **Date:** 19-12-2022
Semester: V **Duration:** 90 Minutes

NOTE: Answer any *two* full questions choosing one question from each part

PART-A

1. a) Explain the factors to be considered for selecting the number of poles of DC machines and write any 3 advantages of higher value of number of poles of DC machines. [CO2][L2] **(10 Marks)**

   b) Find the main dimensions, number of poles and length of air gap of a 1000 KW, 500V, 300 rpm DC generator. Assume the specific loading Bav=0.7 Wb/m^2 , Ampere conductor/m = 40000, square pole face, ratio of pole arc to pole pitch is 0.7. Assume η as 92% and gap contraction factor is 1.15. [CO2][L3] **(10Marks)**

OR

2. a) Show that the output of the generator with single turn coil is given by P= [CO2][L2] **(10Marks)**

   b) Calculate the size of conductor and number of turns for the field coil of a 6 pole, 460 V DC shunt motor. The coil is to supply a mmf of 4000 AT, at working temperature. The length of the inside turn is 0.74m, length available for winding is 0.13 m, the space factor of the winding is 0.52 and the permissible dissipation from external surface excluding ends is 1200 W/m^2. Solution should not be attempted by assuming winding depth. The resistivity of conductor is 0.02 μΩ / m or mm^2 . Keep 15% of applied voltage as reserve for speed control. [CO2][L3] **(10Marks)**

PART-B

3. a) Discuss the design of shunt field winding of a DC machine. [CO2][L2] **(10Marks)**

   b) Estimate the (i) core area (ii) Window area (iii) conductor area of cross section and number of turns of 3 Φ Δ / Y core type transformer rated at 300 KVA, 6600/440 Volts, 50 Hz. A suitable core with three steps having a circumscribing circle of 0.25 m diameter and a leg spacing of 0.4 m is available. The emf per turn is 8.5 volts. Assume current density= 2.5A/mm^2 , window space factor= 0.28 and stacking factor=0.9 [CO3][L3] **(10Marks)**

OR

4. a) Derive output equation of a 3 Φ core type transformer and hence deduce an expression for output emf / turn. [CO3][L2] **(10Marks)**

   b) A 6 pole, 220V, 200 KW dynamo is to be level compounded. The mmf required / pole is 7500 A at no load and 9000 A at full load. Calculate the number of series turns per pole, and show a suitable arrangement for these turns. The height of winding is 0.15m, the field coils are 50 mm thick and fit around at square pole of 0.23m side. Calculate the diameter of shunt field conductor. If insulation increases the diameter by 0.1mm, calculate also the shunt field current. Resistivity is 0.02 Ω / m or mm^2 . Keep 10% of the voltage across the shunt field in reserve. [CO3][L3] **(10Marks)**

Suggest Tanuja K.S STAFF

G. H Rao HOD

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Scheme and solution
Electrical machine design
18EE55
Internals - II

1. a. Factors of selection of No of poles — 6M
3 advantages of poles of DC machine — 4M
} 10 Marks

b) Solu
L = ?
D = ?
P = ?

given.
power o/p P = 1000 kw
E = 500 V
N = 300 rpm
DC gurator
Bavg. = 0.7 wb/m²

ψ = 0.7
L = 0.7 πD / P
η = 92%
kg = 1.15

$D^2L = \frac{1}{C_o} \times \frac{Pa}{n}$

$n = \frac{300}{60} = .5 rps$

$Pa = \frac{1000}{0.92} = 1086.95 kw$

$C_o = \pi^2 \times B_{avg} \times q \times 10^{-3}$

$C_o = \pi^2 \times 0.7 \times 40,000 \times 10^{-3}$

$\boxed{C_o = 276.34}$

$D^2L = \frac{1}{276.34} \times \frac{1086.95}{5}$

$\boxed{D^2L = 0.7866 m^3}$ — (2M)

ii) no of poles.
by choosing no of poles usually P = 2, 4, 6, 8

$f = \frac{Pn}{2} = \frac{12 \times 5}{2} = 30 Hz$.

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current/brush (I_b) = $\frac{2I_a}{P}$

$I_a = \frac{P}{E \times 10^{-3}} = \frac{1000}{500 \times 10^{-3}} = 2000$ Amps.

$I_b = \frac{2 \times 2000}{10} = 400$ Amps. (1M)

$I_b = \frac{2 \times 2000}{12} = 333.3$.

current/brush should not exceed 400Amps.

for 10 pole current/brush = 400Amps.

choose No of poles = 10.

$D^2L = 0.7866$.

$L = \frac{0.7\pi D}{P} = 0.2199D$.

$\boxed{L = 0.2199D}$

$D^2L = 0.7866$.

$D^2(0.2199D) = 0.7866$.

$\boxed{D = 1.529}$ — (1M)

$L = 0.2199D = 0.2199 \times 1.529 = 0.336$ m.

$\boxed{L = 0.336m}$ — (1M)

verification.

$V_a = \frac{\pi DN}{60} = \frac{\pi \times 1.529 \times 300}{60} = 24$.

$\boxed{V_a = 24 m/s}$ It is within the specified limit

Pole pitch = $\frac{\pi D}{P} = \frac{\pi \times 1.529}{10} = 0.47$m — (1M)

length of air gap.

$AT_g = 800,000 B_g k_g l_g$. $k_g = 1.15$

$B_g = \frac{B_{av}}{\psi} = \frac{0.7}{0.7} = 1$ — (1M)

$AT_a = \frac{9 \times T}{2} = \frac{40,000 \times 0.67}{2} = 9400$.

$\boxed{AT_a = 9400A}$ — (1M)

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$A_{Tg} = 0.55 \times 9400$

$\boxed{A_{Tg} = 4700}$ — (1M)

$l_g = \frac{A_{Tg}}{800{,}000 \, B_g k_g} = \frac{4700}{800000 \times 1 \times 1.15}$

$\boxed{l_g = 5.1 \times 10^{-3} \, m}$ — (1M)

$l_g = 5.1 \, mm$

2 a. Derivation of o/p of the generator with single turn coil } (10M)

2 b. $P = 6$, $A_f = 4000$, $l_i = 0.74m$, $a_f = 1200 W/m^2$, $h_f = 0.13m$, $S_f = 0.52$, $S = 0.021 \Omega m$, $S = 2 \times 10^{-8} \Omega m$

Voltage across shunt field winding $= 0.85 V$
$= 0.85 \times 460$
$= 391 V$

Vtg across each field coil $E_f = \frac{\text{Vtg across shunt field}}{P}$

$E_f = \frac{391}{6}$

$E_f = 65.17 \text{ volts}$ — (1M)

Area of field w/d conductor $= \frac{I_f T_f S \times l_m}{E_f}$

External dissipating surface of each coil excluding top and bottom surface.

Length of mean turn $= l_m = 2(l_p + b_p + 2d_f)$

$l_m = 2(l_p + b_p) + 4d_f$

$l_m = l_i + 4d_f$

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cooling surface area available

$$S = 2 l_m h_f$$
$$= 2[(l_i + 4d_f) \times h_f]$$
$$= 2 \cdot [(0.74 \times 4 \times d_f) \times 0.13]$$
$$S = 0.1924 + 1.04 d_f$$

Permissible Power loss $= S \times q_f$

$$= (0.1924 + 1.04 d_f) 1200 \Rightarrow$$
$$= 230.88 + 1248 d_f$$
$$Q_f = 230.88 + 1248 d_f \rightarrow (1) \quad \text{(1M)}$$

Actual Cu loss in field coil $= Q_f = I_f^2 \times R_f$

$$= I_f \times I_f \times R_f$$
$$= \frac{I_f T_f}{T_f} \times I_f R_f$$
$$Q_f = \frac{A T_f \times E_f}{T_f}$$
$$Q_f = \frac{4000 \times 65.17}{T_f}$$
$$Q_f = \frac{260680}{T_f} \rightarrow (2) \quad \text{(1M)}$$

$$230.88 + 1248 d_f = \frac{260680}{T_f}$$
$$T_f = \frac{260680}{230.88 + 1248 d_f} \rightarrow (A) \quad \text{(1M)}$$

Area of conductor $= h_f \times d_f \times S_f$

$$= 0.13 \times 0.52 \times d_f$$
$$= 0.0676 d_f \rightarrow (3) \quad \text{(1M)}$$

Conductor Area $= T_f a_f = T_f \times A_{T_f} \times \frac{S l_m}{E_f}$

$$= \frac{4000 \times 2 \times 10^8 (0.74 + 4 d_f) \times T_f}{65.17}$$
$$= 3.6335 \times 10^{-6} T_f d_f$$
$$= \frac{5.92 \times 10^{-5} T_f + 3.2 \times 10^{-4} T_f d_f}{65.17}$$

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$$0.0676\, d_f = (9.0839 \times 10^{-7} + 4.91 \times 10^{-6} d_f)\, T_f$$

$$T_f = \frac{0.0676\, d_f}{9.08 \times 10^{-7} + 4.91 \times 10^{-6} d_f} \rightarrow (b) \quad \text{— (1M)}$$

equating eqn (A) and (B)

$$\frac{260680}{230.88 + 1248 d_f} = \frac{0.0676\, d_f}{9.08 \times 10^{-7} + 4.91 \times 10^{-6} d_f}$$

$$84.36 d_f^2 - 1.2799 d_f + 15.3704 = 0$$

$$d_f = 0.015$$

$$T_f = \frac{260680}{230.88 + 1248(0.015)}$$

$$T_f = 1044.39 \simeq \underline{\underline{1044}}$$

$$l_m = l_i + 4 d_f$$

$$= 0.7 + 4 \times 0.015$$

$$\boxed{l_m = 0.8} \quad \text{— (2M)}$$

$$A_f = \frac{AT_f\, \delta\, l_m}{E_f} = \frac{4000 \times 0.02 \times 10^{-6} \times 0.8}{65.17}$$

$$\boxed{A_f = 0.98\, mm^2} \quad \text{— (2M)}$$

3a. Design steps of shunt field W/d of a DC machine } — (10M)

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(5).

3.b. 3ϕ A/Y core type

300 kVA. leg spacing = 0.4.
6600/440V. E_t = 8.5 V.
f = 50Hz δ = 2.5 A/mm².
d = 0.25. kw = 0.28.
Sf = 0.9.

Solu

Ai = Sf x Agi. for 3step.
gross core area = 0.84.

gross core area.

Agi = 0.84 x Ar. of i.e.

$= \frac{\pi d^2}{4} = \frac{\pi (0.25)^2}{4}$

Agi = 0.049.

Agi = 0.84 x 0.049.
Agi = 0.041
Agi = 0.9 x 0.041.

Ai = 0.037 m² —— (2M)

iii. window area :- Aw = Hw x ww.

Aw = Ac/kw.

Ac = 2[ap Tp + as Ts]

$Tp = \frac{Vp}{Vs/\sqrt{3}} \times Ts = \frac{6600}{440/\sqrt{3}} \times 30$

Tp = 780 —— (1M)

ap = Ip/δ.

$Ip = \frac{kVA \times 1000}{3 \times Vp} = \frac{300 \times 1000}{3 \times 6600} = 15.15$

$ap = \frac{Ip}{\delta} = \frac{15.15}{2.5} = 6.06 mm^2$

ap = 6.06 mm² —— (1M)

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$\therefore T_s = \frac{V_s}{E_T} = \frac{440/\sqrt{3}}{8.5} = 30$ turns.

$\therefore$ **$T_s = 30$ turns.** — (1M)

$a_s = \frac{I_s}{\delta}$

$I_s = \frac{kVA \times 1000}{3V_s/\sqrt{3}} = \frac{300 \times 1000 \times \sqrt{3}}{3 \times 440} = 393.65$

$I_s = 393.65$ — (1M)

$a_s = \frac{393.65}{2.5} = 157.46 mm^2$

$a_s = 157.46 mm^2$ — (1M)

$A_c = 2[(6.06)780 + (157.46)(30)]$

$A_c = 18901.2 mm^2$ — (1M)

$A_w = \frac{A_c}{k_w} = \frac{18901.2}{0.28} = 67504.28 mm^2$ — (1M)

width of the window (W_w) = leg spacing = 0.4m.

$A_w = H_w W_w$

$H_w = \frac{A_w}{W_w} = \frac{67504.28}{0.4} \times 10^{-6}$.

$H_w = 0.168$ to 0.17 — (1M)

4a.

o/p eqn: of 3ϕ core type xfmr: — (5M)

Expn for o/p Emf/turn — (5M)

} 10M

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P=6P

∴ V

4 b. P=6P l_f = 0.15m bp = 0.23

V=220V d_f = 50mm d = ?

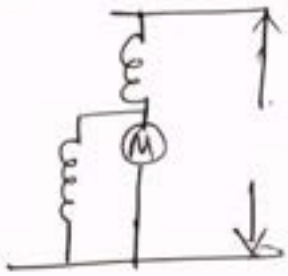
P = 200kw l_f = 0.23

Insulation = 0.1mm ρ = 0.02 Ω/m & mm²

voltage across Shunt field V-10%

V - 0.1V = 0.9V

The mmf requires at no load is develop by the Shunt field while extra mmf require at full load at develop by Series field



mmf of Shunt wld = 7500

mmf of Series wld = AT_S = 9000 - 7500

AT_S = 1500 — (1M)

$T_{se} = \frac{AT_{se}}{I_{se}}$ no% of Series turn/pole.

for Short Shunt $I_S = \frac{1kW \times 10^3}{V} = \frac{200 \times 10^3}{220} = 909$ Amps. — (1M)

$T_S = \frac{AT_S}{I_S} = \frac{1500}{909} = 1.65$

$T_S = 1.65$ — (1M)

The no of turns should be an integer.

Divide the Series field in 3 parallel paths current

= 909/3 = 303

Series field turn/pole $T_S = \frac{AT_S}{303} = \frac{1500}{303} = 4.95 = 5$ — (1M)

Thus there are 5 turns connect in 3 parallel path Shunt field.

Dia of bare conductor = $\sqrt{\frac{4a_f}{\pi}}$

$a_f = \frac{AT_f \cdot S l_m}{E_f}$

$l_m = 2(l_p + b_p) + 4d_f$

$= 2(0.23 + 0.23) + 4 \times 0.05$

E_f = Voltage across Shunt f-coil / No of Poles

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$E_f = \frac{0.9 \times 220}{6}$

$E_f = 33V$ — (1M)

$a_f = \frac{7500 \times 2 \times 10^{-8} \times 1.12}{33} = 5.09\ mm^2$

$d_{fc} = \sqrt{\frac{5.09 \times 4}{\pi}} = 2.54mm$ — (1M)

$d_f ci = d_{fc} + \text{insulation}$

$= 2.54 + 0.1$

$= 2.64\ mm$

$S_f = 0.75 \left(\frac{d_{fc}}{d_f ci}\right)^2$

$= 0.75 \times \left(\frac{2.54}{2.64}\right)^2$

$\boxed{S_f = 0.694}$ — (1M)

$I_f = \frac{A T_f}{T_f}$

$T_f = \frac{h_f d_f S_f}{a_f} = \frac{0.15 \times 50 \times 10^{-3} \times 0.694}{5.09 \times 10^{-6}}$

$\boxed{T_f = 1022 \text{ turns}}$ — (2M)

$I_f = \frac{7500}{1022} = 7.33 \text{ Amps}$ — (1M)

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
ELECTRICAL MACHINE DESIGN - 18EE55

Max Marks: 40 **Internal Assessment Test-III** **Date:** 25-01-2023
Semester: V **Duration:** 90 Minutes

NOTE: Answer any ***two*** full questions choosing one question from each part

PART-A

1. a) Derive output equation of 3 phase Induction Motor [CO4] [L2] **(10 Marks)**

   b) Determine the main dimensions and winding details of a 100KVA, 2000/400 V, 50Hz, single phase shell type oil immersed self-cooled transformer. Assume voltage/turn= 10V, flux density in core=1.1wb/m^2 , current density = 2A/mm^2. Window space factor= 0.33. The ratio of window height to window width as well as ratio of core depth to width of central limb=2.5, stacking factor=0.9. [CO3] [L3] **(10Marks)**

OR

2. a) Explain the step by step procedure of squirrel cage induction Motor. [CO4] [L2] **(10 Marks)**

   b) Determine main dimensions, turns/ph, no.of slots, conductor size and area of slots of 250 HP, 3 phase, 50 Hz, 400V, 1410rpm slip ring IM. Assume Bavg=0.5 Wb/m^2, ac or q= 30,000 A/m, efficiency=0.9, Pf=0.9, winding factor=0.9, current density= 3.5 A/mm^2, slot space factor is 0.4 and ratio of core length to pole pitch = 1.2, the stator is delta connected. [CO4] [L3] **10Marks)**

PART-B

3. a) What are the factors to be considered for estimating the length of air gap for Induction motor. Explain them. [CO4] [L2] **10Marks)**

   b) A 15 KW, 3 phase, 6 pole 50 Hz cage IM has the following data D= 0.32 m, L= 0.125 m., Ss= 54, Number of conductor/slot= 24, current in each conductor is 17.5 A, full load Pf is 0.85 lagging. Design a suitable cage rotor giving number of rotor slots, section of each bar, and section of each ring. Also calculate the effective resistance of the rotor. The full load speed is about 950 rpm, resistivity of copper is 0.02 Ohms / mm^2 & m. [CO4] [L3] **10Marks)**

OR

4. a) Explain the design of tank with cooling tube for the transformer giving the equation to calculate number of tubes to limit temperature rise. [CO3] [L2] **(10Marks)**

   b) A 15KW,400V 3 phase 50 Hz 6 pole IM has stator bore diameter of 0.3 m and core length of 0.12 m. The Number of slots is 72 with 20 conductor / slot. The stator is delta connected. Calculate the value of magnetizing current per phase. If the length of air gap is 0.55 mm. The gap contraction factor is 1.2. Assume that mmf required for iron parts to be 35% of the air gap mmf. Coil span= 11 slots. [CO4] [L3] **(10Marks)**

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Scheme and Solution

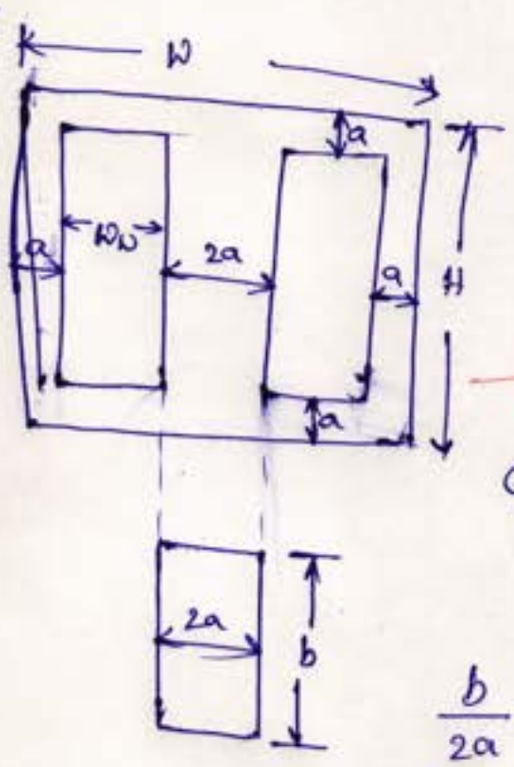
Electrical machine Design

18EE55

Internals – III

1 a) Derivation of o/p eqn: 3phase I.M } — 10 marks

b)



— 1M

Net iron core $A_i = \frac{E_t}{4.44 f B_m}$

$= \frac{10}{4.44 \times 50 \times 1.1}$

$= 0.041\ m^2$ — ½ M

Gross iron area $A_{gi} = \frac{A_i}{S_f} = \frac{0.041}{0.9}$

$= 0.04555$ — ½ M

$\frac{b}{2a} = 2.5$

gross iron area $A_{gi} = 2a \times b$

$b = 5a$

$a = 0.0675$ — ½ M

$b = 0.3375\ m$ — ½ M

$A_y = D_y \times H_y$

$= b \times a$

$A_y = 0.023\ m$ — ½ M

$A_w = H_w W_w$

$A_w = \frac{Q}{2.22 f B_m A_i K_w \delta \times 10^{-3}} = \frac{100}{2.22 \times 50 \times 1.1 \times 0.[illegible] \times 2 \times 10^6 \times 10^{-3}}$

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$A_w = 0.03\ m^2$ — ½ M

$\frac{H_w}{W_w} = 2.5$ $A_w = H_w W_w$ $W = 2W_w + 4a$ $H = H_w + 2H_y$

$H_w = 2.5 \times W_w$ $W_w = 0.1m$ — ½ M $W = 0.49\ m$ — ½ M $H = 0.409$

$H_w = 0.274\ m$ — ½ M $H_y = a$

$= 0.0675m$ — ½ M

Winding details

$$T_p = \frac{V_p}{E_t} = \frac{2000}{10} = 200 \text{ turns}$$ (½ M)

$$T_s = \frac{V_s}{E_t} = \frac{400}{10} = 40 \text{ turns}$$ (½ M)

$$a_p = \frac{I_p}{\delta} = \frac{50}{2} = 25 \text{ mm}^2$$ (½ M)

$$a_s = \frac{I_s}{\delta} = \frac{250}{2} = 125 \text{ mm}^2$$ (½ M)

$$I_p = \frac{KVA \times 1000}{V_p}$$

$$I_p = \frac{100 \times 1000}{2000}$$

$$I_p = 50 \text{ Amps}$$ (1 M)

$$I_s = \frac{KVA \times 1000}{V_s}$$

$$= \frac{100 \times 1000}{100}$$

$$I_s = 250 \text{ Amps}$$ (1 M)

2 a) Design procedure of Squirrel cage IM } — (10 M)

b) Main dimension

$$D^2L = \frac{Q}{C_o n_s}$$

$$n_s = \frac{N_s}{60} = \frac{1500}{60} = 25 \text{ rps}$$ (½ M)

$$N_s = \frac{120f}{P}.$$

$$P = \frac{120f}{N_s} = \frac{120 \times 50}{1500} = 4$$ (½ M)

$$C_o = 11 \, B_{av} \, q \, K_{ws} \times 10^{-3}$$

$$= 11 \times 0.5 \times 30{,}000 \times 0.955 \times 10^{-3}$$

$$C_o = 157.6$$ (½ M)

$$Q = \frac{Hp \times 746}{\eta \times pf \times 1000} = \frac{250 \times 746}{0.9 \times 0.9 \times 1000}$$

$$Q = 230.2.$$ (1 M)

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~~Q = Hp~~

$$D^2L = \frac{230.2}{157.6 \times 25}$$

$$D^2L = 0.0584\ m^3. \quad (1/2M)$$

$$\frac{L}{\tau} = 12$$

$$L = 1.2\frac{\pi D}{P}$$

$$L = 0.942D$$

$D = 0.395\ m$ (1/2M) $L = 0.375\ m$ (1/2M)

No of slots $m = 3$

$$S = 3mD$$
$$= 3 \times 3 \times 4$$
$$= 36 \quad (1/2\ M)$$

turns/ph.

$$E_{ph} = 4.44 f \phi_m T_{ph} K_{w1}$$

$$\phi_m = B_{av} \tau L$$

$$= B_{av} \frac{\pi D}{P} \cdot L$$

$$\phi_m = \frac{0.5\pi \times 0.395 \times 0.375}{4}$$

$\phi_m = 0.0582$ wb — (1/2M)

$$T_{ph} = \frac{E_{ph}}{4.44 f \phi_m K_{w1}}$$

$$= \frac{400}{4.44 \times 50 \times 0.0582 \times 0.955}$$

$= 32.4$ — (1/2 M)

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turns/ph $= \frac{180}{6} = 30$ — (1/2M)

Stator current/ph $= \frac{250 \times 746}{3 \times 400 \times 0.9 \times 0.9} = 192$ (1/2 M)

Area of stator conductor $= a_s = \frac{I_s}{\delta_s} = \frac{192}{3.5} = 55\ mm^2$ — (1/2 M)

Total copper area in each slot $= 3 \times 55$
$= 165\ mm^2$ — (1/2 M)

Total copper area in each slot $= 3 \times 55$

$= 165 \text{ mm}^2$ — (½M)

$$\text{Area of slot} = \frac{\text{copper area/slot}}{\text{space factor}}$$

$$= \frac{165}{0.4}$$

$= 412.5 \text{ mm}^2$ — (½M)

3 a) Explanation of factors to be considered for estimating the length of air gap } 10 MARKS

b)

$$l_g = 0.2 + 2\sqrt{LD}$$

$$= 0.2 + 2\sqrt{0.32 \times 0.125}$$

$l_g = 0.6 \text{ m}$. — (1M)

$D_r = D - 2l_g = 0.32 - 2 \times 0.6$

No of rotor slot $S_r = S_s + P/2$

$= 54 + 6/2$

$= 57$ — (1M)

Rotor bar

$$I_b = \frac{2 \times 0.85 \times 3 \times I_{phs} T_{phs} K_{ws}}{S_r}$$

$$T_{phs} = \frac{\text{Cond/slots} \times \text{slots}}{3 \times 2} = \frac{24 \times 54}{2 \times 3} = 216$$

$$I_b = \frac{2 \times 0.85 \times 3 \times 17.5 \times 216 \times 0.954}{57}$$

$I_b = 322.65 \text{ A}$ — (1M)

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Copper loss in the end ring $= 2I_e^2 r_e$

$= 2(975.67)^2 \times 1.37 \times 10^{-4}$

$= 261.1$ watts — (1M)

Total rotor copper = loss in bars + loss in ring

$= 437.64 + 261.1$

$= 698.74$ watts — (1M)

$$\frac{\text{Copper loss}}{\text{rotor o/p}} = \frac{S}{1-S}$$

$S = 0.045$ — (1M)

$N = (1-S) N_s$

$= (1-0.045)\,1000$

$N = \underline{955}$ rpm — (1M)

$N_s = \frac{120f}{P}$

$= \frac{120 \times 50}{6}$

$N_s = 1000$ — (1M)

Effective resistance of rotor

$$r_r' = 4 m_s^2 T_{phs}^2 K_{w1}^2 \rho \left[\frac{L_b}{S_r a_b} + \frac{2 D_e}{\pi p^2 a_e}\right]$$

$r_r' = 3.159\,\Omega$ — (2M)

4 a) Explanation — (5M)

Design — (5M)

b) $m = \frac{72}{6 \times 3} = 4$ (1/2M)

$S/p = \frac{72}{6} = 12$

Slot angle $= \beta = \frac{180}{S/p} = \frac{180}{12} = 15^\circ$ (1/2M)

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Distribution factor $= \frac{\sin m\beta/2}{m \sin \beta/2}$

$K_d = 0.958$ (1/2 M)

Slot/pole = 12 but coil span = 11 } (1/2 M)

∴ the w/d is chorded by one slot

Angle of chording $= \alpha = {}^{1}/_{12} \times 180^\circ = 15^\circ$ (1/2 M)

pitch factor $K_p = \cos \alpha/2 = \cos 15/2 = 0.9914$ (1/2 M)

∴ Stator w/d factor $K_{ws} = K_p K_d$

$= 0.9914 \times 0.958$

$= 0.95$ (1/2 M)

mmf required for air gap $= AT_g = 800{,}000 B_{g60} l_g K_g$

$B_{g60} = 1.36 B_{av}$ — (1M)

$B_{av} = \frac{\phi_m}{\text{area/pole}}$ $E_{ph} = 4.44 f \phi_m K_{ws} T_{ph}$

$\phi_m = \frac{E_{ph}}{4.44 f K_{ws} T_{ph}}$

$Z_{ss} = 72 \times 20$

$= 1440$ (1/2 M)

$\phi_m = 7.9 \times 10^{-3}$ (1M)

$T_{ph} = \frac{Z_{ss}}{6} = \frac{1440}{6} = 240$ (1/2 M)

$\text{Area/pole} = \frac{\pi DL}{p}$

$= 0.0188$ (1/2 M)

$B_{av} = \frac{7.9 \times 10^{-3}}{0.0188}$

$B_{av} = 0.418 \text{ Wb/m}^2$ (1/2 M)

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$B_{g60} = 1.36 \times 0.418$

$B_{g60} = 0.57$ cob/m² (1/2 M)

$AT_g = 800000\, B_{g60}\, lg\, Kg$

$= 800000 \times 0.57 \times 0.55 \times 10^{-3} \times 1.2$

≈ 301 Amps — (1/2 M)

mmf for iron parts = 35% of air gap mmf

$= 0.35 \times 301$

$= 105$ Amps — (1/2 M)

Total mmf $AT_{60} = 301 + 105$

$= 406$ Amps (1/2 M)

Magnetizing current /ph = $Im = \dfrac{0.427 \times P \times AT_6}{K_w T_s}$

$= \dfrac{0.427 \times 6 \times 406}{0.95 \times 240}$

$= 4.56$ Amps. — (1 M)

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Department of Electrical & Electronics Engineering

CONTROL SYSTEMS -18EE61

INTERNAL ASSEESSMENT TEST -I

Max Marks: 40
Semester: VI

Date: 20-05-2022
Duration: 90 Minutes

NOTE: Answer any *two* full questions choosing one question each part

PART A

1. a) Write the comparison between open loop & closed loop control system with an example (06Marks)[CO1]

   b) Derive an expression for the TF of an field controlled DC motor and also construct the block diagram of DC motor. (08Marks)[CO1]

   c) Define control system? Explain linear and non-linear control system (06Marks)[CO1]

OR

2. a) Write the torque equation for the gear train shown in fig (10 Marks)[CO1]

   b) Obtain the transfer function of the AC Servomotor also construct the block diagram. (10 Marks)[CO1]

PART B

3. a) Give the design of PI, PD and PID controller in frequency domain (10 Marks)[CO5]

   b) Consider a unity feedback system with open loop TF $G(S)=\frac{5}{S(S+0.5)(S+1)}$ Design a PD controller so that the phase margin of the system is 30° at frequency of 1.2 Rad/sec (10 Marks)[CO5]

OR

4. a) What is controller ? explain the effect of P, PI, PD & PID control order a 2nd order system (10 Marks)[CO5]

   b) Consider a unity feedback system with open loop TF $G(S)=\frac{100}{(S+1)(S+2)(S+5)}$ Design a PI controller so that the phase margin of the system is 60° at frequency of 0.5 Rad/sec (10 Marks)[CO5]

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Scheme and Solution

Control Systems - 18EE61

Internals - I

1 a) Comparision of openloop and closed loop control system

open loop — (3M)
closed loop — (3M) } (6M)

b) Definition

Explanation of linear cs — (3M)

Explanation of non-linear cs — (3M)

b) fig — (1)

naming all the variables. — (1)

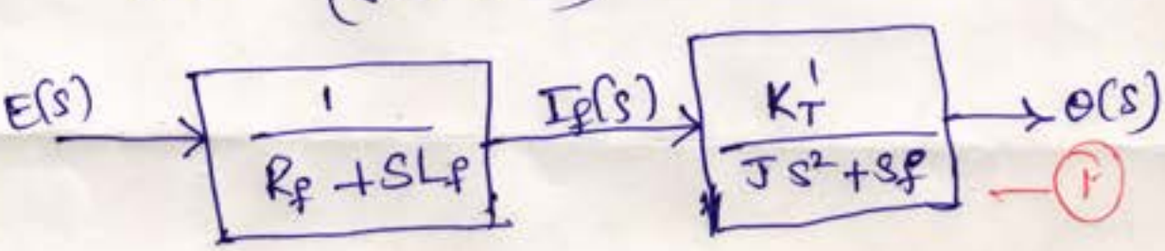
$\phi = K_f i_f$ — (1) — (1)

$T_M = K_T' i_f$ — (2) — (1)

$i_f R_f + L_f \frac{di_f}{dt} = e_f$ — (3) — (1)

$J \frac{d^2\theta}{dt^2} + B \frac{d\theta}{dt} = T_M = K_T' i_f$ — (4) — (1)

$$\frac{\theta(s)}{E(s)} = \frac{K_T'}{(Js^2+sB)(R_f+sL_f)}$$ — (2)



(1)

2 a) fig ——— (2)

naming all the variables — (2)

$$T_1 = J_1 \frac{d^2\theta_1(t)}{dt^2} + B_1 \frac{d\theta_1(t)}{dt} + T_1(t) \quad -(1) \quad -(1)$$

$$T_2 = J_2 \frac{d^2\theta_2(t)}{dt^2} + B_2 \frac{d\theta_2(t)}{dt} + T_L(t) \quad -(2) \quad -(1)$$

$$T_1 = \frac{N_1}{N_2} J_2 \frac{d^2\theta_2}{dt^2} + \frac{N_1}{N_2} B_2 \frac{d\theta_2}{dt} + \frac{N_1}{N_2} T_L \quad -(3) \quad -(2)$$

$$T = J_{1e} \frac{d^2\theta_1}{dt^2} + B_{1e} \frac{d\theta_1}{dt} + \left(\frac{N_1}{N_2}\right) T_L \quad -(1)$$

$$\left(\frac{N_2}{N_1}\right) T = J_{2e} \frac{d^2\theta_2}{dt^2} + B_{2e} \frac{d\theta_2}{dt} + T_L. \quad -(1)$$

2 b) fig ——— (2)

Torque speed curve — (2)

naming all the variables — (2)

$T_M \propto m\omega + K V_c$ — (1) — (1)

$K = \frac{T_0}{V_c}$ ——— (2) — (1)

$$T_M = m \frac{d\theta}{dt} + K V_c \quad -(1)$$

$$T_M = J \frac{d^2\theta}{dt^2} + B \frac{d\theta}{dt} \quad -(1)$$

$$\frac{\theta(s)}{V_c(s)} = \frac{Km}{s(1+sT_m)} \quad -(1)$$

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$V_c(s)$ → $\boxed{\frac{Km}{s(1+sT_m)}}$ → $\omega(s)$ — (1)

3 a) Design procedure of PI, PD & PID controllers

naming the variables — (1)

— (1)

$\theta = \gamma_d - \gamma_c$

$$G_c(j\omega) = \frac{(-K_d\omega^2 + K_i) + j K_p\omega}{j\omega} \quad — (2)\ (1)$$

At $\omega = \omega_1$, $G_c(j\omega) = G_c(j\omega_1) = |G_c(j\omega_1)| \angle G_c(j\omega_1)$

$= A_c \angle\theta$ — (3) (1)

$\therefore A_c \cdot A_1 = 1$

$$A_c = \frac{1}{A_1} \quad — (4)$$

$$G_c(j\omega_1) = \frac{1}{A_1} \angle\theta_1 \quad — (5)$$

$$G_c(j\omega_1) = \frac{(-K_d\omega_1^2 + K_i) + j K_p\omega_1}{j\omega_1} \quad — (6)$$

$$-K_d\omega_1^2 + K_i + j K_p\omega_1 = \frac{\omega_1}{A_1}\sin\theta + j\frac{\omega_1}{A_1}\cos\theta \quad — (7)\ (2)$$

$$K_d = \frac{\sin\theta}{\omega_1 A_1} + \frac{K_i}{\omega_1^2} \quad — (8)\ (1)$$

$$K_p = \frac{\cos\theta}{A_1} \quad — (9)\ (1)$$

$$K_d = \frac{\sin\theta}{\omega_1 A_1} \qquad K_p = \frac{\cos\theta}{A_1} \quad — (1)$$

$$K_i = -\frac{\omega_1\sin\theta}{A_1} \qquad K_p = \frac{\cos\theta}{A_1} \quad — (1)$$

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b)

$$G(s) = \frac{10}{s(1+2s)(1+s)} \quad \text{—— } (1/2)$$

$s = j\omega$

$$G(j\omega) = \frac{10}{j\omega(1+2j\omega)(1+j\omega)} \quad \text{—— } (1/2)$$

$$G(j\omega) = \frac{10}{\omega \angle 90^\circ \sqrt{1+4\omega^2} \angle \tan^{-1}2\omega \sqrt{1+\omega^2} \angle \tan^{-1}\omega} \quad \text{—— } (1/2)$$

$$A_1 = |G(j\omega)| = \frac{10}{\omega\sqrt{1+4\omega^2}\sqrt{1+\omega^2}} \quad \text{—— } (1/2)$$

$$\phi_1 = \angle G(j\omega) = -90 - \tan^{-1}2\omega - \tan^{-1}\omega$$

$\omega_1 = 1.2$ rad/sec —— (1/2)

$A_1 = 2.052$ —— (1)

$\phi_1 = -207.57^\circ$ —— (1)

$\gamma_u = 180 + \phi_1$

$\gamma_u = -27.19^\circ$ (1/2)

$\theta = \gamma_d - \gamma_u$

$\theta = 57.194$ —— (1/2)

$K_p = \frac{\cos\theta}{A_1} = 0.264$ —— (1)

$K_d = 0.3413 = \frac{\sin\theta}{\omega_1 A_1}$ —— (1)

$G_c(s) = 0.264(1 + 1.293s)$ —— (1/2)

$G_o(s) = G_c(s)\, G(s)$

$= \frac{2.64(1+1.293s)}{s(1+2s)(1+s)}$ —— (1)

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Verification

$$G_0(j\omega) = \frac{2.64\sqrt{1+(1.29\omega)^2}\ \angle \tan^{-1}1.293\omega}{\omega\angle 90^\circ \sqrt{1+4\omega^2}\ \angle \tan^{-1}2\omega \sqrt{1+\omega^2}\ \angle \tan^{-1}\omega}$$

$A_0 \simeq 1$

$\phi_0 = \angle G_0(j\omega)$

$\phi_{01} = -150$

$\gamma_0 = 180 - 150 = 30^\circ$ — (1M)

4a. Explanations of controllers — (2M)

Effect of P — (2M)

PI — (2M)

PD — (2M)

PID — (2M)

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b)

$$G(s) = \frac{10}{(1+s)(1+0.5s)+(1+0.2s)}$$ — (1/2M)

$s = j\omega$

$$G(j\omega) = \frac{10}{(1+j\omega)(1+0.5j\omega)(1+0.2j\omega)}$$ — (1/2M)

$$G(j\omega) = \frac{10}{\sqrt{1+\omega^2}\ \angle \tan^{-1}\omega \sqrt{1+(0.5\omega)^2}\ \angle \tan 0.5\omega \sqrt{1+(0.2\omega)^2}\ \angle \tan 0.2\omega}$$ — (1/2M)

$$|G(j\omega)| = \frac{10}{\sqrt{1+\omega^2}\sqrt{1+(0.5\omega)^2}\sqrt{1+(0.2\omega)^2}}$$ — (1/2M)

$\angle G(j\omega) = -\tan^{-1}\omega - \tan^{-1}0.5\omega - \tan^{-1}0.2\omega$ — (1/2M)

$A_1 = |G(j\omega)| = 8.63$ — (1M)

$\phi_1 = \angle G(j\omega) = -46.3$ — (1M)

$\gamma_u = 180 + \phi_1$

$\gamma_u = 134$ — (1/2M)

$\theta = \gamma_d - \gamma_u$

$\theta = -74$ — (1/2M)

$K_p = \frac{\cos\theta}{A_1} = 0.032$ — (1)

$K_i = -\frac{\omega_1 \sin\theta}{A_1} = 0.056$ — (1)

$G_c(s) = \frac{0.056(1+0.57s)}{s}$ — (1)

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$G_o(s) = G(s)\,G_c(s)$

$G_o(s) = \frac{0.56(1+0.57s)}{s(1+s)(1+0.5s)(1+0.2s)}$ — (1/2M)

Verification:-

$G_o(j\omega) = \frac{0.56\sqrt{1+(0.57\omega)^2}\,\angle\tan^{-1}0.57\omega}{j\omega\sqrt{1+\omega^2}\,\angle\tan^{-1}\omega\sqrt{1+(0.5\omega)^2}\,\angle\tan^{-1}0.5\omega\sqrt{1+(0.2\omega)^2}\,\angle\tan^{-1}0.2\omega}$

$A_{01} = |G_o(j\omega)| = 1$

$\phi_{01} = \angle G_o(j\omega) = -120$ — (1/2M)

$\gamma_0 = 180 + \phi_{01}$

$= 180 - 120$ — (1/2M)

$\gamma_0 = 60$

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

Department of Electrical & Electronics Engineering

CONTROL SYSTEMS -18EE61

INTERNAL ASSEESSMENT TEST -II

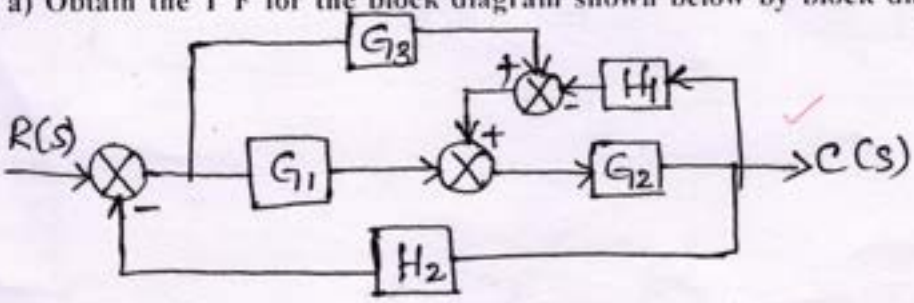
Max Marks: 40 **Date:** -07-2023

Semester: VI **Duration:** 90 Minutes

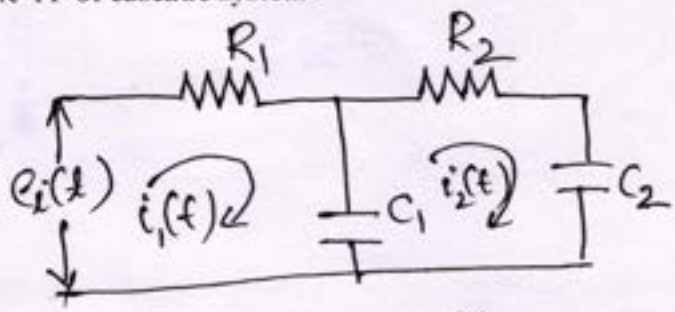
NOTE: Answer any *two* full questions choosing one question each part

PART A

1. a) Obtain the T F for the block diagram shown below by block diagram reduction technique. **(10Marks)**

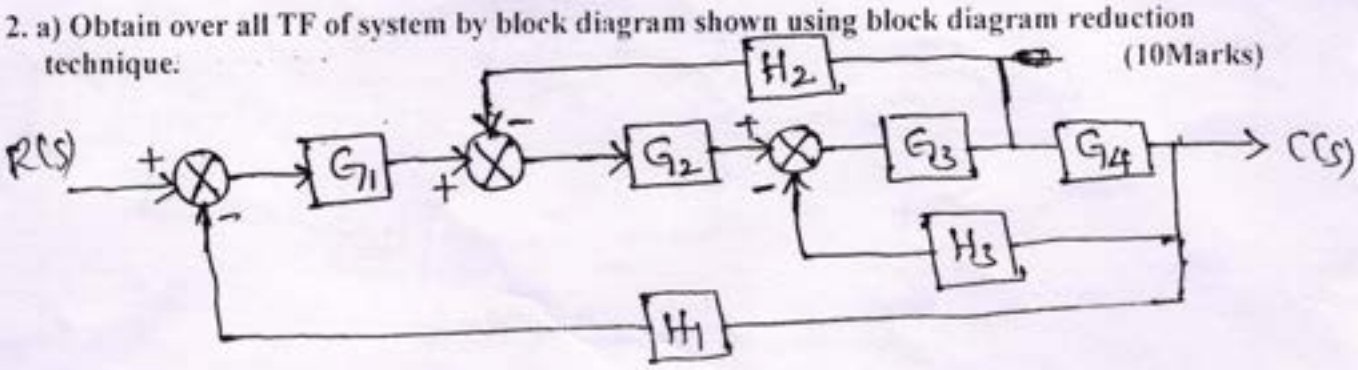


b) Design the TF of cascade system **(10Marks)**

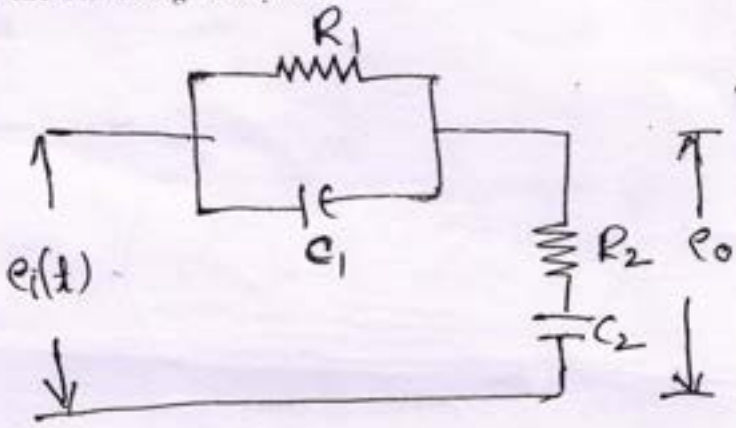


OR

2. a) Obtain over all TF of system by block diagram shown using block diagram reduction technique. **(10Marks)**



b) Design the T.F of a given system **(10Marks)**



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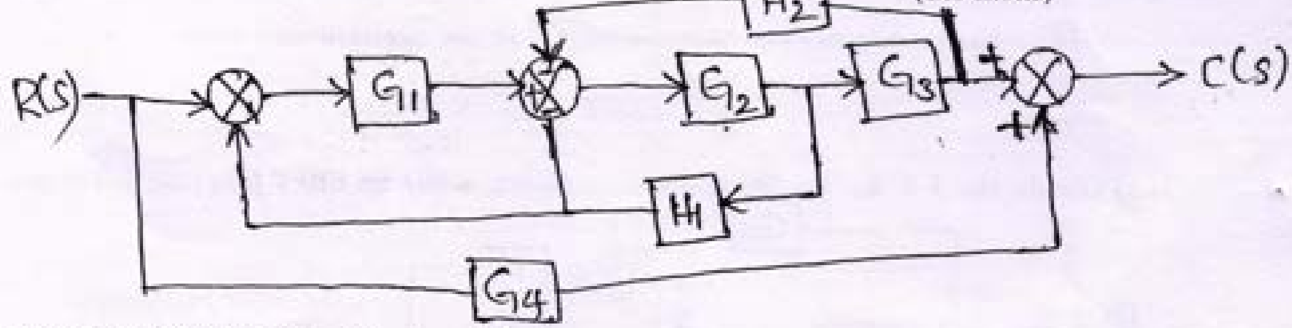
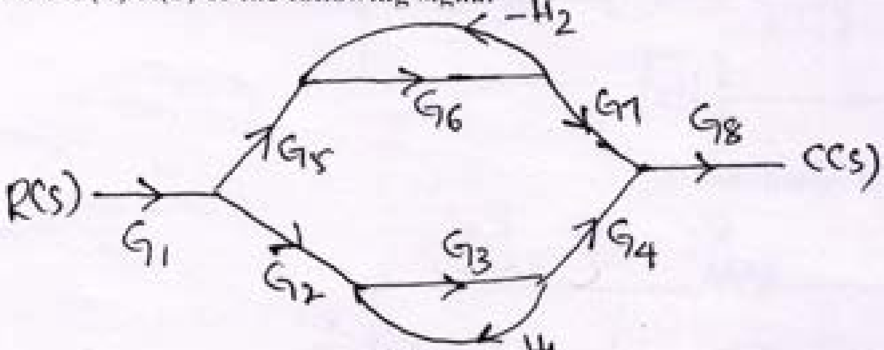
PART B

3.a) Obtain the T F for the block diagram shown below by block diagram reduction technique. **(10Marks)**

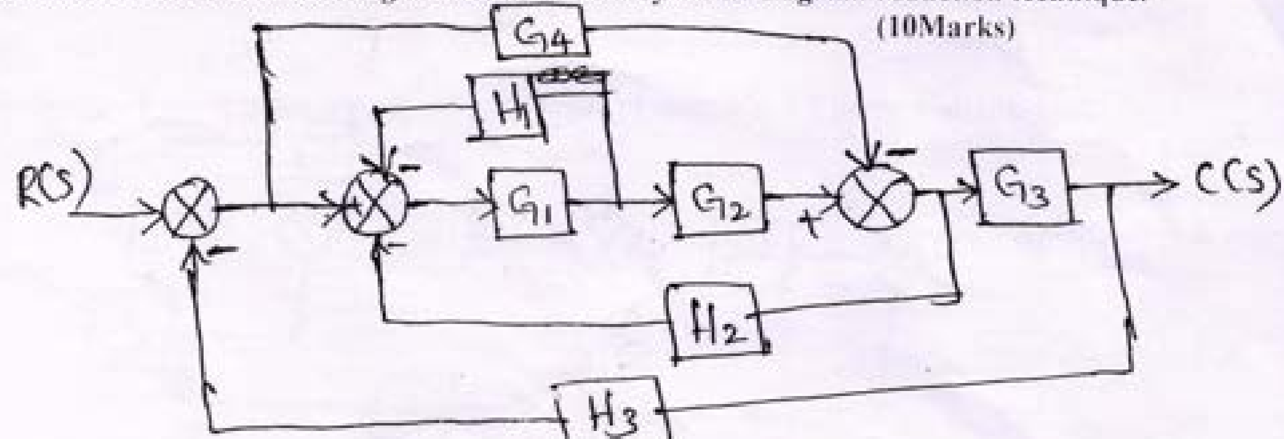


b) Find C(S)/R(S) of the following signal **(10Marks)**

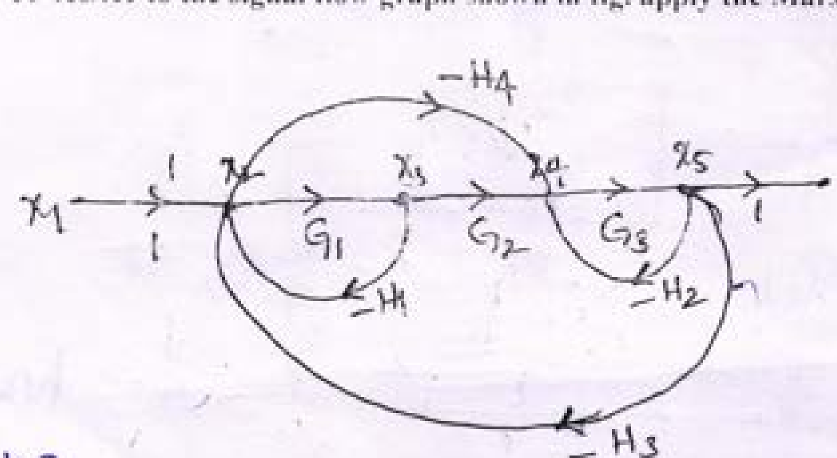


OR

4.a) Obtain the T F for the block diagram shown below by block diagram reduction technique. **(10Marks)**



b) find the TF X6/X1 to the signal flow graph shown in fig. apply the Marson's gain formula



K.S
STAFF

G. H Rame
HOD

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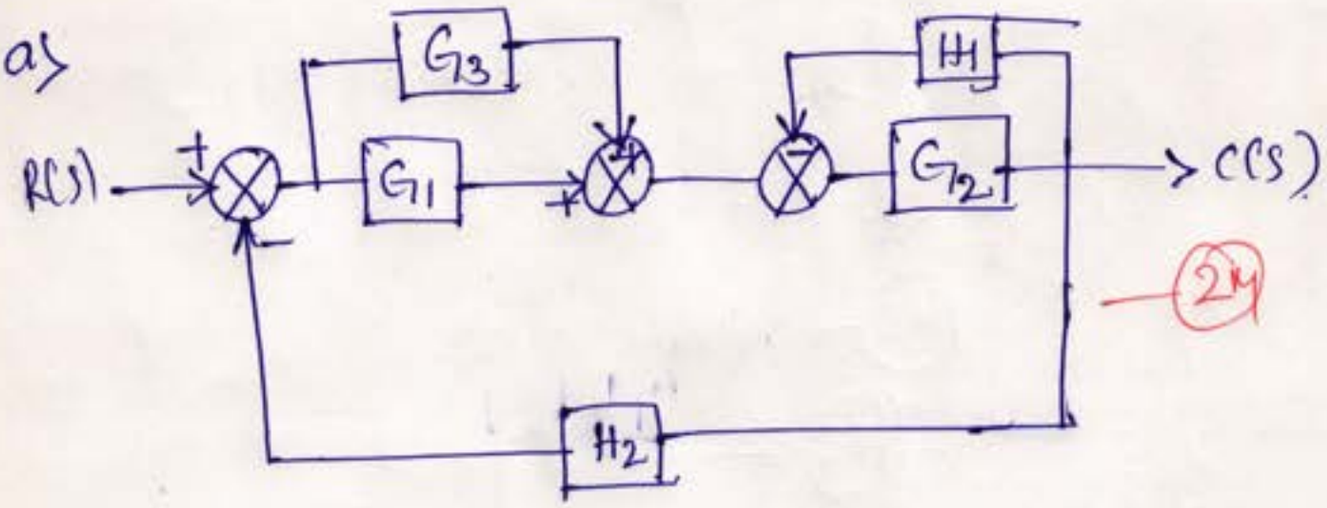
Scheme and Solution

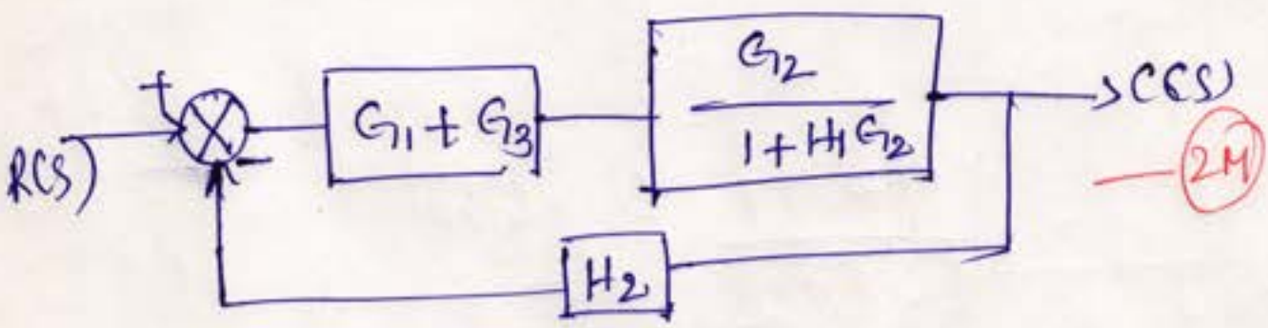
Control Systems – 18EE61

Internal – II

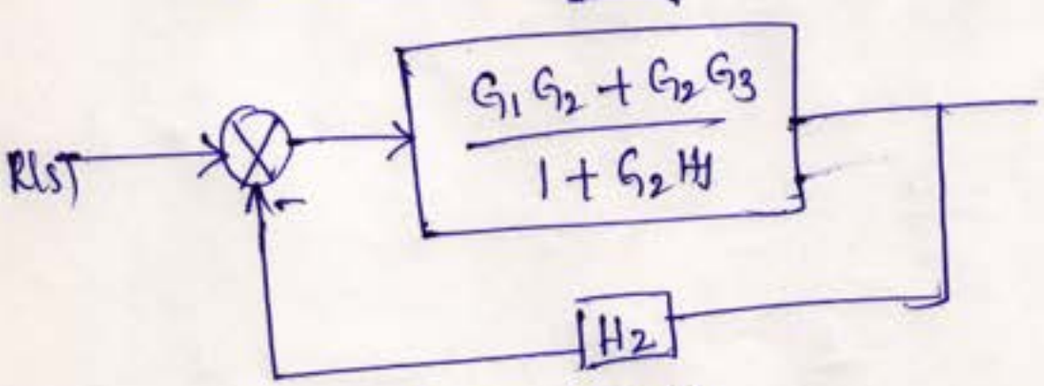
1 a)



2M



2M



2M

$$T.F = \frac{\dfrac{G_1G_2 + G_2G_3}{1 + G_2H_1}}{1 + \dfrac{G_1G_2 + G_2G_3}{1 + H_1G_2} \cdot H_2}$$ — 2M

$$T.F = \frac{G_1G_2 + G_2G_3}{1 + H_1G_2 + G_1G_2H_2 + G_2G_3H_2}$$ — 2M

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b)

$$e_i = i_1 R_1 + \frac{1}{C_1}\int (i_1 - i_2)\,dt \quad -(1) \qquad -(1)$$

$$R_2 i_2 + \frac{1}{C_2}\int i_2\,dt + \frac{1}{C_1}\int (i_2 - i_2)\,dt = 0 \quad -(2) \qquad -(1)$$

o/p eqn:

$$\frac{1}{C_2}\int i_2\,dt = e_0 \quad -(3) \qquad -(1)$$

$$\left[R_1 + \frac{1}{sC_1}\right] I_1(s) - \frac{1}{sC_1} I_2(s) = E_i(s) \quad -(4) \qquad -(2)$$

$$-\frac{1}{sC_1} I_1(s) + \left[R_2 + \frac{1}{sC_2} + \frac{1}{sC_1}\right] I_2(s) = 0 \quad -(5) \qquad -(2)$$

$$\begin{bmatrix} R_1 + \frac{1}{sC_1} & -\frac{1}{sC_1} \\ -\frac{1}{sC_1} & R_2 + \frac{1}{sC_2} + \frac{1}{sC_1} \end{bmatrix} \begin{bmatrix} I_1(s) \\ I_2(s) \end{bmatrix} = \begin{bmatrix} E_i(s) \\ 0 \end{bmatrix} \qquad -(1)$$

$$I_2(s) = \frac{s^2 C_1 C_2 E_i(s)}{s^3 C_1^2 C_2 R_1 R_2 + s^2(R_1 C_1 C_2 + C_1^2 R_1 + R_2 C_1 C_2) + sC_1} \qquad -(1)$$

$$E_0(s) = \frac{1}{sC_2} I_2(s)$$

$$G_1(s) = \frac{E_0(s)}{E_i(s)} = \frac{C_1}{s^3 C_1^2 C_2 R_1 R_2 + s^2(R_1 C_1 C_2 + C_1^2 R_1 + R_2 C_1 C_2) + sC_1} \qquad -(1)$$

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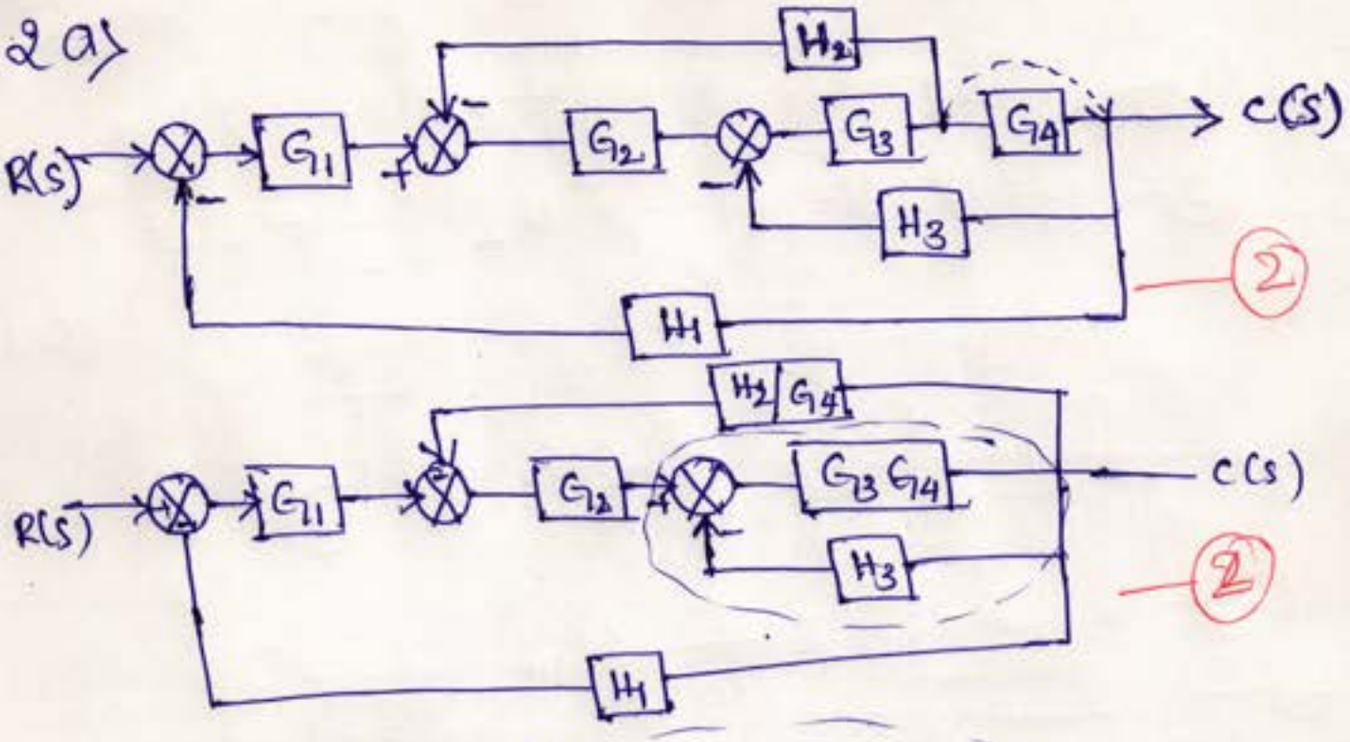
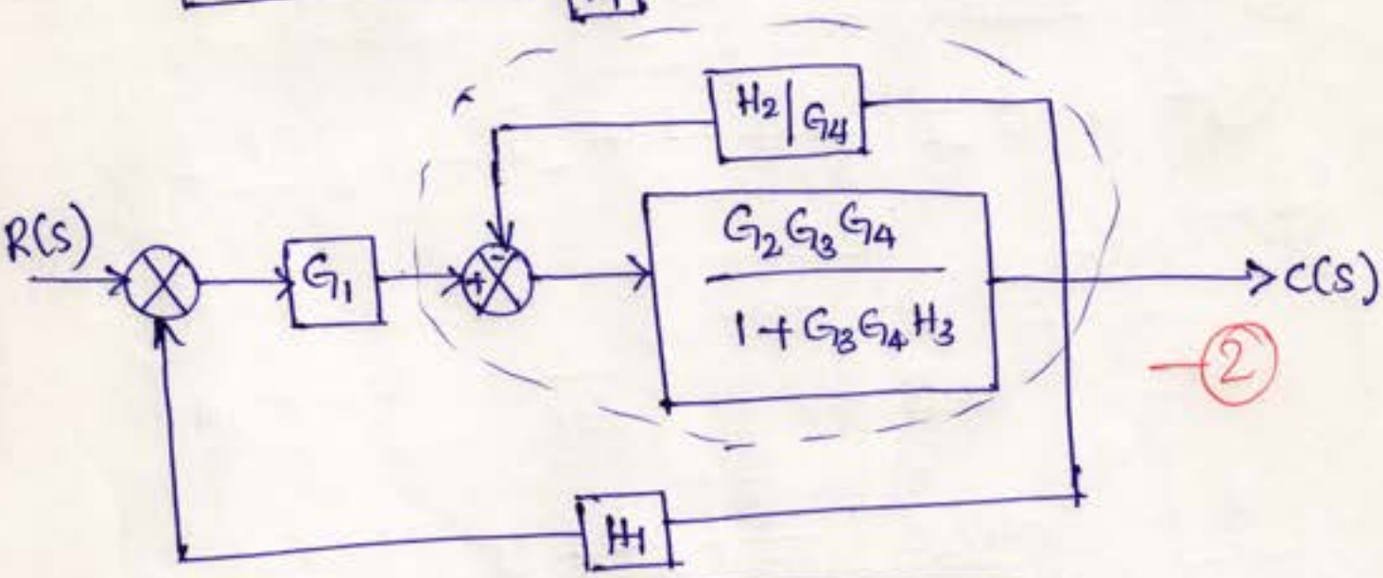
2 a)

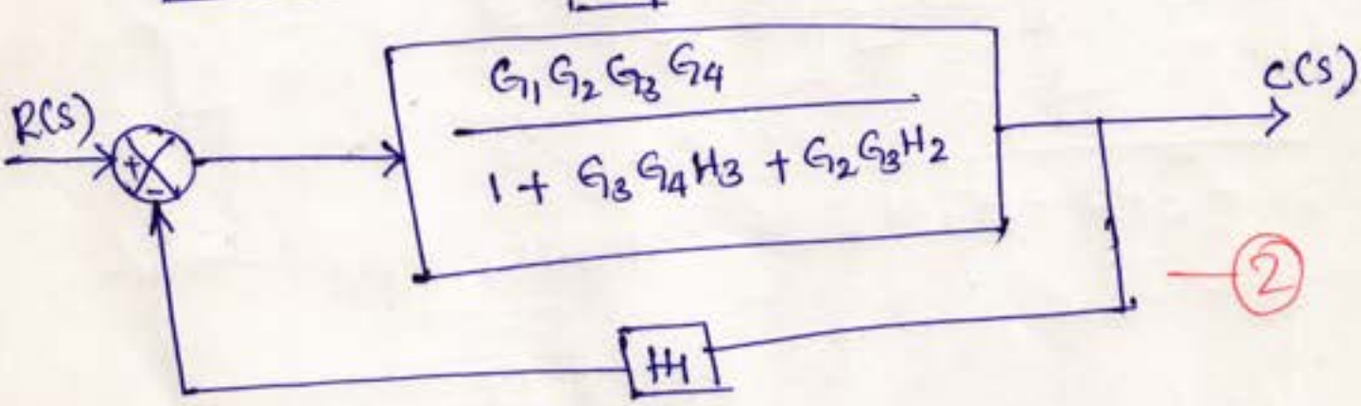


2

2



2



2

$$\frac{C(s)}{R(s)} = \frac{\dfrac{G_1 G_2 G_3 G_4}{1 + G_3 G_4 H_3 + G_2 G_3 H_2}}{1 + \dfrac{G_1 G_2 G_3 G_4}{1 + G_3 G_4 H_3 + G_2 G_3 H_2} \cdot H_1}$$

2

$$\frac{C(s)}{R(s)} = \frac{G_1 G_2 G_3 G_4}{1 + G_3 G_4 H_3 + G_2 G_3 H_2 + G_1 G_2 G_3 G_4 H_1}$$

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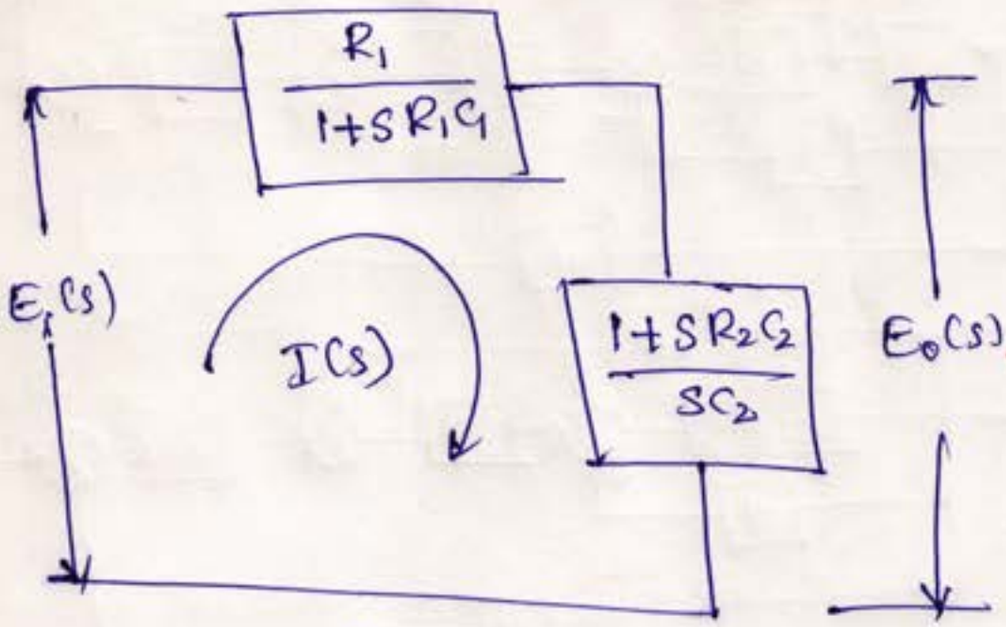
b)



4M

$$E_i(s) = \frac{R_1}{1+SR_1C_1} I(s) + \frac{1+SR_2C_2}{SC_2} I(s)$$

$$E_i(s) = \frac{SR_1C_2 + (1+SR_2C_2)(1+SR_1C_1)}{(1+SR_1C_1)SC_2}$$ — 2M

$$E_o(s) = \frac{1+SR_2C_2}{SC_2} I(s)$$ — 2M

$$T.F = G(s) = \frac{E_o(s)}{E_i(s)}$$

$$T.F = \frac{(1+SR_1C_1)(1+SR_2C_2)}{SR_1R_2 + (1+SR_2C_2)(1+SR_1C_1)}$$ — 2M

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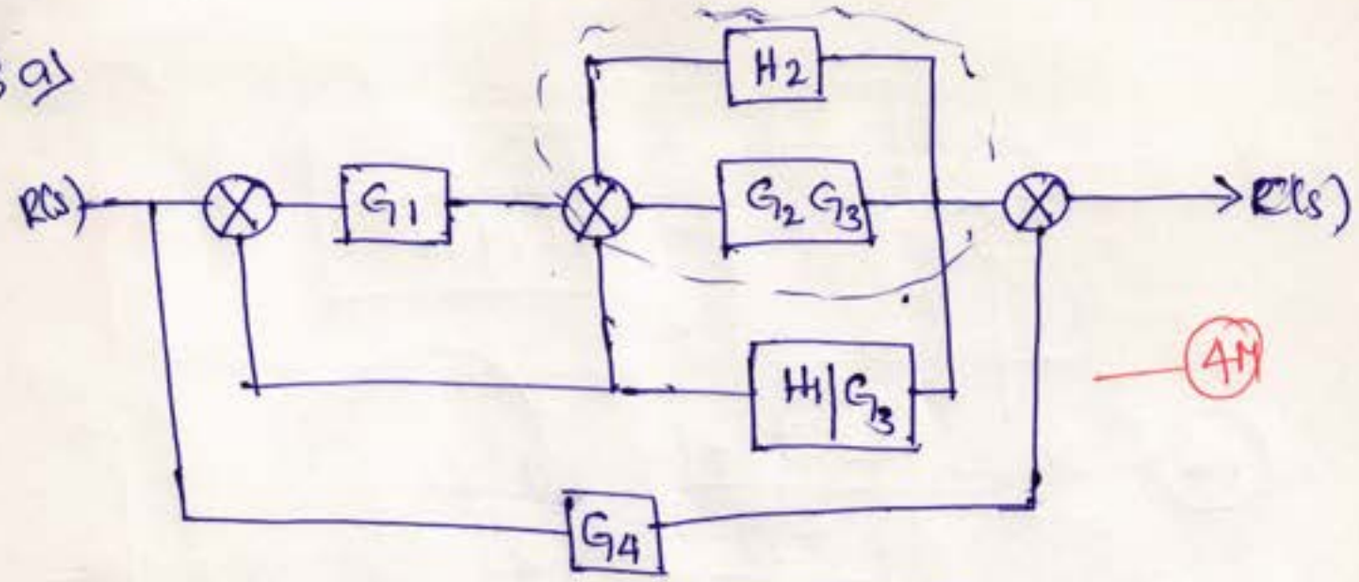
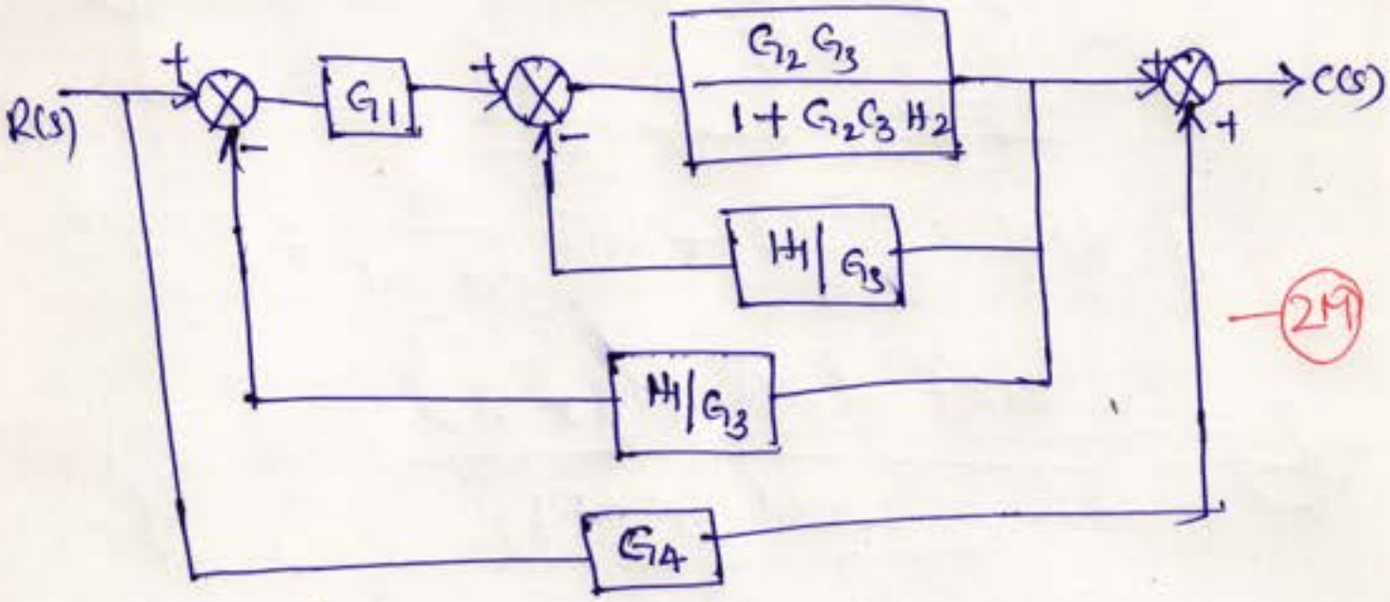
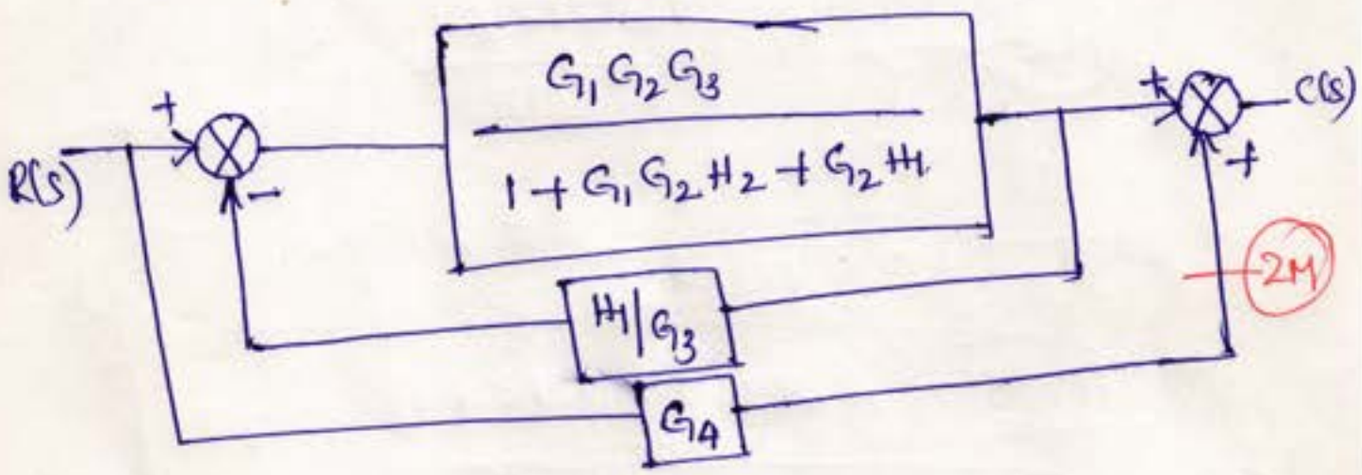
3 a)



4M



2M



2M

$$T.F = \frac{C(s)}{R(s)} = G_4 + \frac{G_1 G_2 G_3}{1 + G_1 G_2 H_2 + G_2 H_1 + G_1 G_2 H_1}$$

2M

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b)

① No of Forward path

$P_1 = G_1 G_5 - G_6 G_7 G_8$

$P_2 = G_1 G_2 G_3 G_4 G_8$ } — 2M

② No of closed loops

$L_1 = -G_3 H_1$

$L_2 = -G_6 H_2$ } — 1M

③ No of two non touching loops

$L_1 L_2 = G_3 G_6 H_1 H_2$ — 1M

④ $\Delta_1 = 1 + G_3 H_1$

$\Delta_2 = 1 + G_6 H_2$ } — 2M

⑤ $\Delta = 1 - (-G_3 H_1 - G_6 H_2) + [G_3 G_6 H_1 H_2]$ — 2M

$\Delta = 1 + G_3 H_1 + G_6 H_2 + G_3 G_6 H_1 H_2$

$$T.F = \frac{P_1 \Delta_1 + P_2 \Delta_2}{\Delta}$$

$$T.F = \frac{G_1 G_5 G_6 G_7 G_8 + G_1 G_3 G_5 G_6 G_7 G_8 H_1 + G_1 G_2 G_3 G_4 G_8 + G_1 G_2 G_3 G_4 G_6 G_8 H_2}{1 + G_3 H_1 + G_6 H_2 + G_3 G_6 H_1 H_2}$$

— 2M

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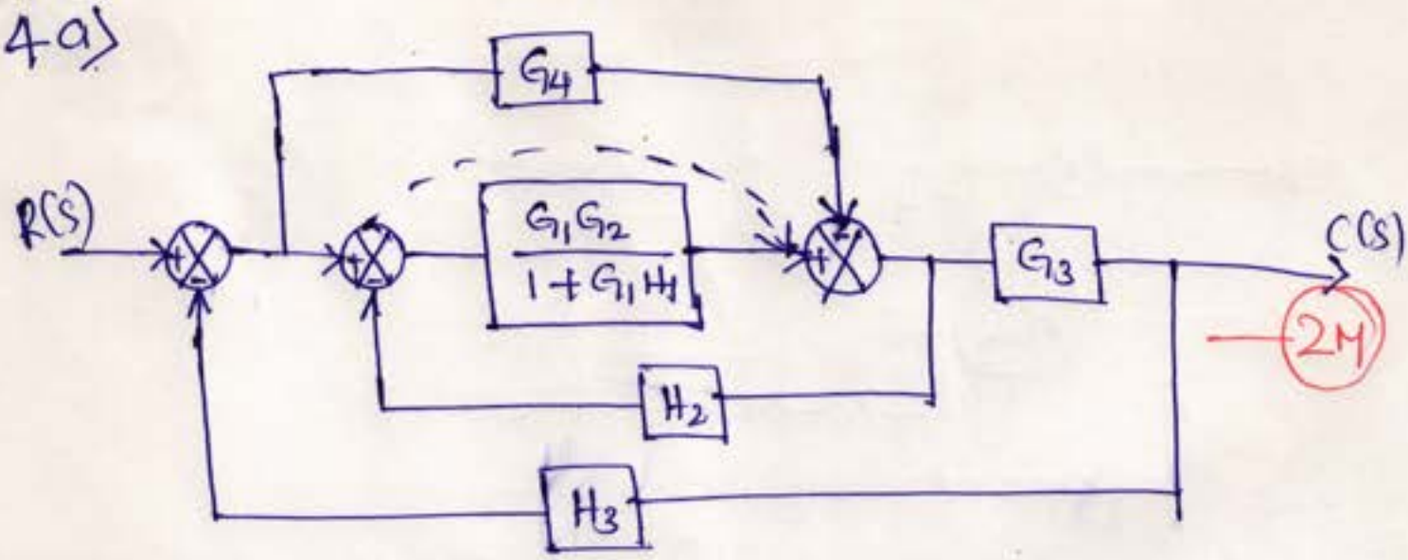
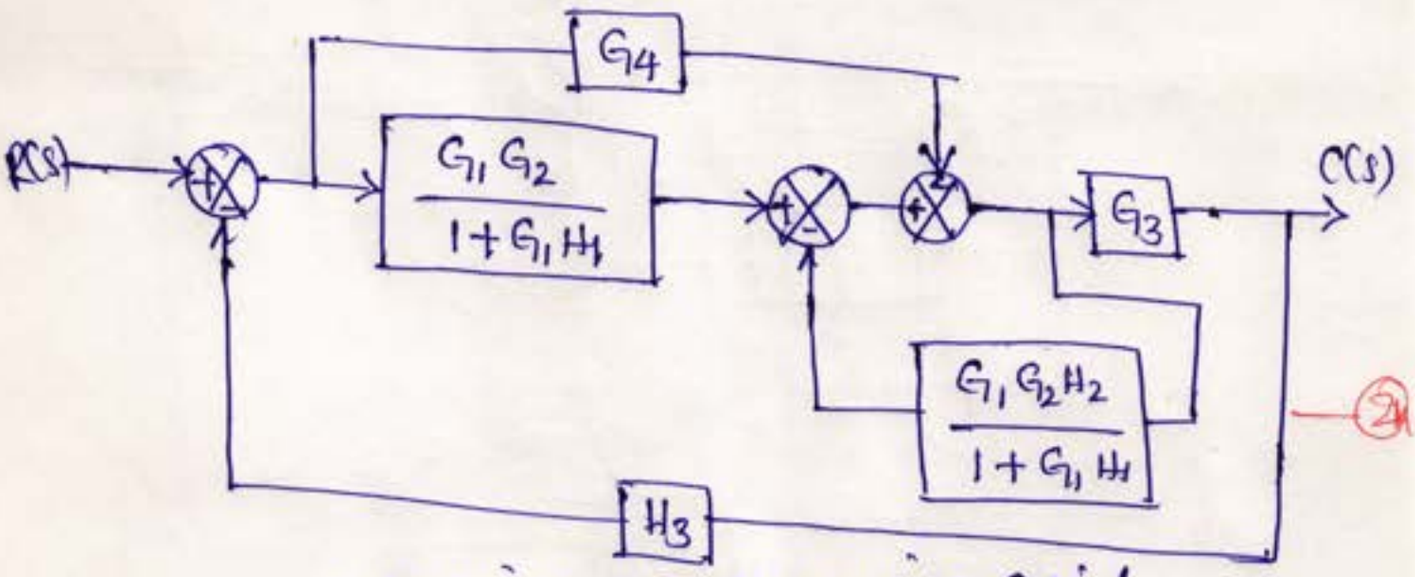
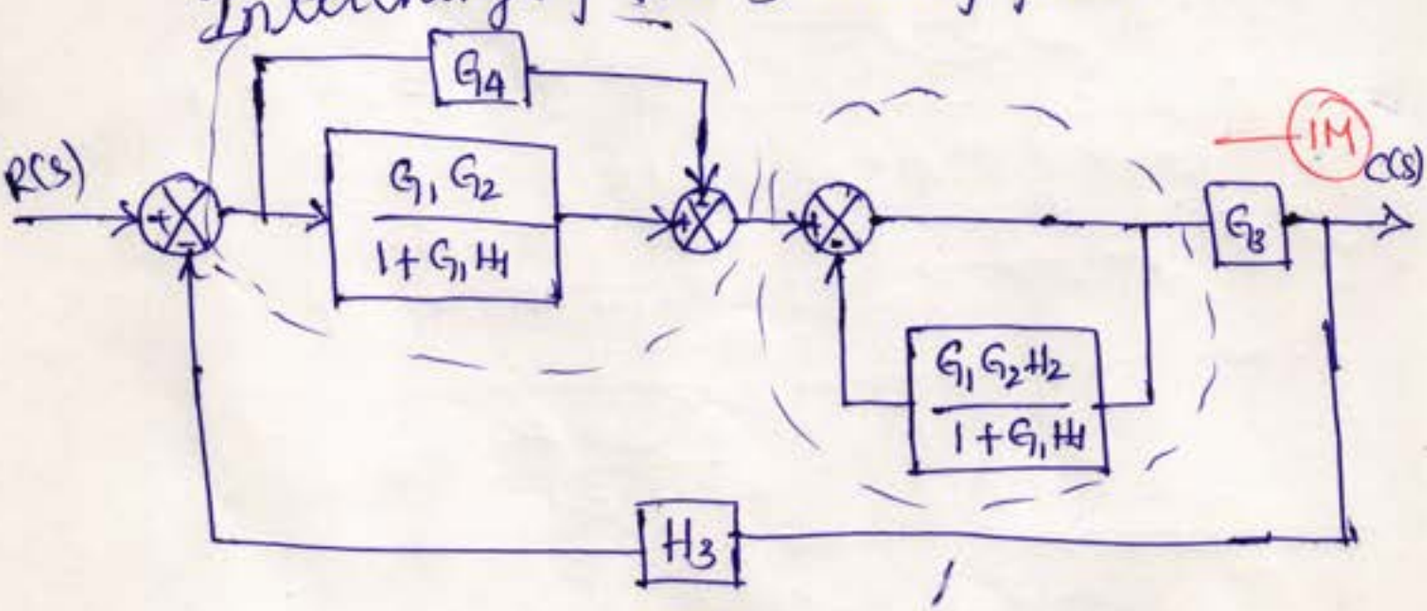
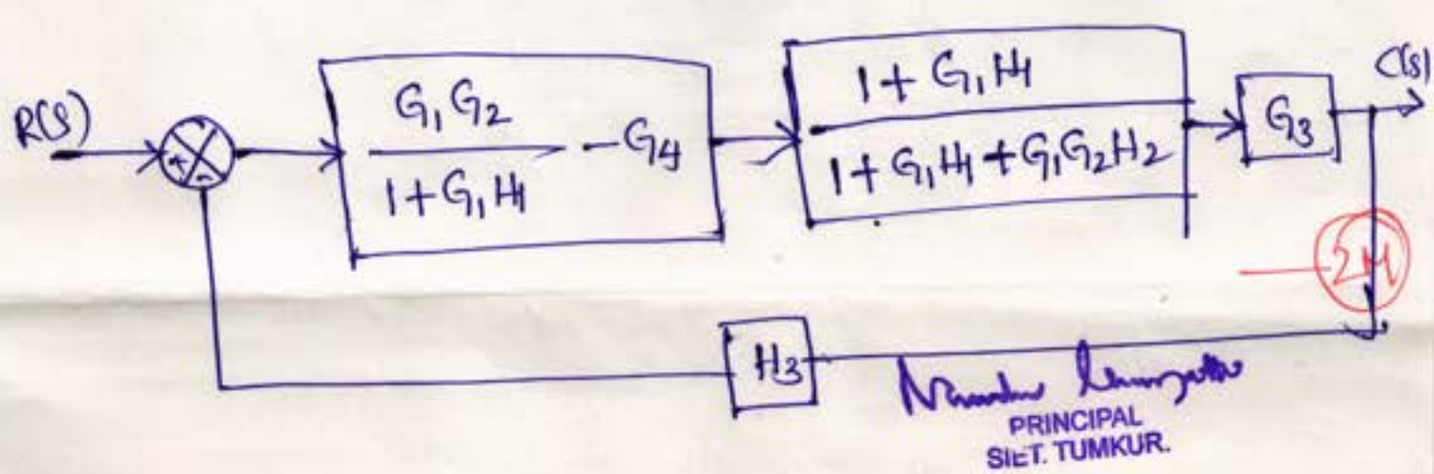
4 a)





Interchanging two summing point





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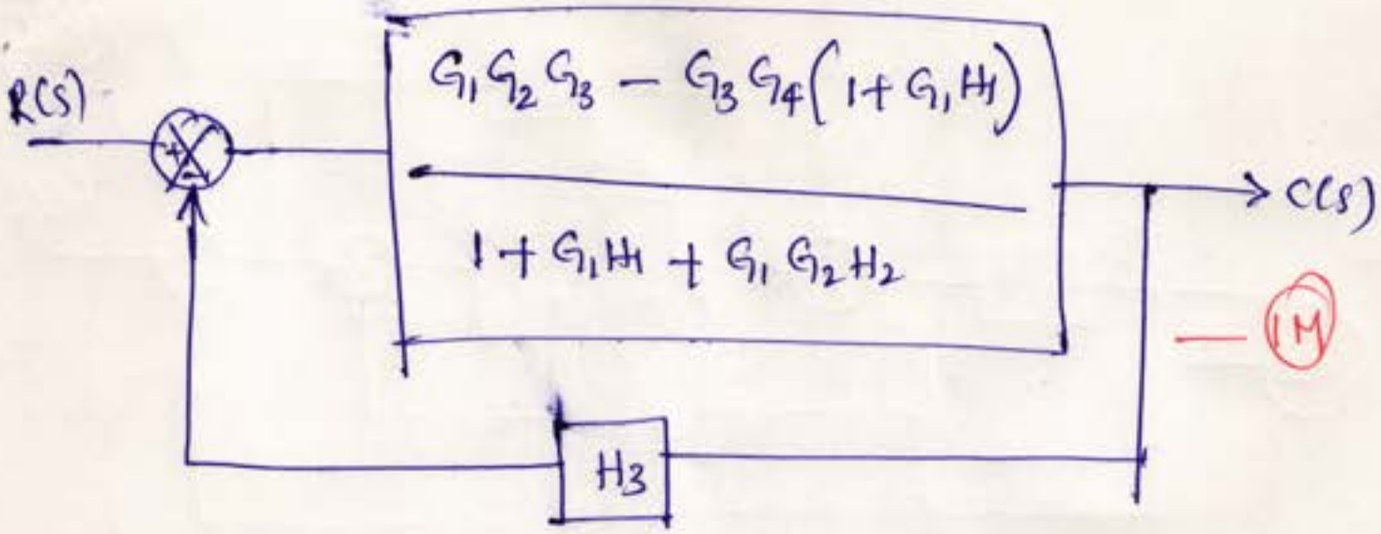

— 1M

$$\frac{C(s)}{R(s)} = \frac{\dfrac{G_1G_2G_3 - G_3G_4(1+G_1H_1)}{1+G_1H_1+G_1G_2H_2}}{1+\dfrac{G_1G_2G_3 - G_3G_4(1+G_1H_1)}{1+G_1H_1+G_1G_2H_2}\cdot H_3}$$

$$\frac{C(s)}{R(s)} = \frac{G_1G_2G_3 - G_3G_4(1+G_1H_1)}{1+G_1H_1+G_1G_2H_2+G_1G_2G_3H_3 - G_3G_4H_3(1+G_1H_1)}$$

— 2M

b) ① No of forward path

$P_1 = G_1G_2G_3$
$P_2 = -G_3H_4$

— 2M

② No of closed loop

$L_1 = -G_1H_1$
$L_2 = -G_3H_2$
$L_3 = -G_1G_2G_3H_3$
$L_4 = G_3H_3H_4$

— 2M

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④ No of two non touching loop

$L_1 L_2 = G_1 G_3 H_1 H_2$ — (1M)

⑤ To find Δ_1 & Δ_2

$\Delta_1 = 1 - 0 = 1$

$\Delta_2 = 1 - 0 = 1$ } — (1M)

~~$\Delta = 1 - [G_1 H_1 - G_2 H_2 - G_1 G_2 G_3$~~

⑥ $\Delta = 1 - (-G_1 H_1 - G_2 H_2 - G_1 G_2 G_3 H_3 + G_3 H_3 H_4) + G_1 G_3 H_1 H_2$ — (2M)

$T.F = \dfrac{P_1 \Delta_1 + P_2 \Delta_2}{\Delta}$

$T.F = \dfrac{G_1 G_2 G_3 - G_3 H_4}{1 + G_1 H_1 + G_3 H_2 + G_1 G_2 G_3 H_3 - G_2 H_3 H_4 + G_1 G_3 H_1 H_2}$ — (2M)

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

Department of Electrical & Electronics Engineering

CONTROL SYSTEMS -18EE61

INTERNAL ASSEESSMENT TEST -III

Max Marks: 40 **Date:** -07-2023

Semester: VI **Duration:** 90 Minutes

NOTE: Answer any *two* full questions choosing one question each part

PART A

1. a) Determine the stability of the system whose open loop TF is given by (i) $10/S(1+0.1S)(1+0.6S)$ (ii) $S^5+2S^4+24S^3+48S^2-25S-50=0$ using R-H criterion. **(10Marks)**

   b) Derive the expression for Rise time and peak overshoot of a standard second order damped system **(10Marks)**

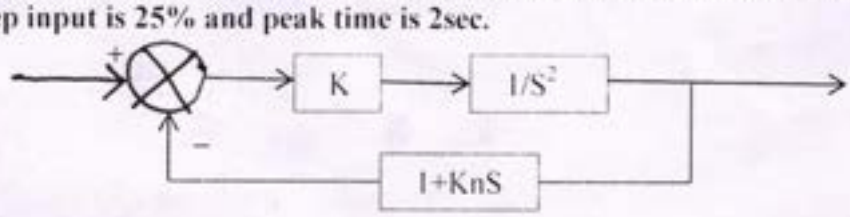
OR

2. a) Sketch root locus for $G(S)=K/S(S^2+4S+13)$ **(10Marks)**

   b) Comment on the stability of the system whose characteristics equations are given below
   (i) $S^4+6S^3+21S^2+36S+20=0$ (ii) $4S^3+3S^2+2S+5=0$ (iii) $S^4+2S^3+S^2+4S+5=0$
   (iv) $S^4+3S^3+4S^2+S+K=0$ (v) $S5+2S^4+2S^3+4S^2+3S+6=0$ **(10Marks)**

PART B

3. a) For the system given below, determine the values of K and Kn so that maximum overshoot due to step input is 25% and peak time is 2sec. **(10Marks)**



   b) Plot the roots locus for the forward transfer function $G(S)=K/S(S+2)(S+3)$. **(10 Marks)**

OR

4. a) Define the following time response specification for an underdamped 2nd order system.
   (i) Rise time (ii) peak time (iii) Peak overshoot (iv) Settling time r **(10 Marks)**

   b) Sketch the root locus $G(S)H(S)= K(S+1)/S^2(S+2)$ **(10 Marks)**

Tanuja K.S.
STAFF

G. H Rama
HOD

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Scheme and Solution

control systems – 18EE61

Internal – III

1 a) (i) Char eqn: $1 + G(S)H(S) = 0$ — 1/2M

$$1 + \frac{10}{S\left(1+\frac{S}{10}\right)\left(1+\frac{6S}{10}\right)} = 0 \quad \text{— 1/2M}$$

$$1 + \frac{1000}{100S + 60S^2 + 10S^2 + 6S^3}$$

$$6S^3 + 70S^2 + 10S + 1000 = 0 \quad \text{— 2M}$$

S^3	6 100
S^2	70 1000
S^1	14.28
S^0	1000.

— 2M

Since there is no sign change in first column. system is stable — 1M

(ii) $S^5 + 2S^4 + 24S^3 + 48S^2 - 25S + 50 = 0$

S^5	1	24	-25
S^4	2	48	-50
S^3	0	0	0

— 2M

The term in the S^3 row are all zero. Hence

$A(S) = 2S^4 + 48S^2 - 50 = 0$

$\frac{dA(S)}{dS} = 8S^3 + 96S$

$S^3 + 12S = 0$ — 1/2M

S^5	1	24	-25
S^4	1	24	-25
S^3	1	12	
S^2	12	-25	
S^1	14		
S^0	-25		

— 2M

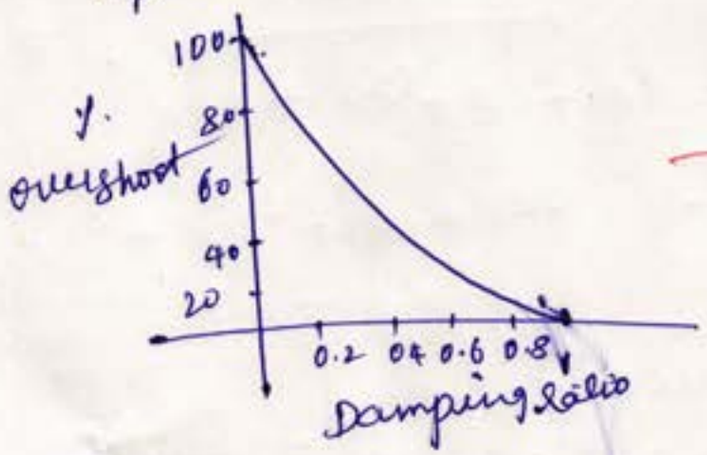
Sign change in the first column of the new array. system is unstable — 1/2M

b) Derivation of Rise time (t_r)

$$t_r = \frac{\pi - \tan^{-1}\frac{\sqrt{1-\zeta^2}}{\zeta}}{\omega_n \sqrt{1-\zeta^2}}$$ } — (5M)

Derivation of peak overshoot (M_p)

$$M_p = 100\, e^{\frac{-\pi\zeta}{\sqrt{1-\zeta^2}}} \%$$ } — (4M)



— (1M)

2) a) Root locus $G(s) = \frac{K}{s(s^2+4s+13)}$

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select $S = 0$ as breakaway point and neglect $S = -2$ because root locus is not existing at that point.

* Root locus is not crossing the imaginary axis.

* Angle of departure is not required because there are no complex conjugate roots.

The complete root locus sketch is as shown in graph sheet. Root locus has 3 branches. 1st branch starts at pole at $S = -2$ and travels through negative real axis to meet zero at $S = -1$. The next 2 root locus branches starts at pole at $S = 0$ and travels parallel to asymptode to meet zero at ∞.

Qa) Sketch the root locus for $G(s) = \dfrac{K}{s(s^2+4s+13)}$

$$s^2 + 4s + 13 = 0$$

$$s = \frac{-4 \pm \sqrt{16 - 4(13)}}{2}$$

$$= \frac{-4 \pm \sqrt{16 - 52}}{2}$$

$$= \frac{-4 \pm \sqrt{-36}}{2}$$

$$= \frac{-4 \pm j6}{2}$$

$$s = -2 \pm j3$$

2M

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$$G(s) = \frac{K}{s(s+2+j3)(s+2-j3)}$$

* Number of poles, $P = 3$
* Number of zeroes, $Z = 0$

* $P - Z = 3 - 0$

$P - Z = 3$ — (1M)

* Number of root locii terminates to ∞ is 3

* Centroid, $\sigma = \frac{\Sigma P - \Sigma Z}{P - Z}$

$= \frac{-2 - 2 - \{-0\}}{3}$

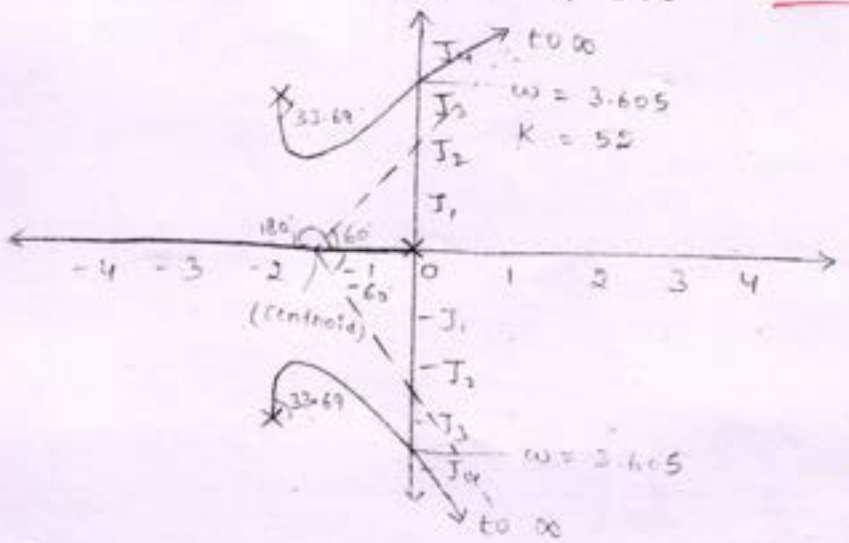
$\boxed{\sigma = -1.33}$ — (1M)

* Angle of departure,

$\theta = \frac{n \times 180^\circ}{P - Z}$

$= \frac{n \times 180^\circ}{3} = n \times 60$ Put $n = 1, 3, 5$

$\theta = 60^\circ, 180^\circ, 300^\circ$ — (1M)



* Root locus exists from $s = 0$ to ∞.

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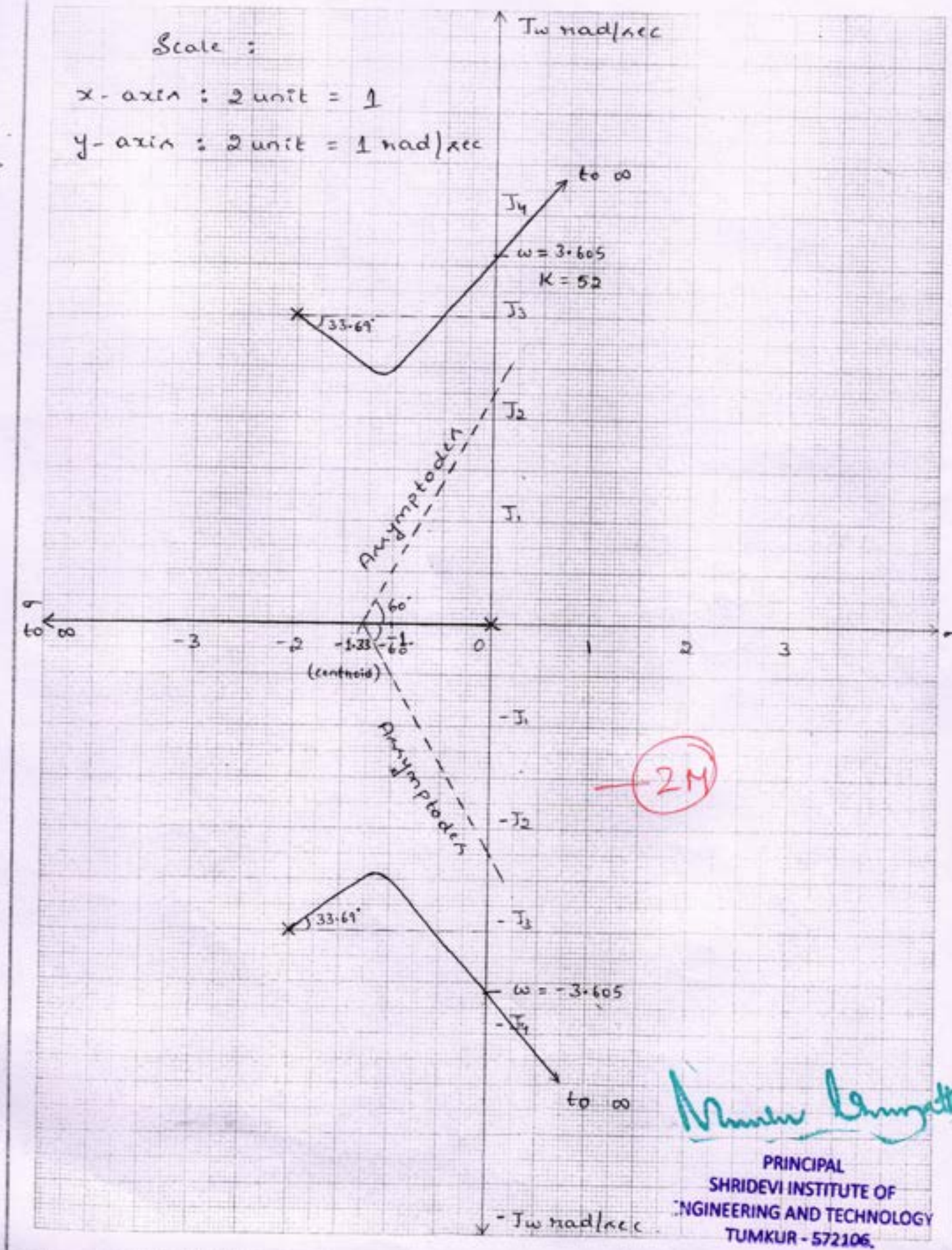
Scale :
x - axis : 2 unit = 1
y - axis : 2 unit = 1 rad/sec
Tw rad/sec
to ∞
J4
ω = 3.605
K = 52
J3
33.69°
J2
Asymptoden
J1
60°
to ∞
-3
-2
-1.33
-1/60
0
1
2
3
(centroid)
-J1
Asymptoden
-J2
33.69°
-J3
ω = -3.605
-J4
to ∞
- Tw rad/sec
2M
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* From the location of poles and zeroes and from the knowledge of typical sketch of root locus it can be concluded that there is no possibility of break away or break in points.

* To find the point of intersection with imaginary axis put $s = j\omega$ in the characteristic equation.

$$1 + G(s)H(s) = 0$$

$$1 + \frac{K}{s(s^2+4s+13)} = 0$$

$$s^3 + 4s^2 + 13s + K = 0$$

$$(j\omega)^3 + 4(j\omega)^2 + 13(j\omega) + K = 0$$

$$-j\omega^3 - 4\omega^2 + 13j\omega + K = 0$$

$$(-4\omega^2 + K) + j(13\omega - \omega^3) = 0 \quad \text{— (2M)}$$

Equating real part to zero

$$-4\omega^2 + K = 0$$

$$K = 4\omega^2$$

$$K = 4(13)$$

$$\boxed{K = 52}$$

Equating imaginary part to zero

$$13\omega - \omega^3 = 0$$

$$13\omega = \omega^3$$

$$\omega^2 = 13$$

$$\boxed{\omega = \pm 3.605 \text{ rad}}$$

* To find the angle of departure at $s = -2 + j3$ — (1M)

$$GH = \frac{K}{s(s+2+j3)(s+2-j3)}$$

$$GH' = \frac{K}{s(s+2+j3)}$$

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b) (i) ~~$s^4+6s^3+36s+20=0$~~ $s^4+6s^3+21s^2+36s+20=0$

s^4	1	21	20
s^3	6	36	
s^2	15	20	
s^1	28		
s^0	20		

(2M)

In first column there is no sign change ∴ the system is stable

(ii) $4s^3+3s^2+2s+5=0$

s^3	4	2
s^2	3	5
s^1	-4.6	0
s^0	5	0

No of sign change in the first colum is 2
∴ system is unstable

(2M)

(iii) $s^4+2s^3+s^2+4s+5=0$

s^4	1	1	5
s^3	2	4	0
s^2	-1	5	0
s^1	14	0	0
s^0	5	0	0

No of sign change = 2
∴ system is unstable

(2M)

(IV) $s^4+3s^3+4s^2+s+k=0$

s^4	1	4	K
s^3	3	1	0
s^2	3.66	K	0
s^1	$\frac{3.66-3K}{3.66}$	0	0
s^0	K	0	0

Case(i) → $K>0$ from s^0 row
Case(ii) → $3.66-3K>0$
$K=1.22$

(2M)

K range from
$0<K<1.22$.

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(V) $s^5+2s^4+2s^3+4s^2+3s+6=0$

s^5	1	2	3
s^4	2	4	6
s^3	0	0	0
s^2	2	6	0
s^1	-16	0	0
s^0	6	0	0

No of sign change = 2

∴ system is unstable — (2M)

3 a)

$$G(s)=\frac{K}{s^2}$$ — (1/2M)

$$H(s)=1+K_n s$$ — (1/2M)

$$\frac{C(s)}{R(s)}=\frac{K}{s^2+KK_n s+K}=\frac{\omega_n^2}{s^2+2\zeta\omega_n s+\omega_n^2}$$ — (2M)

$\omega_n^2 = K$

$\omega_n = \sqrt{K}$ — (1/2M)

$2\zeta\omega_n = KK_n$

$\zeta = \frac{KK_n}{2\omega_n} = \frac{K_n\sqrt{K}}{2}$ — (1/2M)

$25\% \geq 100\, e^{\frac{-\pi\zeta}{\sqrt{1-\zeta^2}}}$ — (1/2M)

$e^{KK_n} = \frac{100}{25} = 4$ — (2M)

$K_n = 0.47$ — (2M)

$K = 2.948$ — (2M)

3 (b) Sketch the root locus of system whose closed loop transfer function is $G(s) = \frac{K}{s(s+2)(s+4)}$. Find the value of K so that the damping ratio of closed loop system is 0.5

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$$G(s) = \frac{K}{s(s+2)(s+4)}$$

* Number of poles, $P = 3$
* Number of zeroes, $Z = 0$
* $P - Z = 3 - 0$

$P - Z = 3$ — (1M)

* Number of root locii terminates to ∞ is 3
* Centroid, $\sigma = \frac{\Sigma P - \Sigma Z}{P - Z}$

$= \frac{-2 - 4 - \{-0\}}{3}$

$\boxed{\sigma = -2}$ — (1M)

* Angle of departure

$\theta = \frac{n \times 180^\circ}{P - Z}$

$= \frac{n \times 180}{3} = n \times 60^\circ$) Put $n = 1, 2, 3, 4, 5$

$\theta = 60^\circ, 180^\circ, 300^\circ$ — (1M)

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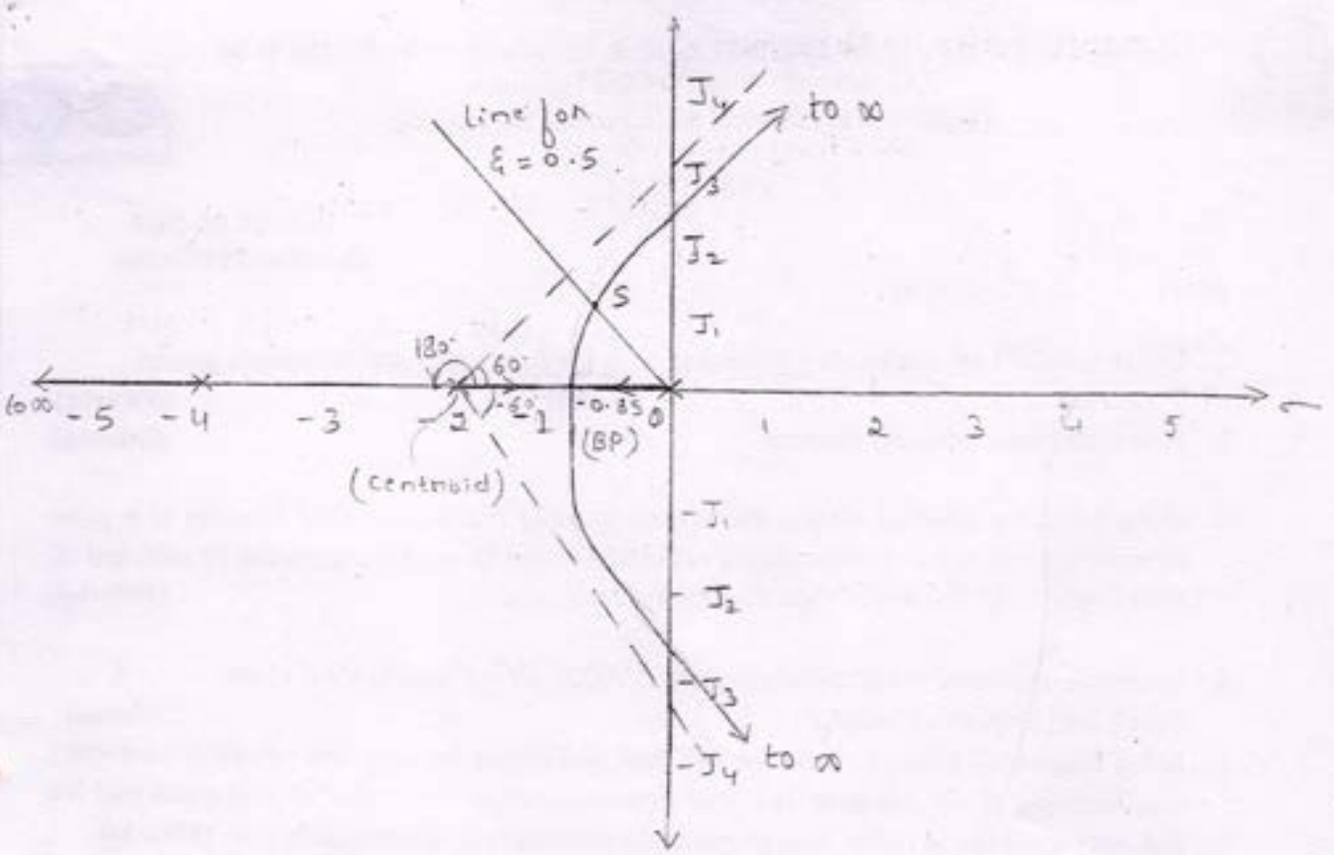

* Root locus exists between $s = -2$ and $s = -0$

* Root locus exists from $s = -4$ to ∞.

* To find the break away point equate $\frac{dK}{ds} = 0$. The characteristic eqn is

$$1 + G(s)H(s) = 0$$

$$1 + \frac{K}{s(s+2)(s+4)} = 0$$

$$(s^2+2s)(s+4) + K = 0$$

$$s^3 + 4s^2 + 2s^2 + 8s + K = 0$$

$$s^3 + 6s^2 + 8s + K = 0$$

$$K = -\left[s^3 + 6s^2 + 8s\right]$$

$$\frac{dK}{ds} = -\left[3s^2 + 12s + 8\right] = 0$$

$$3s^2 + 12s + 8 = 0$$

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$$S = \frac{-12 \pm \sqrt{144 - 4(3)(8)}}{2(3)}$$

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$$= \frac{-12 \pm \sqrt{+48}}{6}$$

$$= \frac{-12 \pm 6.92}{6}$$

$\boxed{S = -0.85}$ or $S = -3.15$ — 2M

Select $S = -0.85$ as the break away point and neglect $S = -3.15$ because root locus is not existing at that point.

* To find the point of intersection with imaginary axis put $S = j\omega$ in the characteristic Equation.

$$S^3 + 6S^2 + 8S + K = 0$$

$$(j\omega)^3 + 6(j\omega)^2 + 8(j\omega) + K = 0$$

$$-j\omega^3 - 16\omega^2 + 8j\omega + K = 0$$

$$(K - 16\omega^2) + j(8\omega - \omega^3) = 0$$

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Equating real part to Zero

$$K - 16\omega^2 = 0$$

$$K = 16\omega^2$$

$$K = 16(8)$$

$\boxed{K = 48}$

Equating imaginary part to Zero

$$8\omega - \omega^3 = 0$$

$$8\omega = \omega^3$$

$$\omega^2 = 8$$

$\boxed{\omega = \pm 2.82}$ rad/sec

— 2M

At $K = 48$ the system is stable.

* Angle of departure is not required because complex conjugate roots are not exists.

* Given, damping ratio $\xi = 0.5$

$$\xi = \cos\beta$$

$$\beta = \cos^{-1}\xi$$

$$= \cos^{-1}(0.5)$$

$$\beta = 60^\circ$$

* To find K for $\xi = 0.5$.

$$s = -0.65 + j1.25$$

$$K = -\left|\{s(s+2)(s+4)\}\right|$$

$$= -\left|\{(-0.65+j1.25)(-0.65+j1.25+2)(-0.65+j1.25+4)\}\right|$$

$$= -\left|(-0.65+j1.25)(1.35+j1.25)(3.35+j1.25)\right|$$

$$= -\left|(1.408)(1.839)(3.575)\right|$$

$$\boxed{K = 9.256}$$ — 2M

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⑥ The open loop transfer function of a unity feed back system is given by $G(s) = \dfrac{K(s+9)}{s(s^2+4s+11)}$

Sketch the root locus of system.

$$s^2 + 4s + 11 = 0$$

$$s = \frac{-4 \pm \sqrt{16 - 4(11)}}{2}$$

Date

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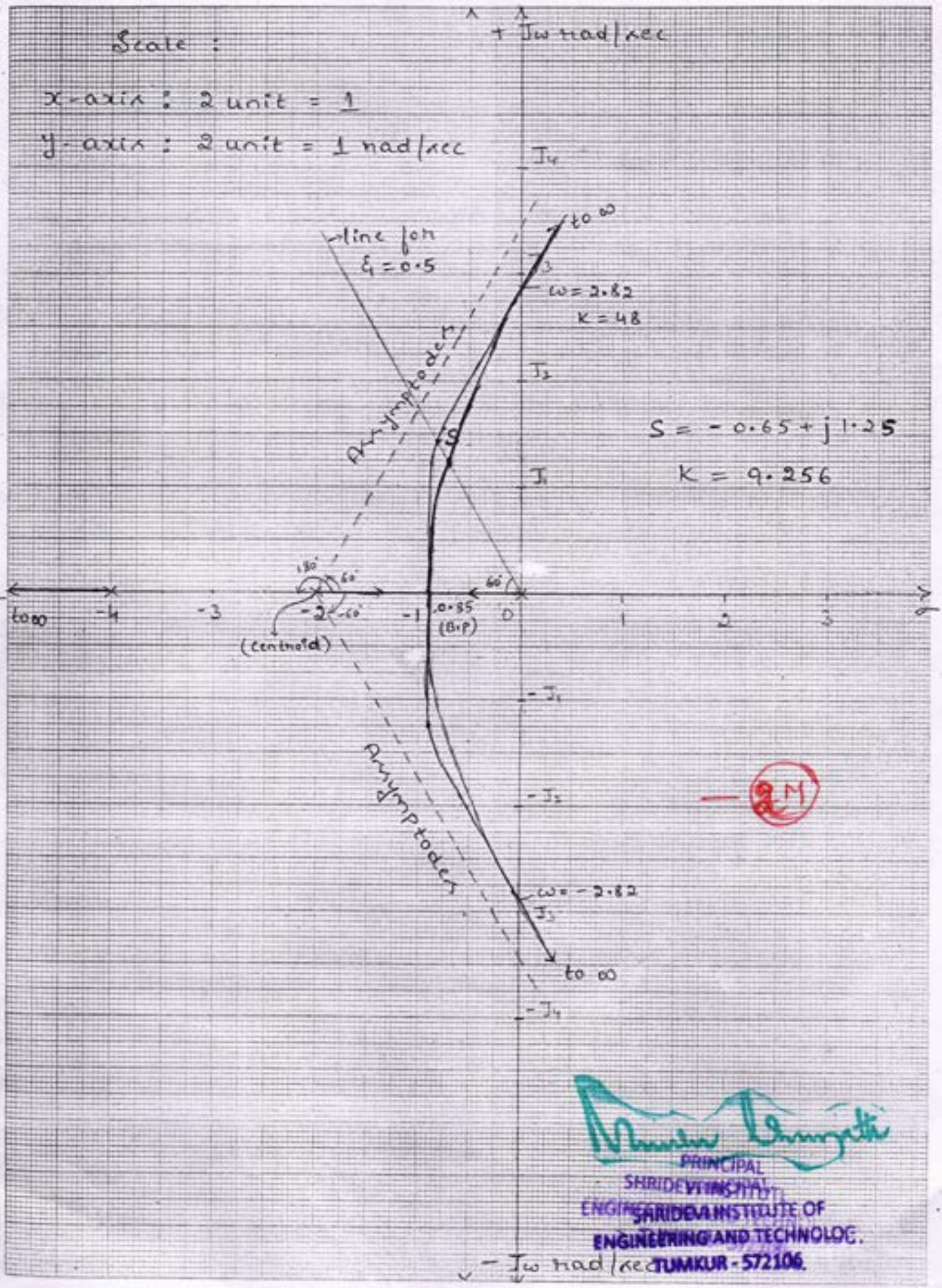

2M

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4 a) Definition of

(i) Rise time —— 2M

(ii) Peak time —— 2M

(iii) Peak over Shoot. —— 2M

(iv) settling time - —— 2M

Graph —— 2M

4 b) Root locus

$$G(s)H(s) = \frac{K(s+1)}{s^2(s+2)}$$

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The complete root locus sketch is as shown in graph sheet. Root locus has 2 branches. The two branches starts at complex poles [along the angle of depanture] and travels to meet zero at ∞.

(4b) Sketch the root locus of $G(s)H(s) = \frac{K(s+1)}{s^2(s+2)}$

$$G(s)H(s) = \frac{K(s+1)}{s^2(s+2)}$$

* Number of poles, $p = 3$
* Number of zeroes, $z = 1$

* $p - z = 3 - 1$

$p - z = 2$ — (1M)

* Number of root locii terminates to ∞ is 2

* Centroid, $\sigma = \frac{\Sigma p - \Sigma z}{p - z}$

$$= \frac{-2 - \{-1\}}{2}$$

$\sigma = -0.5$ — (1M)

* Angle of asymptode,

$$\theta = \frac{n \times 180}{p - z}$$

$$= \frac{n \times 180}{2} = n \times 90^\circ$$

Put $n = 1, 2$

$\theta = 90^\circ, 270$ — (1M)

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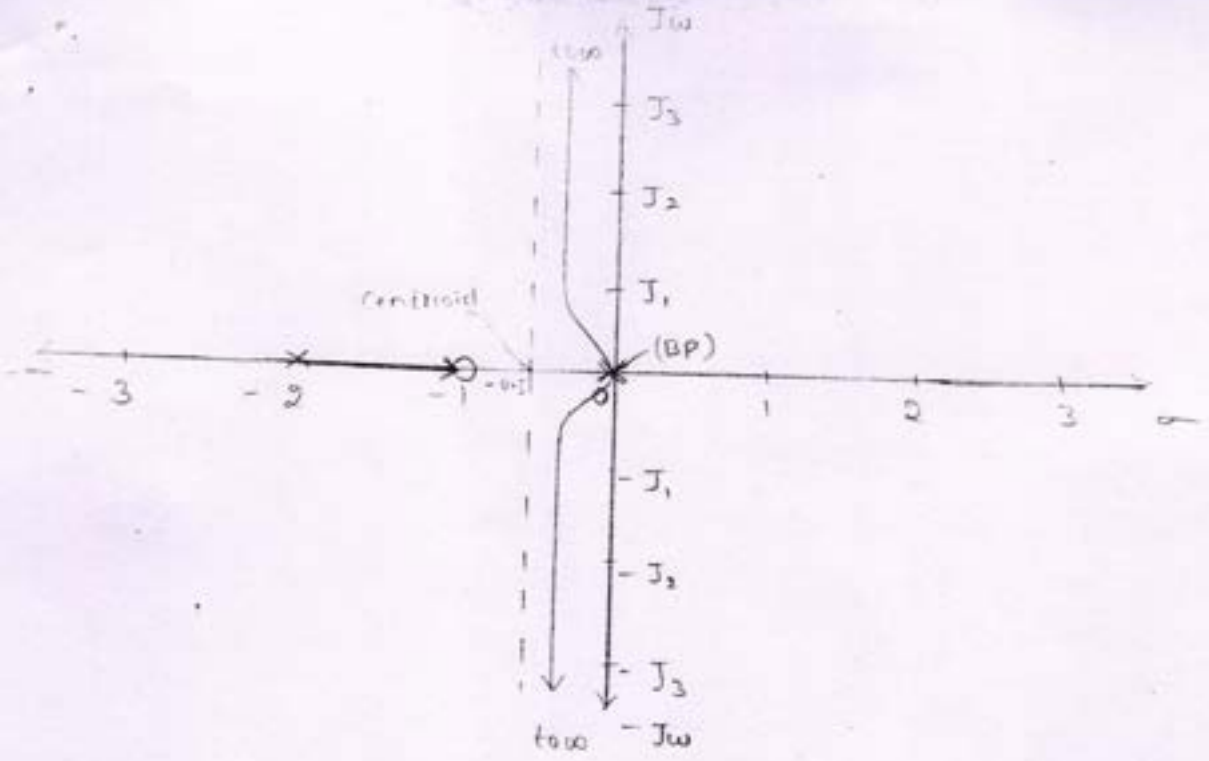

* Root locus exists between $S = -2$ and $S = -1$.
* Root locus exists from $S = 0$ to ∞. — 1M
* To find the break away point equate $\frac{dK}{ds} = 0$. The characteristic eqn is

$$1 + G(S)H(S) = 0$$

$$1 + \frac{K(S+1)}{S^2(S+2)} = 0$$

$$S^3 + 2S^2 + K(S+1) = 0$$

$$K = -\left[S^3 + 2S^2\right]$$

$$\frac{dK}{ds} = -\left[2S^2 + 4S\right] = 0$$

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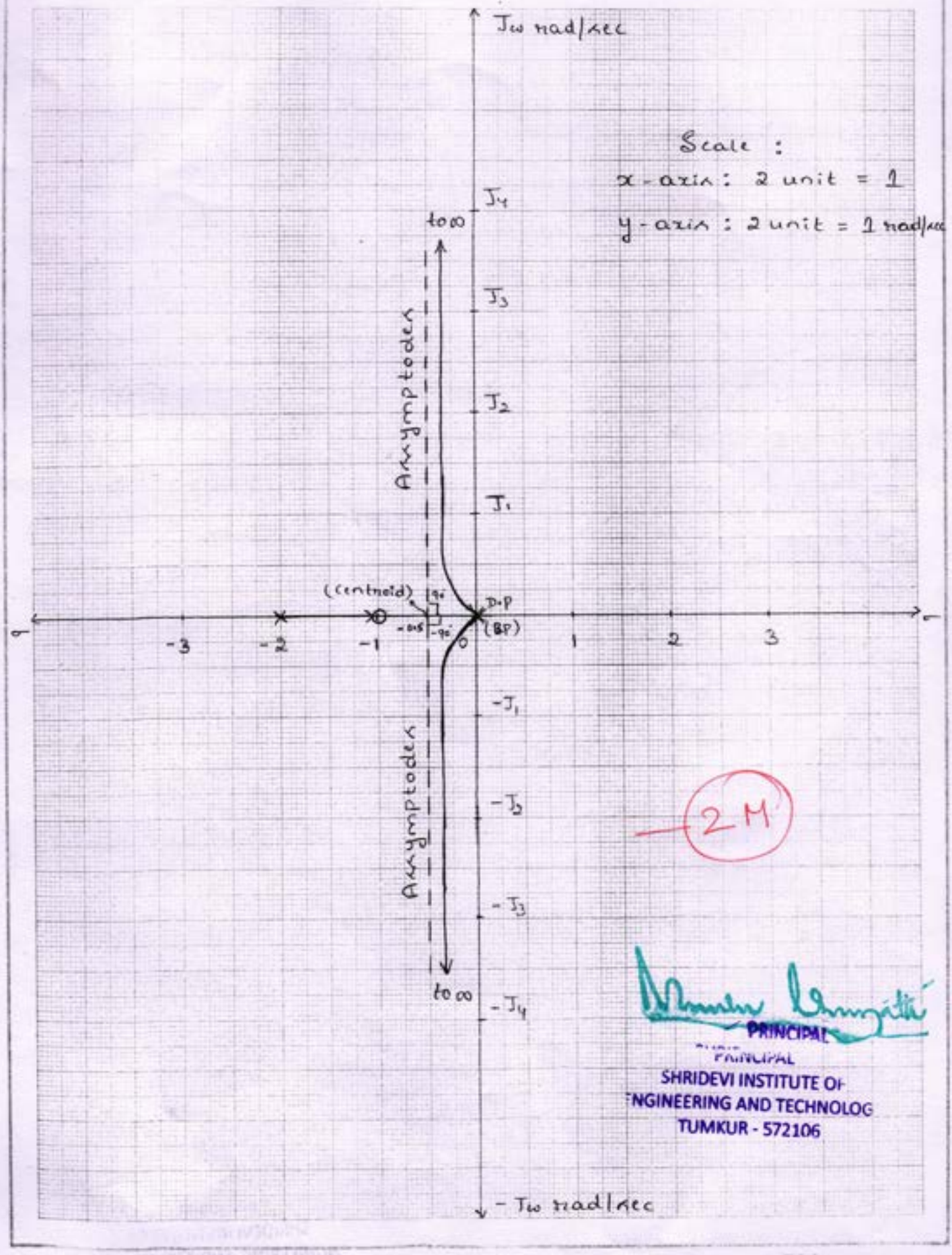
$$2S^2 + 4S = 0$$

$$2S(S+2) = 0$$

$$S(S+2) = 0$$

$\boxed{S = 0}$ or $S = -2$ — 2M



2M

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select $s = -1$ as breakaway point and neglect $s = -2$ because root locus is not existing at that point.

* Root locus is not crossing the imaginary axis.

* Angle of departure is not required because there are no complex conjugate roots.

The complete root locus sketch is as shown in graph sheet. Root locus has 3 branches. 1st branch starts at pole at $s = -2$ and travels through negative real axis to meet zero at $s = -1$. The next 2 root locus branches starts at pole at $s = 0$ and travels parallel to asymptode to meet zero at ∞.

2M

(4) Sketch the root locus for $G(s) = \dfrac{K}{s(s^2 + 4s + 13)}$

$$s^2 + 4s + 13 = 0$$

$$s = \frac{-4 \pm \sqrt{16 - 4(13)}}{2}$$

$$= \frac{-4 \pm \sqrt{16 - 52}}{2}$$

$$= \frac{-4 \pm \sqrt{-36}}{2}$$

$$= \frac{-4 \pm j6}{2}$$

$$s = -2 \pm j3$$

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, APRIL-2023

Semester: **VI** Subject: **DIGITAL SIGNAL PROCESSING** Sub Code: **18EE-63**
Max Marks: 40 Date: 25-04-2023 Duration: **90** Minutes

NOTE: Answer any two full questions from question

1. a) Calculate the 8-point DFT of the following signal x(n) ={1, 1, 1, 1} also calculate magnitude & phase angle of X(k). 12 Marks[CO1]

b) Find the Discrete Fourier Transform for finite duration DT signal of length L is

$$x(n) = \begin{cases} 1 & 0 \le n \le L-1 \\ 0 & Else\ where \end{cases}$$ 08 Marks[CO1]

OR

2. a) Find the N-point DFT of the sequence $x(n) = \cos(\frac{2\pi}{4} kon)$. 08 Marks [CO1]

b) Find the 4-point DFT of sequence $x(n) = 6 + \sin(\frac{2\pi n}{N})$ 08 Marks [CO1]

c) State and prove the i) Circular time shift property ii) Circular frequency shift property 06 Marks [CO1]

3 a) State and prove the Parseval's Theorem. $\sum_{k=0}^{n}|x(n)|^2 = N\sum_{k=0}^{n}|X(k)|^2$ 08 Marks [CO1]

b) Two 4 length sequences are defined below $x(n) = \cos(\frac{\pi n}{2})$, n= 0, 1, 2, 3. $h(n) = 2^n$, n= 0, 1, 2, 3

i) Calculate x(n)*h(n) using circular convolution ii) Calculate x(n)*h(n) using linear convolution 12 Marks [CO1]

OR

4 a) Given an infinite sequence x(n)={1, 2, 3, 4, 1, 3, 5, 7, 2, 4, 6, 8, ……} and h(n)={1, 2, 1}. Find the output y(n) using overlap add method. Considering x(n) is made up of length 4. 10 Marks [CO1]

b) Given an infinite sequence x(n)={1, 2, 3, 4, 1, 3, 5, 7, 2, 4, 6, 8, ……} and h(n)={1, 2, 1}. Find the output y(n) using over save add method. Considering x(n) is made up of length 4. 10 Marks [CO1]

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, APRIL-2023

Semester: **VI** Subject: **DIGITAL SIGNAL PROCESSING** Sub Code: **18EE-63**
Max Marks: 40 Date: 25-04-2023 Duration: **90** Minutes

NOTE: Answer any two full questions from question

1. a) Calculate the 8-point DFT of the following signal x(n) ={1, 1, 1, 1} also calculate magnitude & phase angle of X(k). 12 Marks[CO1]

b) Find the Discrete Fourier Transform for finite duration DT signal of length L is

$$x(n) = \begin{cases} 1 & 0 \le n \le L-1 \\ 0 & Else\ where \end{cases}$$ 08 Marks[CO1]

OR

2. a) Find the N-point DFT of the sequence $x(n) = \cos(\frac{2\pi}{4} kon)$. 08 Marks [CO1]

b) Find the 4-point DFT of sequence $x(n) = 6 + \sin(\frac{2\pi n}{N})$ 08 Marks [CO1]

c) State and prove the i) Circular time shift property ii) Circular frequency shift property 06 Marks [CO1]

3 a) State and prove the Parseval's Theorem. $\sum_{k=0}^{n}|x(n)|^2 = N\sum_{k=0}^{n}|X(k)|^2$ 08 Marks [CO1]

b) Two 4 length sequences are defined below $x(n) = \cos(\frac{\pi n}{2})$, n= 0, 1, 2, 3. $h(n) = 2^n$, n= 0, 1, 2, 3

i) Calculate x(n)*h(n) using circular convolution ii) Calculate x(n)*h(n) using linear convolution 12 Marks [CO1]

OR

4 a) Given an infinite sequence x(n)={1, 2, 3, 4, 1, 3, 5, 7, 2, 4, 6, 8, ……} and h(n)={1, 2, 1}. Find the output y(n) using overlap add method. Considering x(n) is made up of length 4. 10 Marks [CO1]

b) Given an infinite sequence x(n)={1, 2, 3, 4, 1, 3, 5, 7, 2, 4, 6, 8, ……} and h(n)={1, 2, 1}. Find the output y(n) using over save add method. Considering x(n) is made up of length 4. 10 Marks [CO1]

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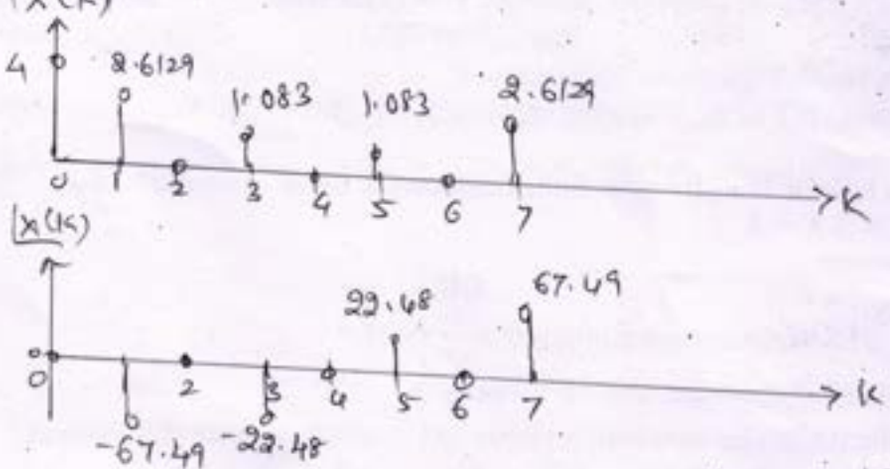
Question Number	Solution	Marks Allocated
1 a)	$x(n) = \{1, 1, 1, 1, 0, 0, 0, 0\}$	(01)
	$\begin{bmatrix} X(0) \\ X(1) \\ X(2) \\ X(3) \\ X(4) \\ X(5) \\ X(6) \\ X(7) \end{bmatrix} = \begin{bmatrix} W_8^0 & W_8^0 & W_8^0 & W_8^0 & W_8^0 & W_8^0 & W_8^0 & W_8^0 \\ W_8^0 & W_8^1 & W_8^2 & W_8^3 & W_8^4 & W_8^5 & W_8^6 & W_8^7 \\ W_8^0 & W_8^2 & W_8^4 & W_8^6 & W_8^8 & W_8^{10} & W_8^{12} & W_8^{14} \\ W_8^0 & W_8^3 & W_8^6 & W_8^9 & W_8^{12} & W_8^{15} & W_8^{18} & W_8^{21} \\ W_8^0 & W_8^4 & W_8^8 & W_8^{12} & W_8^{16} & W_8^{20} & W_8^{24} & W_8^{28} \\ W_8^0 & W_8^5 & W_8^{10} & W_8^{15} & W_8^{20} & W_8^{25} & W_8^{30} & W_8^{35} \\ W_8^0 & W_8^6 & W_8^{12} & W_8^{18} & W_8^{24} & W_8^{30} & W_8^{36} & W_8^{42} \\ W_8^0 & W_8^7 & W_8^{14} & W_8^{21} & W_8^{28} & W_8^{35} & W_8^{42} & W_8^{49} \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$	(06)
	$X(K) = \{4,\ 1-j2.414,\ 0,\ 1-j0.414,\ 0,\ 1+j0.414,\ 0,\ 1+j2.414\}$	(01)
	$\lvert X(K)\rvert = \{4,\ 2.6129,\ 0,\ 1.0823,\ 0,\ 1.0828,\ 0,\ 2.6129\}$	
	$\angle X(K) = \{0,\ -67.49,\ 0,\ -22.48,\ 0,\ 22.68,\ 0,\ 67.49\}$	
		(2)
		(2)
b)	$X(K) = \sum_{n=0}^{L-1} \left(1 e^{-j\frac{2\pi}{N}K}\right)^n = \frac{1-\left[e^{-j\frac{2\pi}{N}K}\right]^{L+1}}{1-e^{-j\frac{2\pi}{N}K}}$	(4)
	$X(K) = e^{-j\frac{\pi}{N}K(L-1)} \frac{\sin\left(\frac{\pi}{N}KL\right)}{\sin\left(\frac{\pi}{N}K\right)}$	(4)

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Question Number	Solution	Marks Allocated
2a)	$X(k) = \sum_{n=0}^{N-1} x(n) e^{-j\frac{2\pi}{N}kn} = \sum_{n=0}^{N-1} \cos\frac{2\pi}{N}k_0 n \; e^{-j\frac{2\pi}{N}kn}$	
	$X(k) = \sum_{n=0}^{N-1} \left(\frac{e^{j\frac{2\pi}{N}k_0 n} + e^{-j\frac{2\pi}{N}k_0 n}}{2}\right) e^{-j\frac{2\pi}{N}kn}$	(2)
	$= \frac{1}{2}\left\{ \underbrace{\sum_{n=0}^{N-1} e^{-j\frac{2\pi}{N}(k-k_0)n}}_{X_1(k)} + \underbrace{\sum_{n=0}^{N-1} e^{-j\frac{2\pi}{N}(k+k_0)n}}_{X_2(k)} \right\}$	
	$X_1(k) = \sum_{n=0}^{N-1} \left[e^{-j\frac{2\pi}{N}(k-k_0)}\right]^n$: when $k = k_0$ $X_1(k) = N\delta(k-k_0)$	(2)
	$X_2(k) = \sum_{n=0}^{N-1} \left[e^{-j\frac{2\pi}{N}(k+k_0)}\right]^n$ when $k = -k_0$ $X_2(k) = N\delta(k+k_0)$	(2)
	$X(k) = \frac{1}{2}\left[N\delta(k-k_0) + N\delta(k+k_0)\right] = \frac{N}{2}\left[\delta(k-k_0) + \delta(k+k_0)\right]$	(2)
b)	$x(n) = \{6, 7, 6, 5\}$ $X(k)$ $W_N^{kn} x(n)$	
	$\begin{vmatrix} X(0) \\ X(1) \\ X(2) \\ X(3) \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 & 1 \\ 1 & -j & -1 & j \\ 1 & -1 & 1 & -1 \\ 1 & j & -1 & -j \end{vmatrix} \begin{vmatrix} 6 \\ 7 \\ 6 \\ 5 \end{vmatrix} = \begin{vmatrix} 24 \\ -2j \\ 0 \\ 2j \end{vmatrix}$	(8)
c)	(i) $x((n-m))_N \longleftrightarrow W_N^{mk} X(k)$	(3)
	(ii) $x(n)\, e^{j\frac{2\pi}{N}ln} \longleftrightarrow X((k-l))_N$	(3)
3a)	$\sum_{k=0}^{N-1} \lvert x(n)\rvert^2 = N \sum_{n=0}^{N-1} \lvert X(k)\rvert^2$	(8)
b)	$x(n) = \{1, 0, -1, 0\}$ $h(n) = \{1, 2, 4, 8\}$	
	i) $y(n) = x(n) \circledast h(n) = \{-3, -6, 3, 6\}$	(5)

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Question Number	Solution	Marks Allocated
	ii)	

x(n) \ h(n)	1	2	4	8
1	1	2	4	8
0	0	0	0	0
-1	-1	-2	-4	-8
0	0	0	0	0

$y_1(n) = \{1, 2, 3, 6, -4, -8\}$ (5)

Since N = 4, there will be aliasing (∵ N = 6)
Wrap around on top of the first 2-points at n = 4 & 5

$y(0) = y_1(0) + y_1(4) = 1 - 4 = -3$

$y(1) = y_1(1) + y_1(5) = 2 - 8 = -6$

$y(2) = y_c(2) = 3$

$y(3) = y_c(3) = 6$ $\quad y(n) = \{-3, -6, 3, 6\}$ (2)

4 a) $x_1(n) = \{1, 2, 3, 4, 0, 0\}$ $\quad h(n) = \{1, 2, 1, 0, 0, 0\}$

$x_2(n) = \{1, 3, 5, 7, 0, 0\}$

$x_3(n) = \{2, 4, 6, 8, 0, 0\}$

$y_1(n) = \{1, 4, 8, 12, 11, 4\}$ $\quad y_2(n) = \{1, 5, 12, 20, 19, 7\}$

$y_3(n) = \{2, 8, 16, 24, 22, 8\}$

$y(n) = \{1, 4, 8, 12, 12, 9, 12, 20, 21, 15, 16, 24 \ldots\}$

b) $x_1(n) = \{0, 0, 1, 2, 3, 4\}$ $\quad x_2(n) = \{3, 4, 1, 3, 5, 7\}$

$x_3(n) = \{5, 7, 2, 4, 6, 8\}$ $\quad x_4(n) = \{6, 8, 0, 0, 0, 0\}$

$y_1(n) = \{11, 4, 1, 4, 8, 12\}$

$y_2(n) = \{22, 17, 12, 9, 12, 20\}$

$y_3(n) = \{27, 25, 21, 15, 16, 24\}$ $\quad y(n) = \{6, 20, 22, 8, 0, 0\}$

$y(n) = \{1, 4, 8, 12, 12, 9, 12, 20, 21, 15, 16, 24 \ldots\}$

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - II, JUNE-2023

Semester: **VI** Subject: **DIGITAL SIGNAL PROCESSING** Sub Code: **18EE-63**
Max Marks: 30 Date: 02-06-2023 Duration: **90** Minutes

NOTE: Answer any two full questions from question

1 a) Tabulate the comparison of direct computation of DFT verses the FFT algorithm for N=32,128 and 512 . 08 Marks[CO2]

b) Develop an 8-point DIT-FFT algorithm. Draw the complete signal flow graph. 12 Marks[CO2]

OR

2 a) Given $x(n) = 2^n$ and N=8, find X(k) using DIT-FFT algorithm 10 Marks [CO2]

b) Find the circular convolution of x(n)[1, 1, 1, 1}with h(n)={1, 2, 3, 4} using radix-2DIT-FFT for DFTs and radix-2DIT-FFT to find IDFT 10 Marks [CO2]

3 a) Find the DFT of the sequence x(n) = {1, 2, 3, 4, 4, 3, 2, 1} using DIF-FFT algorithm. 10 Marks [CO2]

b) Develop an 8-point DIF-FFT algorithm. Draw the complete signal flow graph. 10 Marks [CO2]

OR

4 a) First five samples of the 8-point DFT of a real valued sequence is given by X(0)=0, X(1)=2+j2, X(2)= -j4, X(3)=2-j2,X(4)=0. Determine the remaining points. Hence find the original sequence x(n) using DIF-FFT algorithm. 12 Marks [CO2]

b) Find the 4-point real sequence x(n), if its 4-point DFT samples are X(0)=6, X(1)=-2+j2, X(2) = -2. Use DIF-FFT algorithm. 08 Marks [CO2]

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - II, JUNE-2023

Semester: **VI** Subject: **DIGITAL SIGNAL PROCESSING** Sub Code: **18EE-63**
Max Marks: 30 Date: 02-06-2023 Duration: **90** Minutes

NOTE: Answer any two full questions from question

1 a) Tabulate the comparison of direct computation of DFT verses the FFT algorithm for N=32,128 and 512 . 08 Marks[CO2]

b) Develop an 8-point DIT-FFT algorithm. Draw the complete signal flow graph. 12 Marks[CO2]

OR

2 a) Given $x(n) = 2^n$ and N=8, find X(k) using DIT-FFT algorithm 10 Marks [CO2]

b) Find the circular convolution of x(n)[1, 1, 1, 1}with h(n)={1, 2, 3, 4} using radix-2DIT-FFT for DFTs and radix-2DIT-FFT to find IDFT 10 Marks [CO2]

3 a) Find the DFT of the sequence x(n) = {1, 2, 3, 4, 4, 3, 2, 1} using DIF-FFT algorithm. 10 Marks [CO2]

b) Develop an 8-point DIF-FFT algorithm. Draw the complete signal flow graph. 10 Marks [CO2]

OR

4 a) First five samples of the 8-point DFT of a real valued sequence is given by X(0)=0, X(1)=2+j2, X(2)= -j4, X(3)=2-j2,X(4)=0. Determine the remaining points. Hence find the original sequence x(n) using DIF-FFT algorithm. 12 Marks [CO2]

b) Find the 4-point real sequence x(n), if its 4-point DFT samples are X(0)=6, X(1)=-2+j2, X(2) = -2. Use DIF-FFT algorithm. 08 Marks [CO2]

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Scheme & Solution

Course Title: DSP **Course Code:** 15EEG3

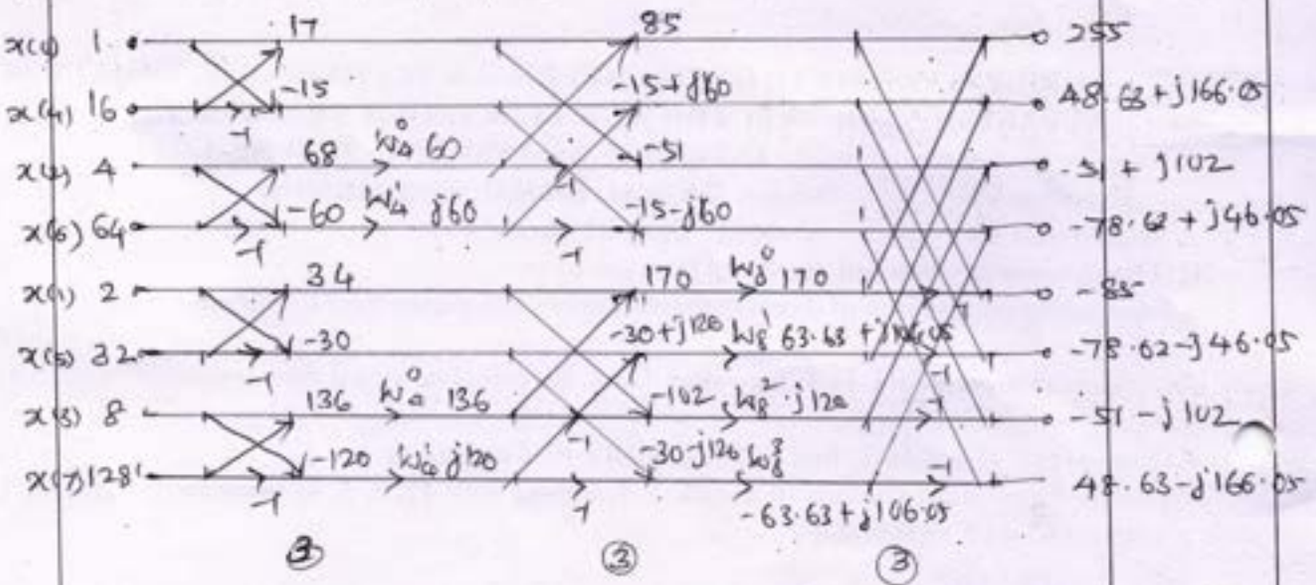
Question Number	Solution	Marks Allocated

1 a)

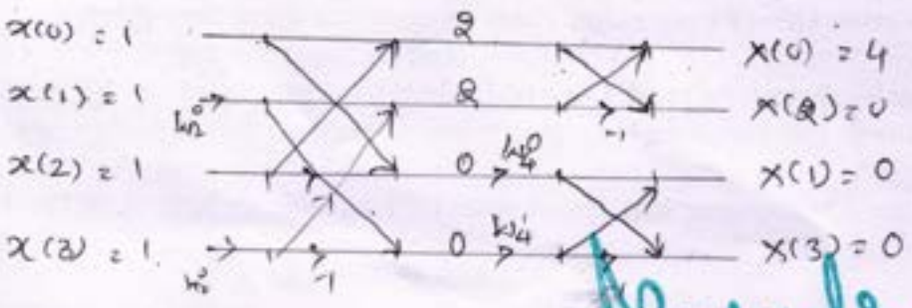
N	Multiplications DFT N^2	Multiplications FFT $\frac{N}{2}\log_2 N$	No & Addition DFT $N(N-1)$	No & Addition FFT $N\log_2 N$	
32	1024	80	992	160	2
128	16,384	448	16,256	896	3
512	2,62,144	2304	2.61.632	4608	3

b) Development 8-point DIT-FFT derivation with flow graph 12

2 a) $x(n) = \{1, 2, 4, 8, 16, 32, 64, 128\}$ 1



b)



3

$X(k) = \{4, 0, 0, 0\}$

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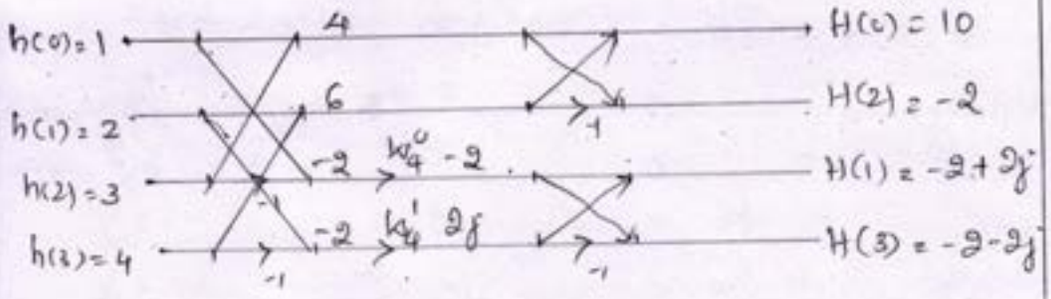
Question Number	Solution	Marks Allocated

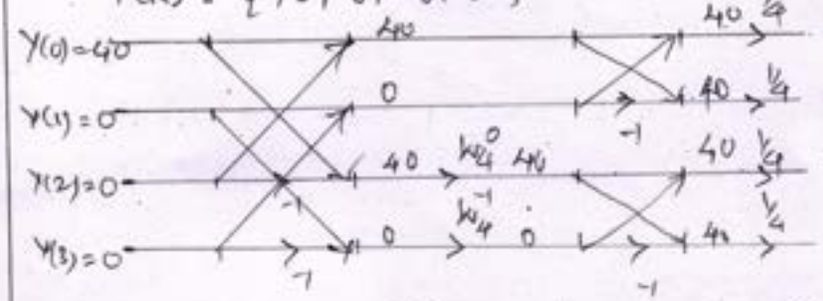


(3)

$H(K) = \{10, -2+2j, -2, -2-2j\}$

$Y(K) = X(K)\,H(K) = \{4\ 0\ 0\ 0\} \{10, -2-2+2j, -2-2j\}$

$Y(K) = \{40, 0, 0, 0\}$

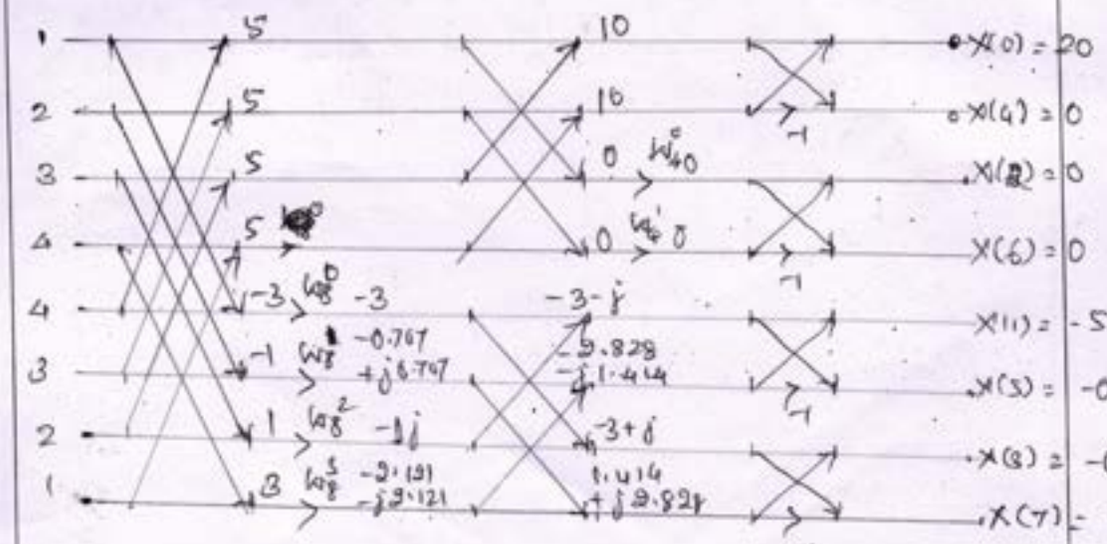


(3)

$y(n) = x(n) \circledast h(n) = \{10, 10, 10, 10\}$

(1)

3 a)



(4)

$X(K) = \{20, -5.828 + j2.414, 0, -0.172 - j0.414, 0, -0.172 + j0.414, 0, -5.828 + j2.414\}$

(1)

b) Standard DIT-FFT derivation + flow graph 16

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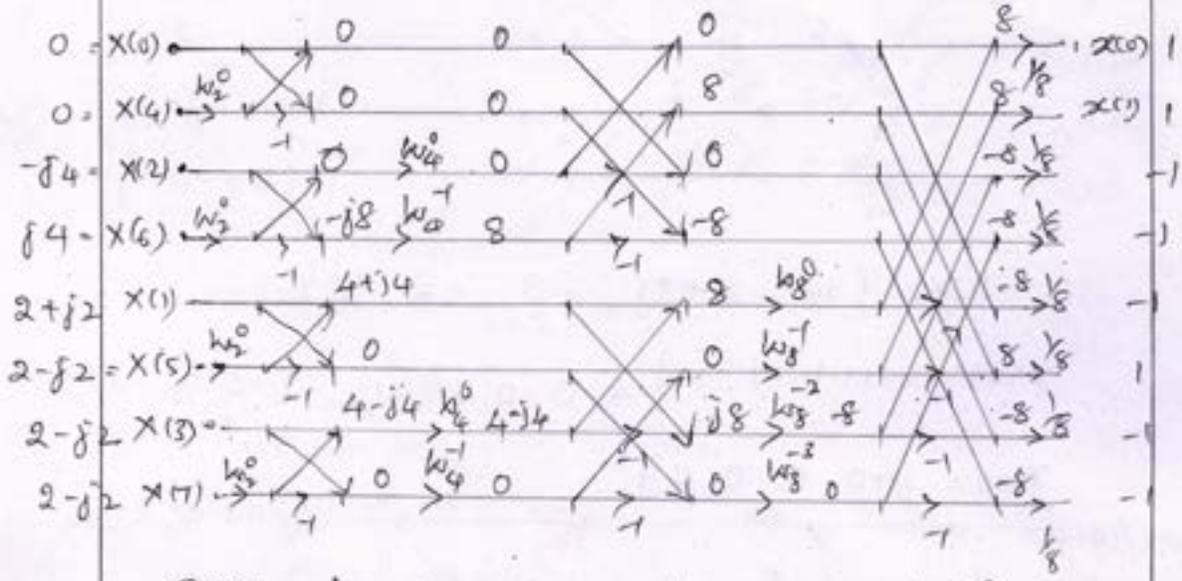
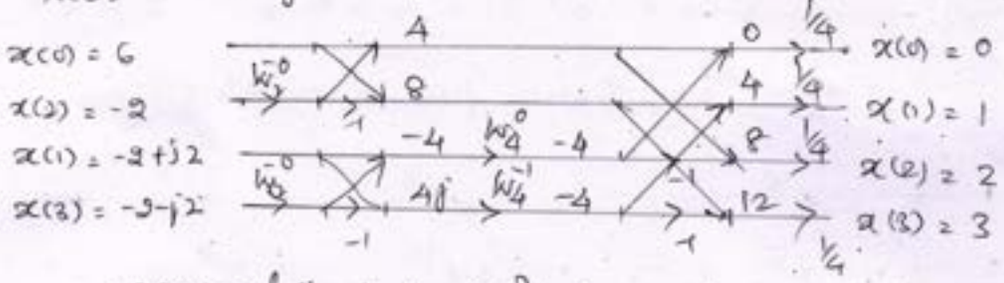
Question Number	Solution	Marks Allocated
4 a)	$X(5) = 2+j2, \quad X(6) = j4 \quad X(7) = 2-j2$  $x(n) = \{1, 1, -1, -1, -1, 1, -1, -1, -1\}$	(3) (9)
b)	$X(3) = -2-j2$  $x(n) = \{0, 1, 2, 3\}$	(1) (6) (1)

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - III, JULY-2023

Semester: **VI** Subject: **DIGITAL SIGNAL PROCESSING** Sub Code: **18EE-63**
Max Marks: 40 Date: 10-07-2023 Duration: **90** Minutes

NOTE: Answer any two full questions from question

1 a) Explain the impulse invariant transformation method of transforming an analog filter to digital filter 10 Marks[CO3]

b) The system function of their analog filter is given as $H_a(s) = \frac{S+1}{S^2+5S+6}$ Obtain the system function of the IIR digital filter by using impulse invariance method. 10 Marks[CO3]

OR

2 a) Explain the bilinear transform method. Derive an expression showing mapping from S-plane to Z-plane. 10 Marks[CO3]

b) A digital low pass filter is required to meet the following specifications
$20\log|H(w)|$ $\omega=0.2\pi \geq -1.9328\,dB$; $20\log|H(w)|$ $\omega=0.6\pi \leq -13.9794\,dB$
The filter must have a maximally flat frequency response. Find H(z) to meet the above specifications using impulse invariant transformation. 10 Marks[CO3]

3 a) Draw the direct form I & II, cascade & parallel realization of a system with transfer function
$H(z) = \frac{8Z^3-4Z^2+4Z-2}{(z-\frac{1}{4})(Z^2-Z-\frac{1}{2})}$ 20 Marks[CO4]

OR

4 a) Realize the linear phase FIR filter having the following impulse response.
$h(n) = \delta(n) - \frac{1}{4}\delta(n-1) + \frac{1}{2}\delta(n-2) + \frac{1}{2}\delta(n-3) - \frac{1}{4}\delta(n-4) + \delta(n-5)$ 08 Marks [CO5]

b) Obtain the cascade and parallel realizations for the system function given by $H(z) = \frac{1+\frac{1}{4}z^{-1}}{(1+\frac{1}{2}z^{-1})(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2})}$. 12 Marks [CO5]

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - III, JULY-2023

Semester: **VI** Subject: **DIGITAL SIGNAL PROCESSING** Sub Code: **18EE-63**
Max Marks: 40 Date: 10-07-2023 Duration: **90** Minutes

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b) Obtain the cascade and parallel realizations for the system function given by $H(z) = \frac{1+\frac{1}{4}z^{-1}}{(1+\frac{1}{2}z^{-1})(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2})}$. 12 Marks [CO5]

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Course Title: Digital Signal Process **Scheme & Solution** **Course Code:** 18EE63

Question Number	Solution	Marks Allocated
1 a)	$H(s) = \sum_{k=1}^{N} \frac{A_k}{s-p_k}$ - (1) $h(n) = \sum_{k=1}^{N} A_k e^{p_k nT}$	2
	$H(z) = Z[h(n)]$ $H(z) = \sum_{k=1}^{N} A_k \frac{1}{1-e^{p_k T} z^{-1}}$	3
	$\frac{1}{s-p_k} \rightarrow \frac{1}{1-e^{p_k T} z^{-1}}$	1
	Conditions 1) $\sigma_k < 0$ s_k lie on LHP 2) $\sigma_k = 0$ & s_k lie on img axis 3 $\sigma_k > 0$ s_k lie on RHP	03
b)	$\frac{A}{s+2} + \frac{B}{s+3}$ $A = -1$, $B = 2$ $H(s) = \frac{-1}{s+2} + \frac{2}{s+3}$	3
	$s_1+2=0$ $s_2+3=0$ $p_1 = -2$ $p_2 = -3$ $\frac{1}{s-p_k} \rightarrow \frac{1}{1-e^{p_k T} z^{-1}}$	
	$H(z) = \frac{-1}{1-e^{-2T} z^{-1}} + \frac{2}{1-e^{-3T} z^{-1}}$	4
	$H(z) = \frac{1-0.0779 z^{-1}}{1-1.559 z^{-1}+0.6065 z^{-2}}$	3
2 a)	$\frac{dy(t)}{dt} = x(t)$ - (2)	1
	$\int_{(n-1)T}^{nT} \frac{dy(t)}{dt} dt = \int_{(n-1)T}^{nT} x(t) dt$	
	$[y(t)]_{(n-1)T}^{nT} = \int_{(n-1)T}^{nT} x(t) dt$	2
	Trapezoidal rule $\int_a^b f(x) dx = \frac{b-a}{2}[f(a)+f(b)]$	1

PROF. [illegible]
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Question Number	Solution	Marks Allocated
	$y(nT) - y[(n-1)T] = \frac{nT-(n-1)T}{2}[x(nT)+x(n-1)T]$	(1)
	$y(nT) + y[(n-1)T] = \frac{T}{2}[x(nT)+x(n-1)T]$	(1)
	$Y(z) - z^{-1}Y(z) = \frac{T}{2}[X(z) + z^{-1}X(z)]$	
	$Y(z)[1-z^{-1}] = \frac{T}{2}(1+z^{-1})X(z) \Rightarrow \frac{2}{T}\left[\frac{1-z^{-1}}{1+z^{-1}}\right] = \frac{X(z)}{Y(z)}$ — (A)	(1)
	Laplace transform of $\frac{dy(t)}{dt} = x(t) \Rightarrow sY(s) = X(s)$ — (B)	(1)
	By comparing (A) & (B) $s = \frac{2}{T}\frac{1-z^{-1}}{1+z^{-1}}$	(2)
b)	$\Omega_1 = \frac{\omega}{T=1}$ $\Omega_1 = 0.2\pi$ & $\Omega_2 = 0.4\pi$	(1)
	$N = \frac{\log\left(\frac{10^{-K/10}-1}{10^{-K_2/10}-1}\right)}{2\log\left(\frac{\Omega_1}{\Omega_2}\right)} = 1.7 \simeq 2$	(2)
	$H(s) = \frac{1}{s^2+\sqrt{2}s+1}$	(1)
	$\Omega_c = \frac{\Omega_1}{(10^{-K/10}-1)^{1/2N}} = 0.726$ $H(s) = \frac{1}{s^2+\sqrt{2}s+1}\Big\vert_{s\to\frac{s}{\Omega_c}}$	(1)
	$H(s) = \frac{0.527}{s^2+1.026575+0.527}$ =	
	$H(s) = \frac{A}{s+0.5132+j0.8582} + \frac{B}{s+0.5132-j0.8582}$	(2)
	$A = j0.3071$ $P_1 = -0.5132-j0.8582$	
	$B = -j0.3071$ $P_2 = -0.5132+j0.8582$	

$\frac{1}{s-P_k} \to \frac{1}{1-e^{P_k T}z^{-1}}$

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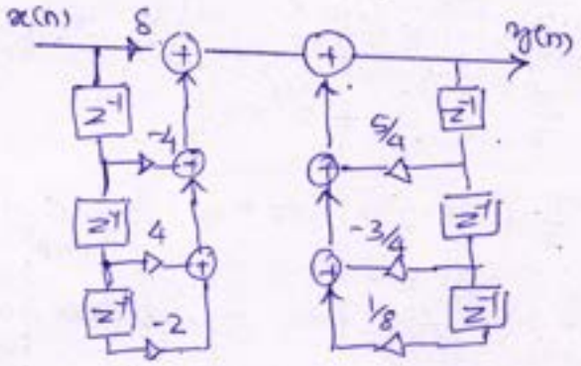
Question Number	Solution	Marks Allocated

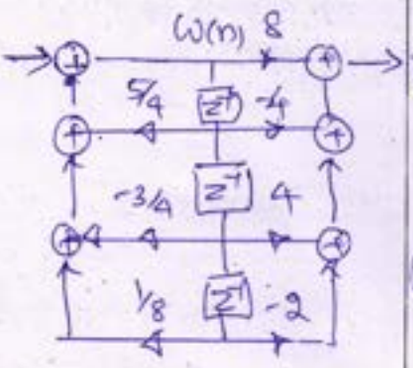
3 a)

$$H(z) = \frac{5.5058 \times 10^{-3} z^{-1}}{1 - 1.197 z^{-1} + 0.3589 z^{-2}}$$

(3)



Direct Form - I

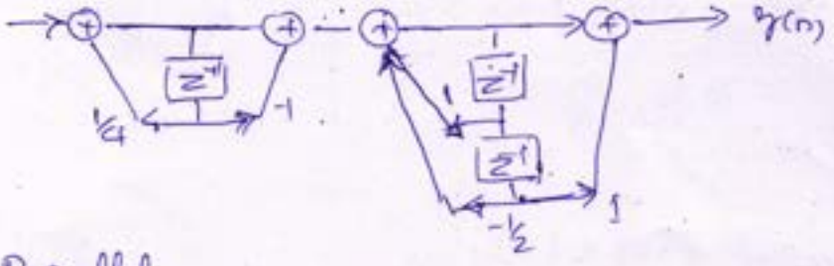


Direct form II

(3+3)

Cascade $(z-1/2)(8z^2+4)/(z-1/4)(z^2-1+1/2)$

$$H(z) = \frac{2(8z-1)}{z-1/4} \cdot \frac{2z^2+1}{z^2-z+1/2} = \frac{2(2-z^{-1})}{(1-1/4 z^{-1})} \cdot \frac{2+z^{-2}}{1-z^{-1}+1/2 z^{-2}}$$



Parallel

(6)

$$H(z) = 8 + \frac{6z^2 - 8z - 1}{z^3 - \frac{5}{4}z^2 + \frac{3}{4}z - 1/8}$$

$$H(z) = 8 + \frac{A}{z-1/2} + \frac{Bz+C}{(z^2-z+1/2)}$$

$A = -18/5$

$B = 48/5$

$C = -16/5$

$$H(z) = 8 + \frac{-18/5 z^{-1}}{1 - 1/4 z^{-1}} + \frac{48/5 z^{-1} - 16/5 z^{-2}}{1 - z^{-1} + z^{-2}}$$

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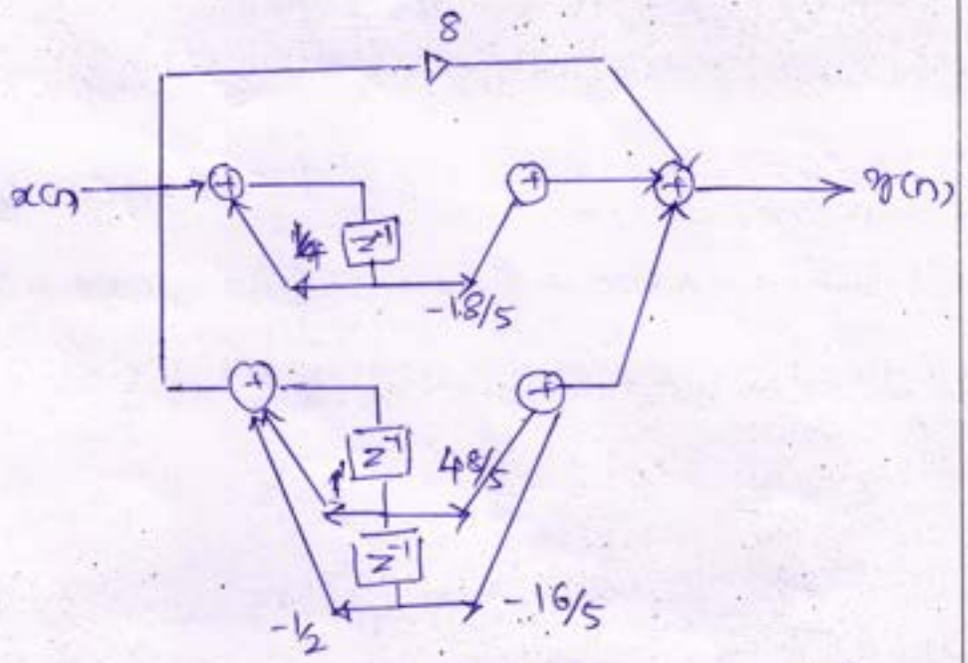
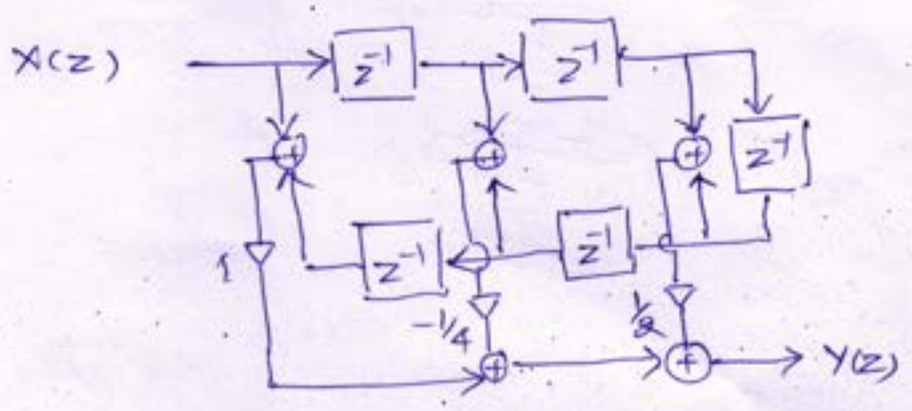
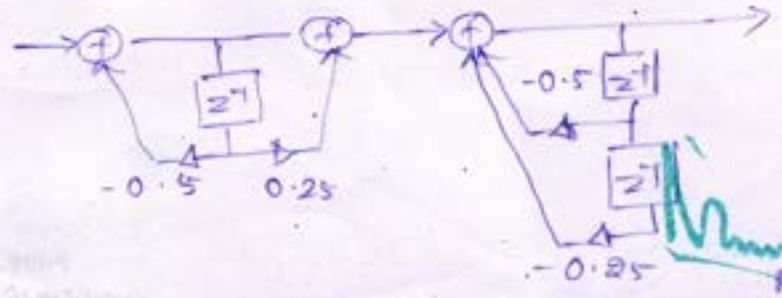
Question Number	Solution	Marks Allocated
4 a)	 $H(z) = 1 - \frac{1}{4}z^{-1} + \frac{1}{2}z^{-2} + \frac{1}{8}z^{-3} - \frac{1}{4}z^{-4} + z^{-5}$ $Y(z) = X(z)\left[1(1+z^{-5}) - \frac{1}{4}(z^{-1}+z^{-4}) + \frac{1}{8}(z^{-2}+z^{-3})\right]$ 	8
b)		4

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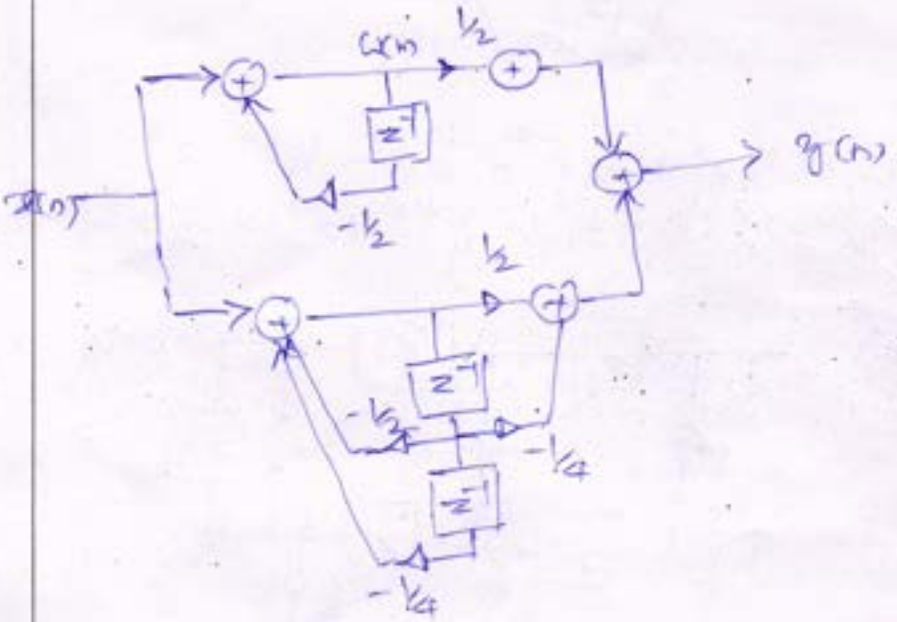
Question Number	Solution	Marks Allocated
	$H(z) = \frac{A}{1+\frac{1}{2}z^{-1}} + \frac{Bz^{-1}+C}{(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2})}$	
	$1+\frac{1}{4}z^{-1} = A(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}) + (Bz^{-1}+C)(1+\frac{1}{2}z^{-1})$	
	$1+\frac{1}{4}z^{-1} = A+C+(\frac{1}{2}A+B+\frac{1}{2}C)z^{-1}+(\frac{1}{4}A+\frac{1}{2}B)z^{-2}$	
	$A+C=1$ | $\frac{1}{2}A+B+\frac{1}{2}C=\frac{1}{4}$ | $\frac{1}{4}A+\frac{1}{2}B=0$. $A=1-C$	
	$A=\frac{1}{2}$ $B=-\frac{1}{4}$ $C=\frac{1}{2}$	
		(8)

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[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi. Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
DEGREE :UG	AY:2022-2023	SEM VII	TITLE: Internal Assessment Test-II	DATE:01-12-22
SUB NAME /CODE: POWER SYSTEM ANALYSIS-2 18EE71				

Answer two full questions choosing one question from each part

PART-A

1. a. What is load flow analysis? Explain how the buses are classified to carry out the load flow analysis in power system? [L1] [CO2](8Marks)

   b. The voltage magnitude at bus2 is to be maintained at 1.03 pu, with bus1 as slack bus in the figure below. Compute voltage at the end of 1st iteration using GS technique. Also find the power at slack bus. Given $0 \le Q_2 \le 35$ MVAr, base MVA=100, $\alpha = 1.4$

Bus No.	Volt	GEN		LOAD	
		PG	QG	PD	QD
1	1.05	-	-	-	-
2	1.03	20	-	50	20
3	1.00	-	-	60	25

Sl.No.	From Bus	To Bus	Impedance
1	1	2	0.08+j0.24
2	1	3	0.02+j0.06
3	2	3	0.06+j0.18

[L2] [CO2](12Marks)

OR

2 .a) For an n-bus power system, obtain the power flow equation in polar Form [L2] [CO2](8Marks)

b. The following is a system data for Load flow analysis

Bus No.	P (pu)	Q (pu)	V (pu)	Remarks
1	-	-	1.06	Slack bus
2	0.5	0.2	-	PQ bus
3	0.4	0.3	-	PQ bus
4	0.3	0.1	-	PQ bus

Sl.No.	Bus code	Admittance
1	1-2	2-j8
2	1-3	1-j4
3	2-3	0.666-j2.664
4	2-4	1-j4
5	3-4	2-j8

[L3] [CO2] (12Marks)

PART-B

3. a) Explain the method of equal incremental cost for the economic operation of generator with transmission losses are neglected [L2] [CO4](8 Marks)

   b) Write a note on the advantages of bus admittance matrix in a load flow analysis? [L2] [CO4](4 Marks)

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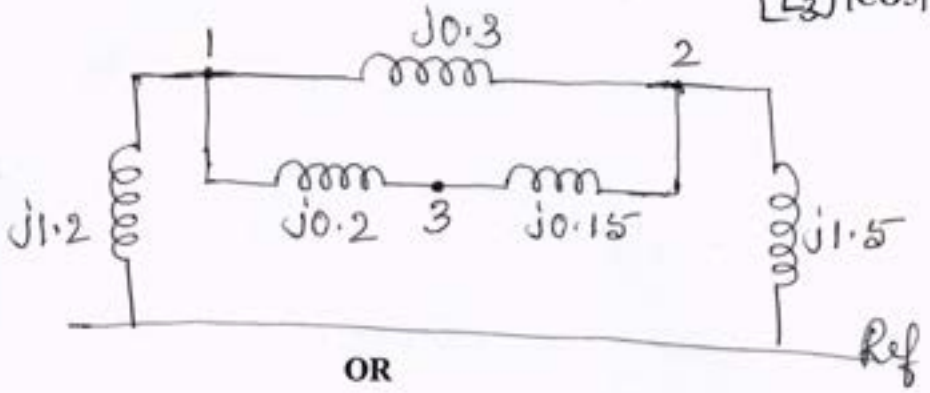
c) Determine the Z—bus impedance using Zbus build in algorithm in the sequence

[L3] [CO5] (8 Marks)



OR

4. a) Draw performance curves for economic dispatch in power system network

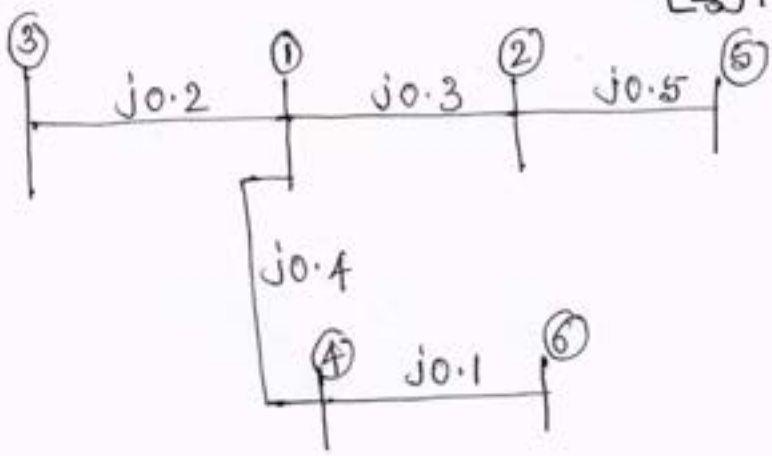
[L2] [CO4] (6 Marks)

b) Explain iterative method for load dispatch neglecting losses & including limits

[L2] [CO4] (6 Marks)

c) Form Zbus for power system shown in fig below by adding element in sequence 1-2, 1-3, 1-4, 4-6, 2-5 take node-1 as the reference node

[L3] [CO5] (8 Marks)



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18EE71: Power System Protection - 02
Internal Assessment - 02

1(A) · **Load flow analysis**:- It is the computational procedure required to determine the steady state operating characteristics of a power system n/w from the given line data & bus data.

There are 3 diffe types of classification of buses are:

1) slack bus (or) reference bus (or) swing bus
2) Generator bus
3) Load bus.

① **slack bus**: Here vtg magnitude & its phase angle are specified real power (P) & reactive power (Q) are to be determined. In load flow study real & reactive power cannot be fixed at all the buses & the net complex power is also not known in advance till the load flow study is over ∴ at slack bus P & Q are not specified in advance. So, it has to supply the diffe in total system + losses & sum of the complex power specified at remaining buses. Hence, slack bus must be a Generator bus.

$$\text{slack bus complex power} = \left[\begin{matrix}\text{Total system load} \\ + \text{losses}\end{matrix}\right] - \left[\begin{matrix}\text{sum of complex} \\ \text{power specified at} \\ \text{other buses}\end{matrix}\right]$$

② **Generator bus**:

In this type of bus vtg magnitude & real power are specified. We have to determine reactive power (Q) & vtg angle (δ)

③ **Load bus**:

In this type of bus real power (P) & reactive power (Q) is specified. The unknown quantities are vtg magnitude & its phase.

1B. $Y_{bus} = \begin{bmatrix} 6.25 - j18.75 & -1.25 + j3.75 & -5 + j5 \\ -1.25 + j3.75 & 2.916 - j8.75 & -1.666 + j5 \\ -5 + j15 & -1.666 + j5 & 6.66 - j20 \end{bmatrix}$

$$\text{Total } P_2 = \frac{P_{2gen} - P_{2load}}{\text{Base value}} = \frac{20 - 50}{100} = -0.3 \text{ pu}$$

$$Q_{2\,min} = \frac{Q_{2gen} - Q_{2load}}{\text{Base}} = \frac{0 - 20}{100} = -0.2 \text{ pu}$$

$$Q_{2max} = \frac{35 - 20}{100} = 0.15 \text{ pu.}$$

$$P_3 = \frac{P_{3gen} - P_{3load}}{\text{Base}} = \frac{0 - 60}{100} = -0.6 \text{ pu}$$

$$Q_3 = \frac{Q_{3Gen} - Q_{3load}}{\text{Base}} = \frac{0 - 25}{100} = -0.25 \text{ pu}$$

$\therefore Q_{2min} \le Q_2 \le Q_{2max} = -0.2 \le Q_2 \le 0.15$

$$Q_2 = V_2^* \left[\sum_{j=1}^{n} Y_{2j} V_j \right] = V_2^* \left[Y_{21} V_1^{(0)} + Y_{22} V_2^{(0)} + Y_{23} V_3^{(0)} \right]$$

$$= -\text{Img} \left\{ V_2^* \left(Y_{21} V_1^{(0)} + Y_{22} V_2^{(0)} + Y_{23} V_3^{(0)} \right) \right\}$$

$$= -\text{Img} \left\{ (1.03 \{ (-1.25 + j3.75) 1.05 \angle 0 + (2.916 - j8.75) 1.03 \angle 0 + (-1.666 + j5) 1 \angle 0 \right] \}.$$

$$Q_2 = \text{Img}(-0.0319 + j0.07725)$$

$$\boxed{Q_2 = j0.07725} = Q_{2\,calculated}$$

$$V_i^{k+1} = \frac{1}{Y_{ii}} \left[\frac{P_2 - jQ_2}{(V_i^*)^0} - \sum Y_{2j} V_j \right] = \frac{1}{Y_{22}} \left[\frac{P_2 - jQ_2}{(V_2^*)^0} - Y_{21} V_1^{(0)} - Y_{23} V_3^{(0)} \right]$$

$$V_2' = \frac{1}{2.916 - j8.75} \left[\frac{-0.3 - j0.07725}{1.03 \angle 0} - (-1.25 + j3.75) 1.05 \angle 0 - (-1.66 + j5)(1.6) \right]$$

$$\boxed{V_2' = 1.03 \angle -1.86^\circ}$$

$$V_{2acc}' = V_2^{(0)} + \alpha \left[V_2' - V_2^{(0)} \right] = 1.03 + 1.4 \left[1.0294 - j0.0334 - 1.03 \right]$$

$$\boxed{V_{2acc}' = 1.0302 \angle -2.60^\circ}$$

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$$V_3^1 = \frac{1}{Y_{33}}\left[\frac{P_3 - jQ_3}{(V_3^*)^0} - \sum_{j=1}^{n} Y_{3j} V_j\right] = \frac{1}{Y_{33}}\left[\frac{P_3 - jQ_3}{(V_3^*)^0} - Y_{31} V_1^{(0)} - Y_{32} V_2^{(0)}\right]$$

$$= \frac{1}{6.66 - j20}\left[\frac{-0.6 + j0.25}{1.0\angle 0} - (-5 + j5)(1.05) - (-1.66 - j20)(1.029 - j0.046)\right]$$

$$V_3^1 = 0.3342 + j0.2525$$

$$\boxed{V_3^1 = 0.418\angle 37.07^\circ}$$

$$V_{3acc}^1 = V_3^{(0)} + \alpha\left[V_3^1 - V_3^{(0)}\right] = 1.0 + 1.4\left[(0.3342 + j0.2525) - 1.0\right]$$

$$= 0.0678 + j0.3535$$

$$\boxed{V_{3acc}^1 = 0.359\angle 79.14}$$

At the end of 1st iteration

$$V_{2acc}^1 = 1.0302\angle -2.60$$

$$V_{3acc}^1 = 0.359\angle 79.14$$

2a.

We have,

$$I_1 = Y_{11}V_1 + Y_{12}V_2 + \cdots + Y_{1n}V_1$$

$$I_2 = Y_{21}V_1 + Y_{22}V_2 + \cdots + Y_{2n}V_n$$

$$\vdots$$

$$I_n = Y_{n1}V_1 + Y_{n2}V_2 + \cdots + *.$$

$$I_{bus} = Y_{bus}[V_{bus}]$$

where $V_1, V_2 \cdots V_n$ are the buses 1, 2, 3 upto n

$I_1, I_2 \cdots I_n$ are the current entering at the buses 1, 2, 3 $\cdots n$

$Y_{bus} \rightarrow$ Bus Admittance Matrix

In general, the current at i^{th} bus,

$$I_i = Y_{i1}V_1 + Y_{i2}V_2 + Y_{i3}V_3 + \cdots + Y_{in}V_n$$

$$I_i = \sum_{j=1}^{n} Y_{ij} V_j \quad \text{—①}$$

Power injected at the i^{th} bus

$$S_i = V_i I_i^* = P_i + jQ_i \quad \text{—②}$$

Let $V_i = |V_i|\angle\delta_i$

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$V_j = |V_j| \angle \delta_j$

$Y_{ij} = G_{ij} + jB_{ij} = |Y_{ij}| \angle \theta_{ij}$

$S_i = V_i I_i^* = V_i \left[\sum_{j=1}^{n} Y_{ij} V_j\right]^*$

$S_i = V_i \sum_{j=1}^{n} Y_{ij}^* V_j^* = V_i \sum_{j=1}^{n} |Y_{ij}| \angle -\theta_{ij}$

$P_i + jQ_i = |V_i| \angle \delta_i \sum_{j=1}^{n} |Y_{ij}| \angle -\theta_{ij} \; |V_j| \angle -\delta_j$

$= |V_i| \sum_{j=1}^{n} |Y_{ij}| |V_j| \angle \delta_i - \theta_{ij} - \delta_j$

$= |V_i| \sum_{j=1}^{n} |Y_{ij}| |V_j| [\cos(\delta_i - \theta_{ij} - \delta_j) + j \sin(\delta_i - \theta_{ij} - \delta_j)]$

$= |V_i| \sum_{j=1}^{n} |Y_{ij}| |V_j| \cos(\delta_i - \theta_{ij} - \delta_j) + j |V_i| \sum_{j=1}^{n} |Y_{ij}| |V_j| \sin(\delta_i - \theta_{ij} - \delta_j)$

$= |V_i| \sum_{j=1}^{n} |Y_{ij}| |V_j| \cos(\theta_{ij} - \delta_i + \delta_j) - j |V_i| \sum_{j=1}^{n} |Y_{ij}| |V_j| \sin(\theta_{ij} - \delta_i + \delta_j)$

By equating real & imaginary parts

$P_i = |V_i| \sum_{j=1}^{n} |Y_{ij}| |V_j| \cos(\theta_{ij} - \delta_i + \delta_j)$ — (3)

$Q_i = -|V_i| \sum_{j=1}^{n} |Y_{ij}| |V_j| \sin(\theta_{ij} - \delta_i + \delta_j)$ — (4) where $i = 1, 2 \cdots n$.

28.

$$Y_{bus} = \begin{bmatrix} 3-j12 & -2+j8 & -1+j4 & 0 \\ -2+j8 & 3.666-j14.664 & -0.666+j2.664 & -1+j4 \\ -1+j4 & -0.666+j2.664 & 3.666-j14.664 & -2+j8 \\ 0 & -1+j4 & -2+j8 & 3-j12 \end{bmatrix}$$

$$V_i^{k+1} = \frac{1}{Y_{ii}} \left[\frac{P_i - jQ_i}{(V_i^*)^k} - \sum_{j=1}^{n} Y_{ij} V_j^k \right]$$

$$V_2^1 = \frac{1}{Y_{22}} \left[\frac{P_2 - jQ_2}{(V_2^*)^0} - \sum_{j=1}^{n} Y_{21} V_1^{(0)} \right] = \frac{1}{Y_{22}} \left[\frac{P_2 - jQ_2}{(V_2^*)^0} - Y_{21} V_1^{(0)} - Y_{23} V_2^{(0)} - Y_{24} V_4^{(0)} \right]$$

$$= \frac{1}{3.66 - j14.664} \left[\frac{-0.5 + j0.2}{1\angle 0} - (-2+j8)\, 1.06\angle 0 - (-0.666+j2.664)\, 1\angle 0 - (-1+j4)\, 1\angle 0 \right]$$

$V_2^1 = 1.0118 - j0.0288$

$\boxed{V_2^1 = 1.012 \angle -1.63}$

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$$V_3^1 = \frac{1}{Y_{33}}\left[\frac{P_3 - jQ_3}{(V_3^*)^0} - Y_{3j}V_j^{(0)}\right] = \frac{1}{Y_{33}}\left[\frac{P_3 - jQ_3}{(V_3^*)^0} - Y_{31}V_1^{(0)} - Y_{32}V_2^1 - Y_{34}V_4^{(0)}\right]$$

$P_3 = P_{3gen} - P_{3load} = 0 - 0.4 = -0.4$

$Q_3 = Q_{3gen} - Q_{3load} = 0 - 0.3 = -0.3$

$$= \frac{1}{3.66 - j14.664}\left[\frac{-0.4 + j0.3}{1\angle 0} - (-1+j4)(1.06) - (-0.666 + j2.664)(1.0118 - j0.0288) - (-2+j8)1\angle 0\right]$$

$V_3^1 = 0.994 - j0.026$

$$\boxed{V_3^1 = 0.994\angle -1.49^\circ}$$

$$V_4^1 = \frac{1}{Y_{44}}\left[\frac{P_4 - jQ_4}{(V_4^*)^0} - Y_{4j}V_j^{(0)}\right] = \frac{1}{Y_{44}}\left[\frac{P_4 - jQ_4}{(V_4^*)^0} - Y_{41}V_1^{(0)} - Y_{42}V_2^1 - Y_{43}V_3^1\right]$$

$$= \frac{1}{3 - j12}\left[\frac{-0.3 + j0.1}{1\angle 0} - (0) - (-1+j4)(1.0118 - j0.0288) - (-2+j8)(0.994 - j0.026)\right]$$

$$= \frac{2.3766 - j11.98}{3 - j12}$$

$V_4^1 = 0.986 - j0.048$

$$\boxed{V_4^1 = 0.987\angle -2.78}$$

At the end of 1st iteration

$V_2^1 = 1.012\angle -1.63^\circ$

$V_3^1 = 0.994\angle -1.49$

$V_4^1 = 0.987\angle -2.78$

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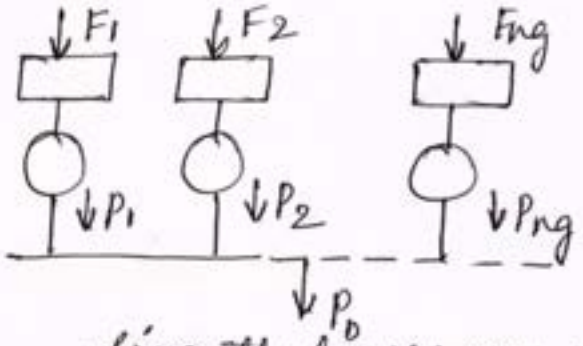
3a) The simplest economic dispatch problem when transmission line losses are neglected. In this problem model does not consider system configuration & line impedances.

Assume that the system is only one bus with all generation & loads connected to it as shown in fig below.



Since the losses are neglected

Total Gen = Total demand (P_D).

Let us consider a system with no. of generating plants supplying the total demand P_D.

Let F_i → cost of plant 'i' in Rs/hr.

The mathematical formation of the problem of economic scheduling is given by,

$$F_T = \sum_{i=1}^{ng} F_i = \sum_{i=1}^{ng} a_i + b_i P_{Gi} + c_i P_{Gi}^2$$

The above expn is min subjected to the constraint

$$\text{i.e } \sum_{i=1}^{ng} P_{Gi} = P_D$$

Where F_T – Total production cost

F_i – Production cost of i^{th} plant

P_{Gi} – Generation of i^{th} plant.

P_D – Total load demand

ng – Total no. of dispatchable generating plants

Lagrange method for solution of economic schedule

$$\text{WKT, } F_T = \sum_{j=1}^{n} F_i$$

$$P_D = \sum_{i=1}^{ng} P_{Gi} = 0$$

The augmented cost fn by using the lagrange multiplier is given by: $\mathcal{L} = F_T + \lambda (P_D - \sum_{i=1}^{ng} P_{Gi})$

The min is obtained when

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$$\frac{\partial \mathcal{L}}{\partial P_{Gi}} = 0 \quad \& \quad \frac{\partial \mathcal{L}}{\partial \lambda} = 0$$

$$\frac{\partial \mathcal{L}}{\partial P_{Gi}} = \frac{\partial F_T}{\partial P_{Gi}} - \lambda = 0$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = P_D - \sum_{i=1}^{ng} P_{Gi} = 0$$

In the above, the 2nd eq^n is simply the original constraint of the problem. The cost of a plant F_i depends only on its own o/p P_{Gi}. Hence, $\frac{\partial F_T}{\partial P_{Gi}} = \frac{\partial F_i}{\partial P_{Gi}} = \frac{dF_i}{dP_{Gi}}$

Using the above,

$$\frac{\partial F_i}{\partial P_{Gi}} = \frac{dF_i}{dP_{Gi}} - \lambda \quad \text{where } i = 1, 2, 3 \cdots ng$$

We can write,

$$b_i + 2C_i P_{Gi} = \lambda$$

The above eq^n is called co-ordination eq^n

We have, $P_{Gi} = \frac{\lambda - b_i}{2C_i}$

WKT, $\sum_{i=1}^{ng} P_{Gi} = P_D \Rightarrow \sum_{i=1}^{ng} \frac{\lambda - b_i}{2C_i} = P_D$

Analytical sol^n of λ is obtained by

$$\lambda = \frac{P_D + \sum_{j=1}^{ng} \frac{b_i}{2C_i}}{\sum_{j=1}^{ng} \frac{1}{2C_i}} //.$$

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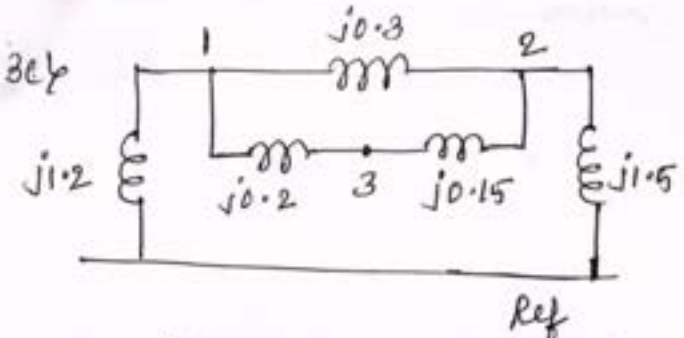
9B) Advantages:

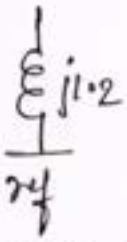
1. The data preparation of the bus admittance matrix is very simple.
2. The formation of the bus admittance matrix & its modification is easy.
3. The bus admittance matrix is a sparse matrix thus the computer memory requirement is less.
4. Off diagonal elements are symmetric in terms of bold position & value w.r.t diagonal
5. The diagonal element of each node is the sum of the admittances connected to it.



Step ①: Type 1 modification

$k=0,\ k=1$

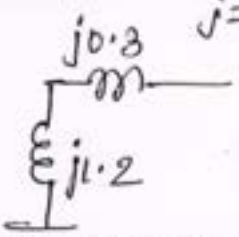
$$Z_{b(new)} = [j1.2]$$



Step ②: Type 2 modification

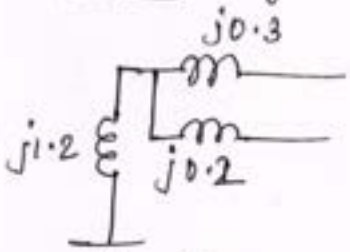
$j=1 \quad k=2,\ n=1$

$$Z_{b(new)} = \begin{bmatrix} Z_{b(old)} & \vdots & Z_{11} \\ \cdots & \vdots & \cdots \\ Z_{11} & \vdots & Z_b+Z_{11} \end{bmatrix} = \begin{bmatrix} j1.2 & j1.2 \\ j1.2 & j1.5 \end{bmatrix}$$



Step ③: Type-2 modification

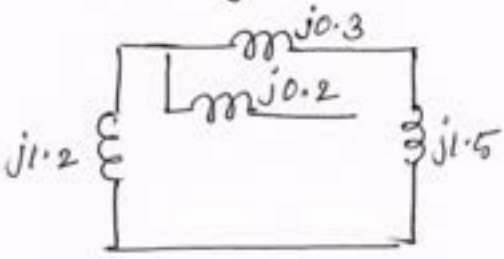
$$Z_{b(new)} = \begin{bmatrix} Z_{b(old)} & \vdots & Z_{11} \\ \cdots & \vdots & Z_{21} \\ Z_{11}\ Z_{12} & \vdots & Z_{11}+Z_b \end{bmatrix} = \begin{bmatrix} j1.2 & j1.2 & j1.2 \\ j1.2 & j1.5 & j1.2 \\ j1.2 & j1.2 & j1.4 \end{bmatrix}$$



Step ④: Type-3 modification

$j=2,\ r=0,\ n=3$

$$Z_{b(new)} = Z_{b(old)} - \frac{1}{Z_b+Z_{jj}} \begin{bmatrix} Z_{1j} \\ Z_{2j} \\ Z_{3j} \end{bmatrix} \begin{bmatrix} Z_{j1} & Z_{j2} & Z_{j3} \end{bmatrix}$$



$$Z_{b(new)} = \begin{bmatrix} j1.2 & j1.2 & j1.2 \\ j1.2 & j1.5 & j1.2 \\ j1.2 & j1.2 & j1.4 \end{bmatrix} - \frac{1}{j1.5+j1.2} \begin{bmatrix} j1.2 \\ j1.5 \\ j1.2 \end{bmatrix} \begin{bmatrix} j1.2 & j1.5 & j1.2 \end{bmatrix}$$

$$Z_{b(new)} = \begin{bmatrix} j1.2 & j1.2 & j1.2 \\ j1.2 & j1.5 & j1.2 \\ j1.2 & j1.2 & j1.4 \end{bmatrix} - \frac{1}{j2.7} \begin{bmatrix} -1.44 & -1.8 & -1.44 \\ -1.8 & -2.25 & -1.44 \\ -1.44 & -1.8 & -1.44 \end{bmatrix}$$

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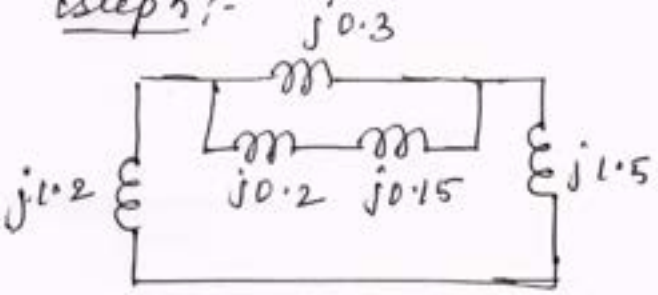
$$Z_{b(new)} = \begin{bmatrix} j1.2 & j1.2 & j1.2 \\ j1.2 & j1.5 & j1.2 \\ j1.2 & j1.2 & j1.4 \end{bmatrix} - \begin{bmatrix} j0.533 & j0.666 & j0.533 \\ j0.666 & j0.833 & j0.533 \\ j0.533 & j0.666 & j0.533 \end{bmatrix}$$

$$Z_{b(new)} = \begin{bmatrix} j0.667 & j0.534 & j0.667 \\ j0.534 & j0.667 & j0.667 \\ j0.667 & j0.534 & j0.867 \end{bmatrix}$$

step 5:-



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$$Z_{b(new)} = Z_{b(old)} - \frac{1}{Z_b + Z_{ii} + Z_{jj} - 2Z_{ij}} \begin{bmatrix} Z_{12} - Z_{13} \\ Z_{22} - Z_{23} \\ Z_{32} - Z_{33} \end{bmatrix} \begin{bmatrix} Z_{21-31}, Z_{22} - Z_{32}, Z_{23} - Z_{32} \end{bmatrix}$$

$$= \begin{bmatrix} j0.667 & j0.534 & j0.667 \\ j0.534 & j0.667 & j0.667 \\ j0.667 & j0.534 & j0.867 \end{bmatrix} - \frac{1}{j0.5 + j0.667 + j0.867 - 2(j0.666)}$$

$$\begin{bmatrix} j0.534 - j0.667 \\ j0.667 - j0.534 \\ j0.534 - j0.867 \end{bmatrix} \begin{bmatrix} j0.534 - j0.667 & j0.667 - j0.534 \\ & j0.534 - j0.867 \end{bmatrix}$$

$$= \begin{bmatrix} j0.667 & j0.534 & j0.667 \\ j0.534 & j0.667 & j0.667 \\ j0.667 & j0.534 & j0.867 \end{bmatrix} - \frac{1}{j0.702} \begin{bmatrix} -j0.133 \\ j0.133 \\ -j0.333 \end{bmatrix} \begin{bmatrix} -j0.133 & j0.133 & -j0.333 \end{bmatrix}$$

$$= \begin{bmatrix} j0.667 & j0.534 & j0.667 \\ j0.534 & j0.667 & j0.667 \\ j0.667 & j0.534 & j0.867 \end{bmatrix} - \frac{1}{j0.702} \begin{bmatrix} -0.017 & 0.017 & -0.044 \\ 0.017 & -0.017 & 0.044 \\ -0.044 & 0.044 & -0.110 \end{bmatrix}$$

$$= \begin{bmatrix} j0.667 & j0.534 & j0.667 \\ j0.534 & j0.667 & j0.667 \\ j0.667 & j0.534 & j0.867 \end{bmatrix} - \begin{bmatrix} -j0.024 & j0.024 & -j0.062 \\ j0.024 & -j0.024 & j0.062 \\ -j0.062 & j0.062 & -j0.156 \end{bmatrix}$$

$$Z_{b(new)} = \begin{bmatrix} j0.691 & j0.51 & j0.729 \\ j0.51 & j0.691 & j0.605 \\ j0.729 & j0.472 & j1.023 \end{bmatrix}$$

Ans. The o/p power of any generator has a max value dependent on the rating of the generator. It also has a min limit set by stable boiler operation. Thus, the generators are restricted to lie within a given max & min limit.

The total production cost is defined by,

$$F_T = \sum_{i=1}^{ng} F_i = \sum_{i=1}^{ng} a_i + b_i P_{Gi} + c_i P_{Gi}^2 \text{ is min,}$$

subjected to constraints is given by.

The inequality constraint is given by,

$$P_{Gi(min)} \leq P_{Gi} \leq P_{Gi(max)}$$

where $P_{Gi(min)}$ and $P_{Gi(max)}$ are the min & max generating limits for plant. The necessary conditions for the optimal dispatch with losses neglected becomes,

$$\frac{dF_i}{dP_{Gi}} = \lambda \quad \text{for } P_{Gi(min)} < P_{Gi} < P_{Gimax}$$

$$\frac{dF_i}{dP_{Gi}} \leq \lambda \quad \text{for } P_{Gi} = P_{Gimax}$$

$$\frac{dF_i}{dP_{Gi}} \geq \lambda \quad \text{for } P_{Gi} = P_{Gimin}$$

The estimated λ, P_i are calculated from the co-ordination eqn is given by,

$$P_{Gi} = \frac{\lambda - b_i}{2c_i}$$ & its iteration is continued till

$$\sum_i P_{Gi} = P_D$$

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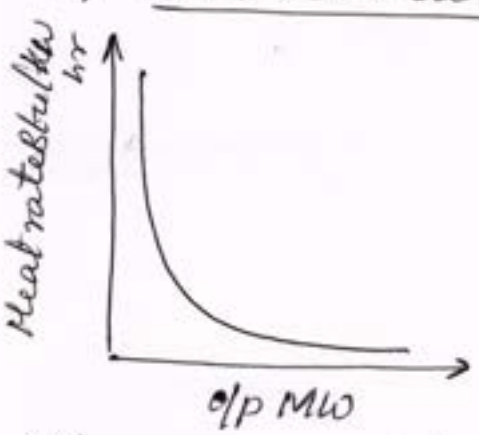
4b. i) Input-Output curve:

This is a fundamental curve of thermal plants & a plot of the i/p in British thermal unit (Btu) per hr Vs the power o/p of the plant in MW.

ii) Heat-rate curve: Heat rate is the ratio of fuel i/p in Btu KW/hr to energy o/p in MW. It is the slope of i/p - o/p curve at any point. The reciprocal of heat rate is called fuel efficiency. The heat rate curve is a plot of heat rate v/s o/p in MW.



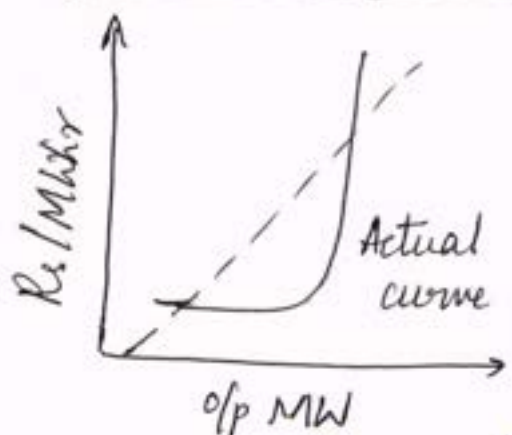
iii) Incremental fuel rate curve:

The incremental fuel rate is equal to small change in i/p divided by the corresponding change in o/p.

Incremental fuel rate = $\frac{\Delta i/p}{\Delta o/p}$

Its unit is Btu/Kwhr.

iv) Incremental cost curve:



Incremental fuel cost is the product of incremental fuel rate & fuel cost (Rs/Btu). The curve is shown in fig. The unit of incremental fuel cost is Rs/MWhr.

In general,

Let Fi – Fuel cost of plant

PGi – Generated o/p

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The approximate CIE is given by:

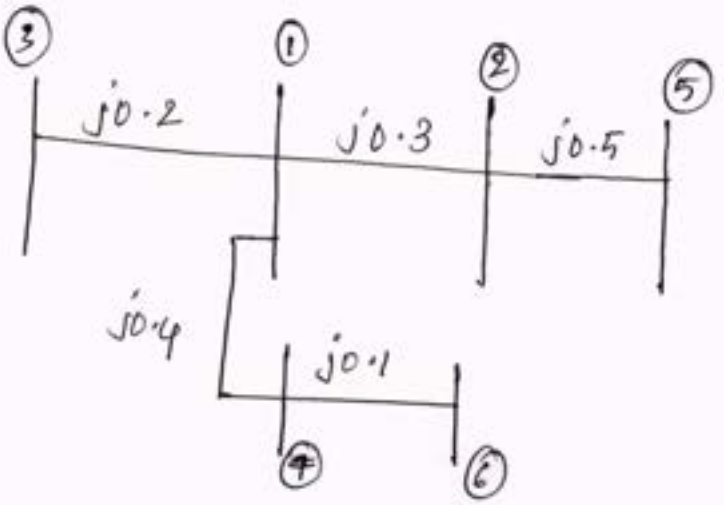
$F_i = a_i + b_i P_{Gi} + c_i P_{Gi}^2$ Rs/hr

Incremental fuel cost is given by;

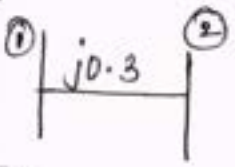
$$\frac{dF_i}{dP_{Gi}} = b_i + 2c_i P_{Gi}$$

Incremental production cost = Incremental fuel cost + Incremental cost of labour, water & maintainance,

HC.

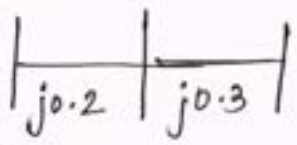


Step ①:



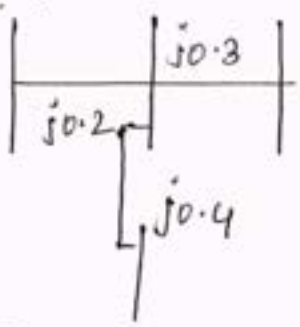
$Z_{b(new)} = [j0.3]$

Step ②:



$$Z_{b(new)} = \begin{bmatrix} j0.3 & 0 \\ 0 & j0.2 \end{bmatrix}$$

Step ③:



$$Z_{b(new)} = \begin{bmatrix} j0.3 & 0 & 0 \\ 0 & j0.2 & 0 \\ 0 & 0 & j0.4 \end{bmatrix}$$

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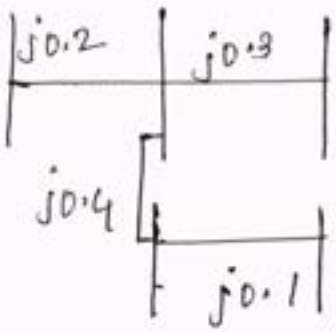
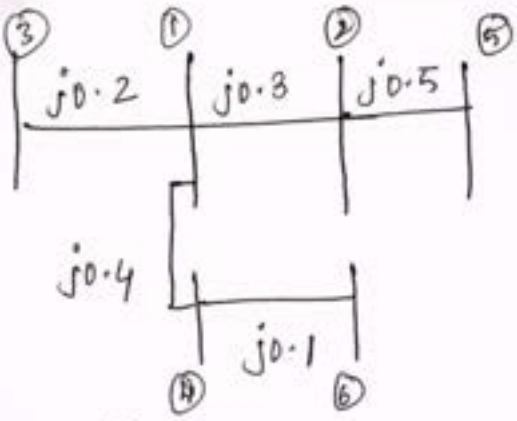
Step ④:



$$Z_{b(new)} = \begin{bmatrix} j0.3 & 0 & 0 & 0 \\ 0 & j0.2 & 0 & 0 \\ 0 & 0 & j0.4 & j0.4 \\ 0 & 0 & j0.4 & j0.5 \end{bmatrix}$$

Step5:



$$Z_{bnew} = \begin{bmatrix} j0.3 & 0 & 0 & 0 & j0.3 \\ 0 & j0.2 & 0 & 0 & 0 \\ 0 & 0 & j0.4 & j0.4 & 0 \\ 0 & 0 & j0.4 & j0.5 & 0 \\ j0.3 & 0 & 0 & 0 & j0.8 \end{bmatrix}$$

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Department of Electrical & Electronics Engineering

Power Systems 2 -18EE-71

Max Marks: 40 **Internal Assessment Test-III** **Date:** 29-12-2022

Semester: VII **Duration:** 90 Minutes

NOTE: Answer any ***two*** full questions choosing one question in each part

PART-A

1. a) Explain with example RK method [L2] |CO5|(10 Marks)

   b) Three power plants of total capacity of 425 MW and scheduled for operation to supply total system load of 300MW. Find the optimum load scheduling, if the plants have the following incremental fue costs in Rs/MWhr and the generation constants, if the transmission losses are neglected.

   $dc_1/dp_1 = 30+0.15P_1$ $25MW \le P1 \le 125MW$

   $dc_2/dp_2 = 40+0.2P_2$ $30MW \le P2 \le 100MW$

   $dc_3/dp_3 = 15+0.18P3$ $50MW \le P3 \le 200MW$ [L3] |CO4|(10Marks)

OR

2. a) Deduce the condition for optimal load dispatch considering transmission losses in a system and draw flow chart [L2] |CO4|(10 Marks)

   b) The fuel input in calories/hr for plants 1 & 2 are given by

   $F_1 = (8P_1+0.024P_1^2+80) \times 10^6$ cal/hr

   $F_2 = (6P_2+0.044P_2^2+120) \times 10^6$ cal/hr

   The maximum and minimum loads on the uits are 100 MW and 10 MW respectively. Determine the minimum cost of generation per day with the load curve is shown in fig. Take the cost of fuel as Rs.10/- per million calories. [L3] |CO4|(10 Marks)

PART-B

3. a) Deduce the fast decoupled load flow model clearly starting the assumptions made |CO4|(10 Marks) [L2]

   b) A system consists of two plants connected by a transmission line and a load is located at plant2. When a 100 MW are transmitted to the load from plant 1. A loss is 10 MW takes place in the tie line. Determine the generation schedule at both plants and the power received by the load when the incremental cost for the system λ=25 Rs/MWhr & the incremental fuel cost are

   $dF_1/dp_1 = (0.03P_1 + 17)$ Rs/MWhr $dF_2/dp_2 = (0.06P_2 + 19)$ Rs/MWhr |CO4|(10 Marks [L3]

OR

4. a) Illustrate the steps involved in estimating internal voltage angle and machine speed using Runge-Kutta method during transient period. [L2] |CO5|(10 Marks)

   b) The incremental cost of a fuel plant is in Rs/hr for a plant consisting of 2 units is given by $dC_1/dpg_1 = (0.25Pg_1+40)$, $dC_2/dpg_2 = (0.3Pg_2+30)$. Assume that both units are operating all times & total load varies 40 MW to 250 MW. How will the load be shared for a load of 200MW, what is the corresponding value of the plant incremental cost. Determine the saving in fuel cost in Rs/hr . for the optimum scheduling of total load of 250MW as compare to equal distribution of the same load between the two units. [L3] |CO4|(10 Marks)

Tanuj K.S
STAFF

G.H Rao
HOD

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Scheme and Solution

power systems - 2

18EE-71

Internal - III

1 a) Explanation of RK method — 5M

example of RK method — 5M

b) For economic scheduling

$$\frac{dC_1}{dP_1} = \frac{dC_2}{dP_2} = \frac{dC_3}{dP_3}$$

$P_2 = 0.75P_1 - 50$ — 1½M $\quad P_3 = 0.833P_1 + 83.33$ — 1½M

$$P_1 + P_2 + P_3 = 0$$

$P_1 = 103.24$ MW

$P_2 = 27.43$ MW — 2M

$P_3 = 169.33$ MW

Since $P_2 = 27.43$ condition is not satisfied

300 MW of power cannot be alloted economically among all the 3 units

let $P_2 = 30$ MW

$$\frac{dC_2}{dP_2} = \lambda$$

$$40 + 0.2 \times 30 = \lambda$$

$\lambda = 46$ — 1M

for economic scheduling

$$\frac{dC_1}{dP_1} = \frac{dC_2}{dP_2} = \frac{dC_3}{dP_3} = \lambda = 46$$

$$P_1 = \frac{46 - 30}{0.15} = 106.6 \text{ MW}$$ — 1M

$P_2 = 30$ MW — 1½M

$$P_3 = \frac{46-15}{0.18} = 172.22 \text{ MW} \quad \text{— (1M)}$$

$\therefore$ Total recived load

$$P_D = P_1 + P_2 + P_3$$

$$= 106.66 + 30 + 172.22$$

$$P_D = 309 \text{ MW.} \quad \text{— (2M)}$$

2 a) Derivation of optimal load dispatch including transmission loss — (5M)

flow chart — (5M)

b)

$$F_1 = (8P_1 + 0.024P_1^2 + 80) \times 10^6 \times \frac{10}{10^6} \text{ Rs/hr}$$

$$F_1 = 80P_1 + 0.24P_1^2 + 800 \text{ Rs/hr} \quad \text{(1/2 M)}$$

$$F_2 = (6P_2 + 0.04P_2^2 + 120) \times 10^6 \times \frac{10}{10^6}$$

$$= 60P_2 + 0.4P_2^2 + 1200 \text{ Rs/hr} \quad \text{(1/2 M)}$$

For economic scheduling

$$\frac{dF_1}{dP_1} = \frac{dF_2}{dP_2}$$

$$\frac{dC_1}{dP_1} = 0.48P_1 + 80$$

$$\frac{dC_2}{dP_2} = 0.8P_1 + 60 \quad \text{— (1M)}$$

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$P_1 + P_2 = 50 MW$

$P_2 = 50 - P_1$ } 1M

for scheduling

$\frac{dF_1}{dP_1} = \frac{dF_2}{dP_2}$

$P_1 = 15.625 MW$

$P_2 = 34.375 MW$ } 1M

$F_{T_1} = F_1 + F_2$

$F_{T_1} = 5843.75 Rs/hr$

$F_{T_1} = (5843.75 \times 12) Rs/day$

$F_{T_1} = 70125 Rs/day$ — 1M

(3)

$P_1 + P_2 = 150 MW$ } 1M

for economic scheduling

$\frac{dF_1}{dP_1} = \frac{dF_2}{dP_2}$

$P_1 = 78.125 MW$

$P_2 = 71.875 MW$ } 1M

$F_{T_2} = F_1 + F_2$

$F_{T_2} = 16093.75 Rs/hr$

$F_{T_2} = 16093.75 \times 12$

$F_{T_2} = 193125 Rs/day$ — 1M

Total min cost/day

$F_T = F_{T_1} + F_{T_2}$

$= 70125 + 193125$

$\boxed{F_T = 263250 Rs/day}$ — 2M

3a) Assumptions — 2M

derivation of J_1 — — 2M

J_2 — — 2M

J_3 — — 2M

J_4 — — 2M

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b) For a two source load

$$P_L = B_{11} P_1^2 + B_{12} P_1 P_2 + B_{22} P_2^2$$ — (1M)

Hence $B_{12} = 0 \quad B_{22} = 0$ } — (1M)

$$\therefore P_L = B_{11} P_1^2$$

$$B_{11} = \frac{10}{(100)^2} = 0.001$$ — (2M)

For economic scheduling at plant 1

$$\frac{dC_1}{dP_1} + \lambda \frac{dP_L}{dP_1} = \lambda$$

$$0.03P_1 + 17 + 25 \frac{d}{dP_1}(B_{11} P_1^2) = 25$$

$$P_1 = 100\,M$$ — (2M)

for optimal scheduling at plant 2

$$\frac{dC_2}{dP_2} + \lambda \frac{dP_L}{dP_2} = \lambda$$

$$0.06P_2 + 19 = 25$$

$$P_2 = 100\,MW$$ — (2M)

power Recived by load

$$P_1 + P_2 = P_D + P_L$$

$$P_D = 190\,MW$$ — (2M)

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(5M)

4 a) Steps of RK method — (5M)

flow diagram — (5M)

b) $\frac{dC_1}{dP_{g_1}} = 0.25 P_{g_1} + 40$

$\frac{dC_2}{dP_{g_2}} = 0.3 P_{g_2} + 30$

$P_1 + P_2 = P_D$

$P_1 + P_2 = 200MW$ — (1M)

$P_2 = 200 - P_1$ — (1M)

for optimal scheduling

$\frac{dC_1}{dP_{g_1}} = \frac{dC_2}{dP_{g_2}}$

$P_{g_1} = 90.91MW$ — (2M)

$P_{g_2} = 109.09MW$ — (1M)

$\lambda = \frac{dC_1}{dP_{g_1}} = \frac{dC_2}{dP_{g_2}}$

$\lambda = 0.25 P_{g_1} + 40$

$\lambda = 62.72$ — (1M)

Total $P_D = 250MW$

$P_1 + P_2 = 250 MW$

$P_2 = 250 - P_1$

for optimal scheduling of 250 MW

$\frac{dC_1}{dP_{g_1}} = \frac{dC_2}{dP_2}$

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$P_{g_1} = 118.18\ MW$ — (2M)

$P_{g_2} = 131.81\ MW$ — (1M)

$P_{g_1} = P_{g_2} = \frac{250}{2} = 125MW$ — (1M)

net saving

$$\Delta C_T = \Delta C_1 + \Delta C_2$$

$$= \int_{118.18}^{125} (0.25 P_{g_1} + 40)\, dP_{g_1} + \int_{131.81}^{125} (0.3 P_{g_2} + 40)\, dP_{g_2}$$

$$= 480.11 - 466.63$$

$\Delta C_T = 13.48\ Rs/hr$ — (2M)

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FIRST INTERNAL ASSESSMENT

ub: Power System Protection.
em: VII sem
lax Marks: 40

Sub code: 17EE72
Date: 27.10.22
Duration: 90 Minutes

Note: **Answer two full questions selecting one full question from each module.**

MODULE – 1

1. a) With a neat diagram, explain zones of protection in a power system. **10M(CO1)**
   b) Explain various methods of back up protection. **10M(CO1)**

OR

2. a) Briefly explain the essential qualities of protective relays. **10M(CO1)**
   b) How protective relays are classified, list them. **5M(CO1)**
   c) Explain the importance of automatic reclosing. **5M(CO1)**

MODULE – II

3. a) Briefly explain the Time Current characteristics for the over current protection. **10M(CO1)**
   b) What are the merits and demerits of static relays. **10M(CO1)**

OR

4. a) Explain different types of over current protective schemes. **10M(CO1)**
   b) Briefly explain the terms I) Time setting & ii) Current setting. **10M(CO1)**

gnature of staff

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Signature of H.O.D 21/10/22

27.10.22

Scheme of Evaluation - IA - 1

Power System Protection [18EE72]

1. a) Diagram of Zones of protection → 5M.
   Explaination → 5M

   b) Various Methods of back up protection
   i) Remote - back up
   ii) Relay back up
   iii) Breaker back up
   Brief explaination.

2. a) Essential qualities of protection.
   Brief explaination of
   i) Selectivity or descrimination.
   ii) Reliability
   iii) Sensitivity
   iv) Stability
   v) Fast operation.

   b) Classification of protective relays
   i) Based on technology
   a) Electromagnetic Relays
   b) Static Relays
   c) Microprocessor based Relays. → 2M
   ii) Based on their Function.
   a) Over current protection relays
   b) Under voltage Relays
   c) Impedance Relays.
   d) Under frequency Relays
   e) Directional Relays. → 3M.

   c) Explaination about Automatic Reclosing → 5M.

3. a) Time - current Characteristics → Graphs
   i) Definite time over current relay
   ii) Instantaneous " " "
   iii) Inverse - time " " "
   iv) IDMT Relay " "
   v) Very inverse time " "

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b) Merits of Static Relays → 6M
Demerits of Static Relays → 4M.

A.a) Types of over current protective schemes
Explanations of i) over current protection.
ii) Distance protection
iii) Carrier current protection
iv) Differential protection. → 10M.

b) Time setting
current setting } Explanation with PSM & TMS → 10M

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SECOND INTERNAL ASSESSMENT

Sub: Power System Protection. **Sub code**: 18EE72
Sem: VII sem **Date**: 01.12.22
Max Marks: 40 **Duration:** 90 Minutes

Note: **Answer two full questions selecting one full question from each module.**

MODULE – 1

1. **a)** With a neat sketch, explain the construction and working principle of reverse power directional relay. **10M**
   b) What is an impedance relay? With a neat sketch, explain the basic operation of an impedance relay. **10M**

OR

2. **a)** With a neat sketch, explain the directional earth fault relay. **10M**
   b) Explain the impedance relay characteristics on the R-X diagram. **10M**

MODULE – II

3. **a)** Explain stepped time distance characteristics of three distance relaying units used for I, II and III zone of protection. **8M**
   b) With a neat sketch explain an over current protective scheme for ring feeder. **6M**
   c) Explain combined earth fault and phase fault protective scheme. **6M**

OR

4. **a)** Define the following terms:
   i) Fuse ii) Fuse element iii)Rated Current iv) Minimum fusing current v) Fusing factor. **10M**
   b) With a neat sketch, explain the construction and working of an HRC fuse. **10M**

Signature of staff **Signature of H.O.D**

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Power System protection 01.12.22.

Second IA (18EE72)

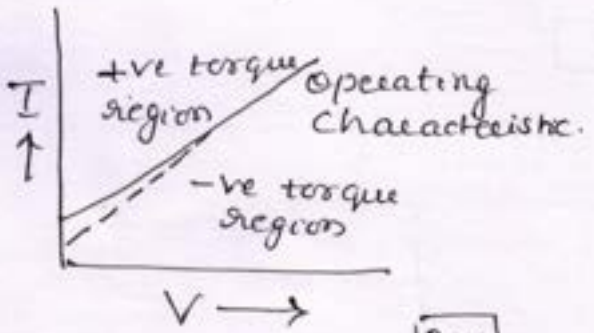
Scheme of Evaluation

1. a) Diagram ⟶ 4M
Explaination ⟶ 6M

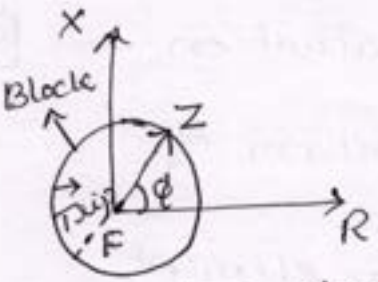
b) Definition ⟶ 1M
Sketch (diagram) of Impedance Relay → 4M.
Explaination → 5M.

2. a) Connection diagram of directional earth fault relay. ⟶ 6M
Explaination → 4M.

b) Operating characteristics of an impedance Relay



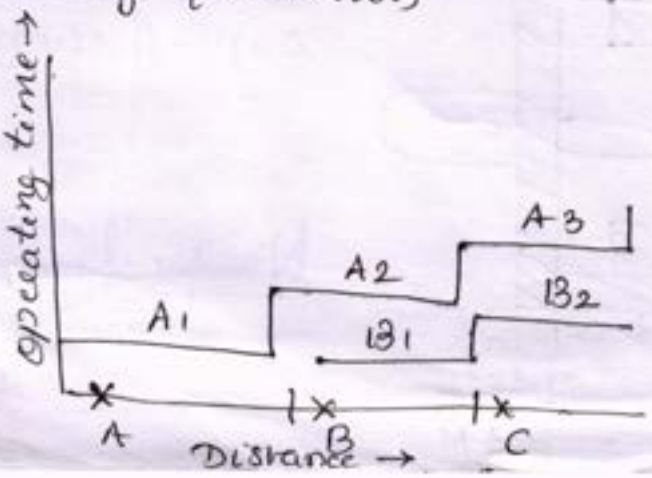
3M



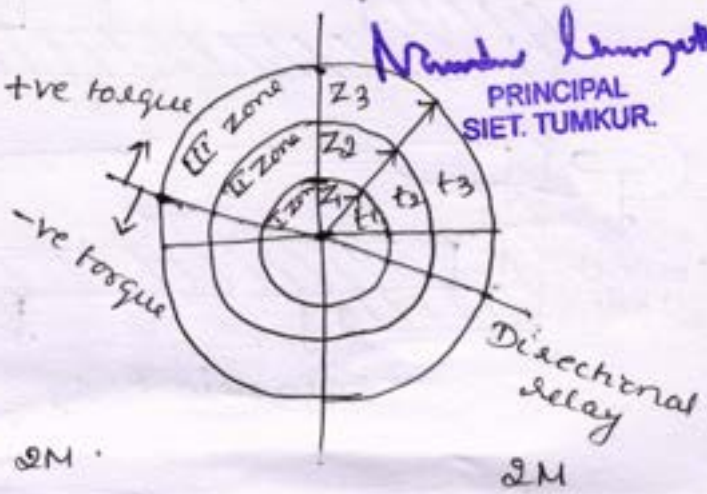
Operating Characteristics of an Impedance relay on R-X diagram → 3M

Explaination ⟶ 4M.

3. a) Stepped time distance characteristics of three distance relaying units used for I, II and III zone of protection



2M.



2M

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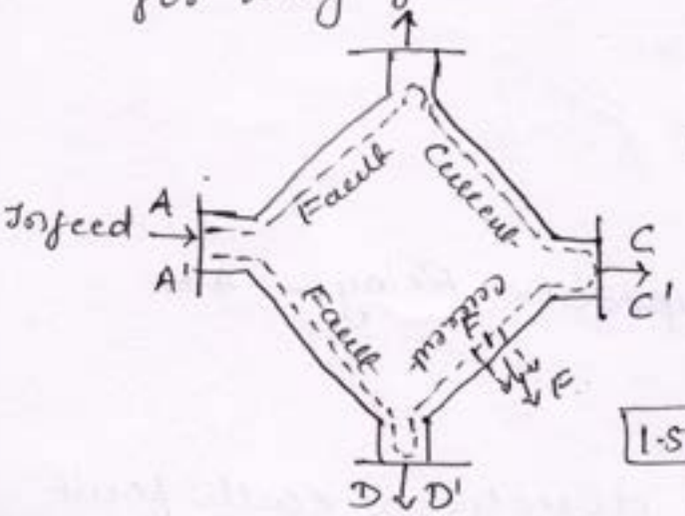
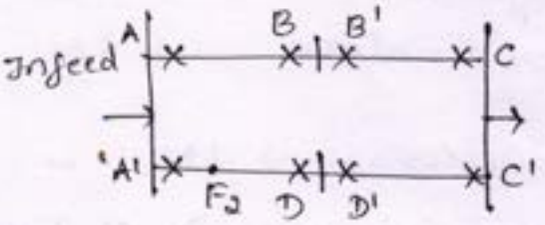
Explaination → 4M.

b) Explaination of an over current protective Scheme for ring feeder.



1.5M



1.5M

Explaination → 3M

c) Combined Earth fault and phase fault protective Scheme :

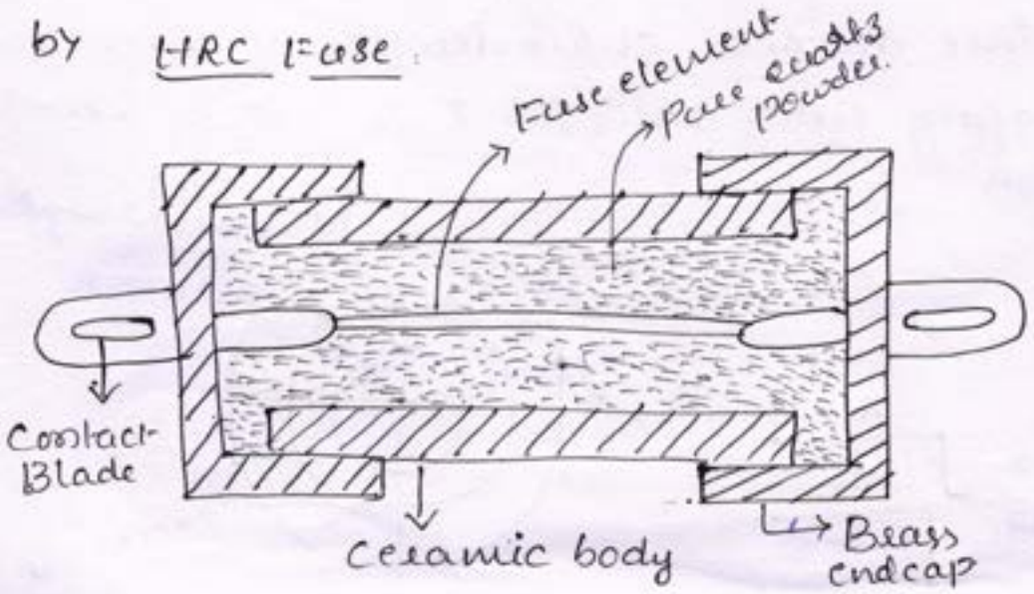
Explaination → 6M.

4.a) Definitions of

i) Fuse
ii) Fuse element.
iii) Rated current.
iv) Minimum fusing current
v) Fusing factor.

each - 2M × 5 = 10M

b) HRC Fuse



Construction → 3M
Explaination → 3M

→ 4M.

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20 YEARS Academic Excellence

THIRD INTERNAL ASSESSMENT

Sub: Power System Protection. **Sub code**: 18EE72
Sem: VII sem **Date**: 29.12.22

Note: **Answer two full questions selecting one full question from each module.**

MODULE – I

1. **a)** With a neat sketch. explain the construction and working principle of Klydonograph and Magnetic link. **10M**
   b) What are causes of over voltages in a power system. **10M**

OR

2.**a)** With a neat sketch, explain the recovery rate theory and energy balance theory of arc interruption in a circuit breaker. **10M**
   b) Explain the terms: restriking voltage, recovery voltage and RRRV. Derive an expression for restriking voltage and RRRV interms of system voltage, inductance and capacitance. **10M**

MODULE – II

3. **a)** What are the different types of air blast circuit breaker. Discuss their operating principle and area of application. **10M**
   b) What are the advantages and disadvantages of SF6 circuit breaker. **6M**
   c) Explain the phenomenon of current chopping in circuit breaker. **4M**

OR

4. **a)** With a neat sketch, explain the working principle of HVDC circuit breaker. **10M**
   b) With a neat circuit diagram explain the synthetic testing of a circuit breaker. **10M**

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Power System protection (18EE72)

Scheme of Evaluation.

29-12-22

III I A.

Module-1

1. a) Klydonograph.

Sketch
Construction } → 5M
Explanation

Magnetic Link → Explaination → 5M.

b) Causes of over voltages :-(10 points) → 10M.
Brief explaination

2. a) Recovery Rate theory

Sketch:
Explanation } → 5M

Energy balance theory
Explanation → 5M.

b) Definitions of Restriking voltage
Recovery voltage } → 3M.
RRRV

Derivation → 7M.

3. a) Types of Air blast circuit-breaker. (4M)
Operating principle and area of application. [6M]

b) Advantages of SF_6 circuit breaker → 3M
Disadvantages " " " " → 3M.

c) Current chopping in circuit-breaker → 4M.

4. a) HVDC circuit breaker → 5M
Figure and working principle → 5M.

b) Synthetic testing of circuit-breaker.
Circuit diagram → 5M
Explanation → 5M.

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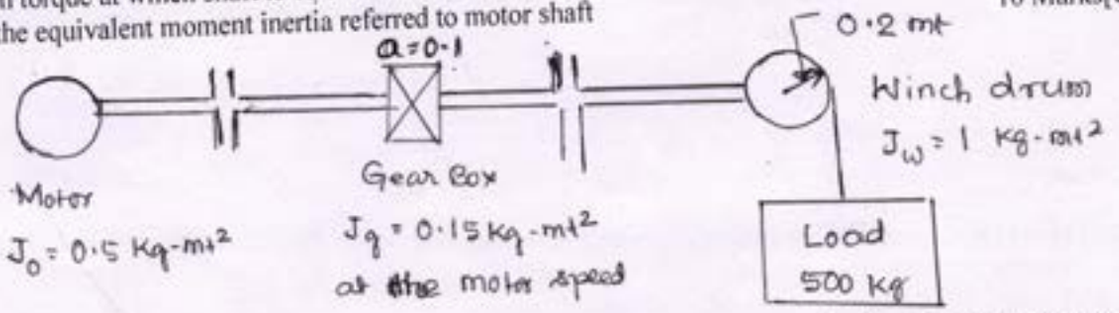
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, OCTOBER 2022

Semester : VII **Subject: INDUSTRIAL DRIVES & APPLICATIONS** **Sub Code: 18EE741**
Max Marks: 40 Date: 28-10-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) What are the advantages of an electric drives system. 06 Marks [CO1]
b) With a neat block diagram, state & explain the essential parts of an electric drive system. 08 Marks[CO1]
c) State and explain the functions of various converters. 06 Marks[CO1]

2 a) Explain the speed torque conventions & multi-quadrant operations of a motor, driving a hoist load. 10 Marks [CO2]
b) In the mechanism shown in figure, motor drives the winch drum through a reduction gear with a=0.1.
The friction torque at winch shaft is 15 N-mt and at motor shaft 10 N-mt. Motor speed is 1500 rpm. 10 Marks[CO2]
Calculate the equivalent moment inertia referred to motor shaft



3 a) Derive an expression for equivalent torque & moment of inertia for load with rotational motion & translational motion. 10 Marks [CO2]
b) Explain steady state stability of an electric drives. 10 Marks [CO2]

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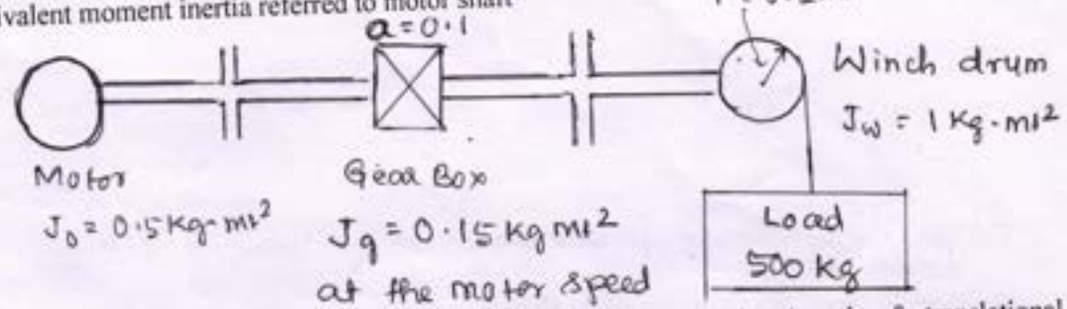
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, OCTOBER 2022

Semester : VII **Subject: INDUSTRIAL DRIVES & APPLICATIONS** **Sub Code: 18EE741**
Max Marks: 40 Date: 28-10-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) What are the advantages of an electric drives system. 06 Marks [CO1]
b) With a neat block diagram, state & explain the essential parts of an electric drive system. 08 Marks[CO1]
c) State and explain the functions of various converters. 06 Marks[CO1]

2 a) Explain the speed torque conventions & multi-quadrant operations of a motor, driving a hoist load. 10 Marks[CO2]
b) In the mechanism shown in figure, motor drives the winch drum through a reduction gear with a=0.1.
The friction torque at winch shaft is 15 N-mt and at motor shaft 10 N-mt. Motor speed is 1500 rpm. 10 Marks[CO2]
Calculate the equivalent moment inertia referred to motor shaft



3 a) Derive an expression for equivalent torque & moment of inertia for load with rotational motion & translational motion. 10 Marks [CO2]
b) Explain steady state stability of an electric drives. 10 Marks [CO2]

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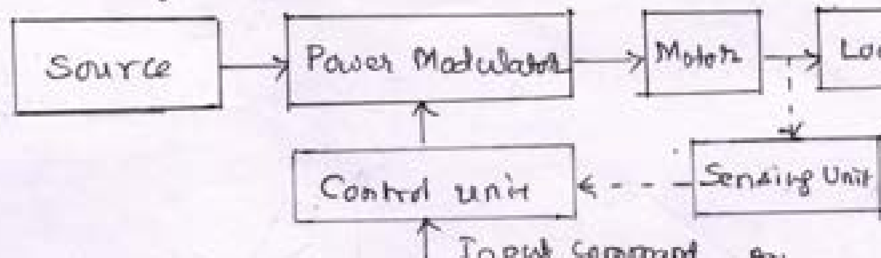
Course Title: Industrial Drives & Applications **Scheme & Solution** **Course Code:** 18EE741

Question Number	Solution	Marks Allocated

1 a)
* Electric drives have high efficiency, low no. load losses & considerable short time over loading capability
* Electric drives have longer life, lower maintenance & cleaner operation
* Donot pollute the environment (6) Marks
* There is no-need to refuel or warm-up the motor
* Electric drives can be operate in all 4-quadrants
* Electric drives can be operating in any conditions (Explosive, radioactive environment, submerged in liquids)

b)


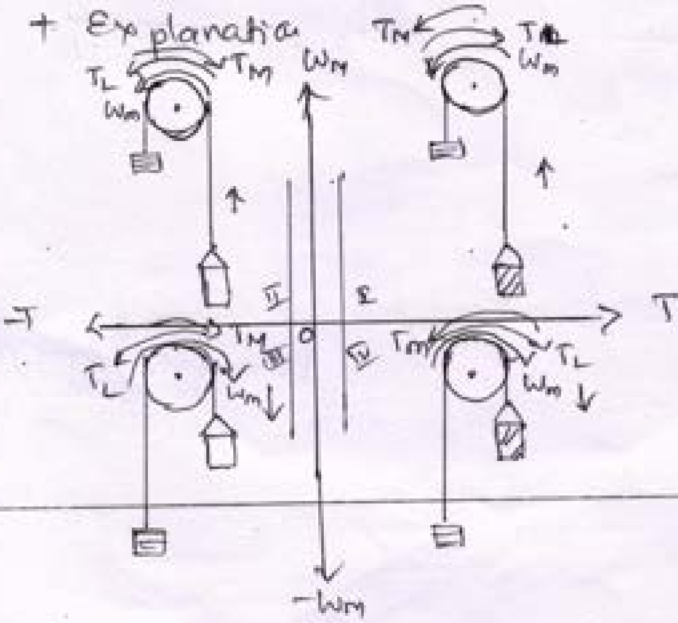
( ) Marks

Explanation (5) Marks

c)
i) AC to DC converters
ii) AC Voltage controller
iii) DC - DC converters
iv) Inverters
v) Cyclo converters
+ Explanation

variable Impedance / Switching circuits + Explanation. (4) Marks

(2) Marks

2 a)


(4) Marks

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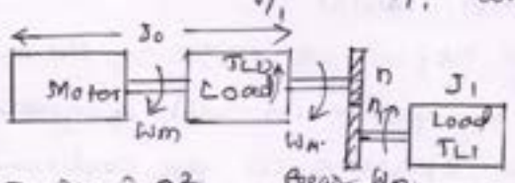
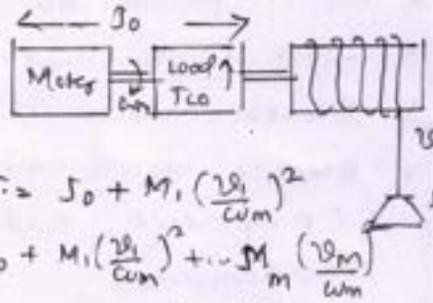
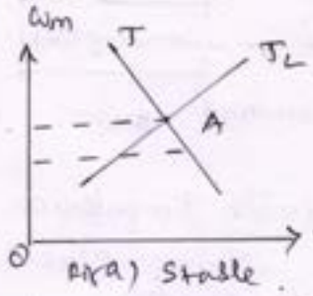
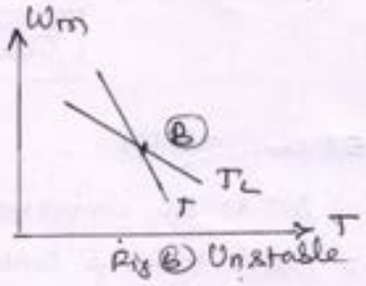
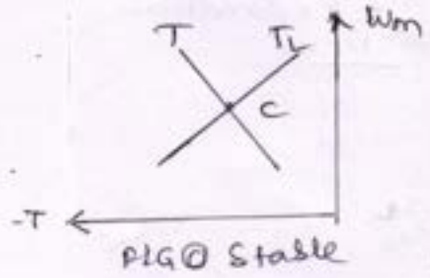
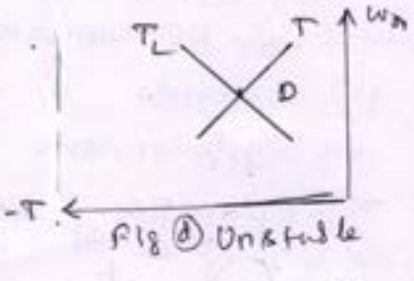
Question Number	Solution	Marks Allocated
	Explanation about multi-quadrant operation	6 Marks
b)	$\omega_m = \frac{2\pi N}{60} = \frac{2\pi(150)}{60} = 157.0796$ $\omega_{m1} = a\omega_m = 0.1 \times \omega_m = 15.70796$	(2) Marks
	$v = \omega_m \times R = 3.1415$ mt/sec	(2) Marks
	$J = J_0 + J_g + a^2 J_w + M\left(\frac{v}{\omega_m}\right)^2 = 0.86$ Kg-mt^2	(3) Marks
	$T = T_{L0} + \frac{a_1 T_w}{\eta_1} + \frac{P}{\eta_1}\left(\frac{v}{\omega_m}\right) = 120.66$ N-mt	(3) Marks
5 a)		(2)+(2) Marks
	$J = J_0 + J_1 a^2$	
	$J = J_0 + a_1^2 J_1 \ldots a_m^2 J_m$	
	$T_L = T_{L0} + \frac{a_1 T_{L1}}{\eta_1}$	
	$T_L = T_{L0} + \frac{a_1 T_{L1}}{\eta_1} + \ldots \frac{a_m T_{Lm}}{\eta_m}$	
		(2)+(3) Marks
	$J = J_0 + M_1\left(\frac{v_1}{\omega_m}\right)^2$	
	$J = J_0 + M_1\left(\frac{v_1}{\omega_m}\right)^2 + \ldots M_m\left(\frac{v_m}{\omega_m}\right)$	
	$T_L = T_{L0} + \frac{P_1}{\eta_1}\left(\frac{v_1}{\omega_m}\right)$	
	$T_L = T_{L0} + \frac{P_1}{\eta_1}\left(\frac{v_1}{\omega_m}\right) + \ldots \frac{P_m}{\eta_m}\left(\frac{v_m}{\omega_m}\right)$	
b)	 Fig(a) Stable	(4) Marks
	 Fig (b) Unstable	
	 Fig (c) Stable	
	 Fig (d) Unstable	
	Explanation	6 Marks

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - II, DECEMBER 2022

Semester : VII **Subject: INDUSTRIAL DRIVES & APPLICATIONS** **Sub Code: 18EE741**
Max Marks: 40 Date: 02-12-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Derive an expression for over loading factor K while selecting the main rating for intermittent periodic duty. 06 Marks[CO3]

b) Obtain the thermal model of motor for heating & cooling. Also draw the heating & cooling curve. 06 Marks[CO3]

c) The 10 min rating of a motor used in a domestic mixer is 200 watts. The heating time constant is 40 min and the maximum efficiency occurs at full load (continuous). Determine the continuous rating. 08 Marks[CO3]

2 a) Explain the classes of motors duty with load diagram 10 Marks[CO3]

b) Explain the single phase fully controlled rectifier control of separately excited DC motor with continuous conduction. 10 Marks[CO2]

3 a) A 220 volt, 1500 rpm, 10 Amps separately excited DC motor is fed from a single phase fully controlled rectifier with an AC source voltage of 230 V, 50 Hz, Ra = 2 Ω, conduction can be assumed to be continuous. 10 Marks[CO4]
Calculate firing angle for i) Half the rated motor torque & 500 rpm ii) Rated motor torque & -1000 rpm

b) Explain the multi-quadrant operation of separately excited DC motor fed from fully controlled rectifier for the following schemes
i) Single fully controlled rectifier with a reversing switch ii) Dual converter 10 Marks[CO4]

4 a) Explain the chopper control of separately excited DC motor for motor control & Regenerative braking operation. 10 Marks[CO4]

b) A 230 volt, 960 rpm, 200 Amps separately excited DC motor has an armature resistance of0.02 Ω. The motor is fed from a chopper which provides both motoring & braking operation operations. The source has a voltage of 230 Volt assume continuous conduction. (i) Calculate the duty ratio of chopper for motoring operation at rated torque and 350 rpm (ii) Calculate the duty ratio of chopper for braking operation at rated torque and 350 rpm iii) If maximum duty ratio of chopper is limited to 0.95 and maximum permissible motor current is **twice** the rated. Calculate maximum permissible motor speed obtainable without field weakening and power fed to the source

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - II, DECEMBER 2022

Semester : VII **Subject: INDUSTRIAL DRIVES & APPLICATIONS** **Sub Code: 18EE741**
Max Marks: 40 Date: 02-12-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Derive an expression for over loading factor K while selecting the main rating for intermittent periodic duty. 06 Marks[CO3]

b) Obtain the thermal model of motor for heating & cooling. Also draw the heating & cooling curve. 06 Marks[CO3]

c) The 10 min rating of a motor used in a domestic mixer is 200 watts. The heating time constant is 40 min and the maximum efficiency occurs at full load (continuous). Determine the continuous rating. 08 Marks[CO3]

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68.27
123.2

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SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: I DA **Scheme & Solution** **Course Code:** 18EE741

Question Number	Solution	Marks Allocated
1 a)	$\frac{\theta_{ss}}{\theta_{max}} = \frac{1 - e^{-(t_r/\tau_1 + t_s/\tau_2)}}{1 - e^{-t_r/\tau_1}} = \frac{P_{cu}\left(\frac{P_c}{P_{cu}} + K^2\right)}{P_{cu}\left(\frac{P_c}{P_a} + 1\right)}$	2 + 2
	$K = \sqrt{(\alpha+1)\frac{(1 - e^{-(\frac{t_r}{\tau_1} + \frac{t_s}{\tau_2})})}{1 - e^{-t_r/\tau_1}}} - \alpha$	2
b)	 $\theta_2 = \theta_{ss}(1 - e^{-t/\tau}) + \theta_1 e^{-t/\tau}$	(2) + (4)
c)	$K = \sqrt{\frac{1+\alpha}{1 - e^{-t_r/\tau_1}}} - \alpha \quad \alpha = \frac{P_c}{P_a} = \frac{P_{cu}}{P_a} \quad \alpha = 1 \quad K = \sqrt{\frac{1+1}{1 - e^{-10/40}}} - 1$	(4)
	$K = 2.835 \quad P_A = \frac{P}{K} = \frac{200}{2.835} = 70.5291\ W$	(4)
2 a)	Explanation of classes of motor duties	10
b)	Circuit Diagram + Waveform, $v_a = \frac{2V_m}{\pi}\cos\alpha$	2+2+4
	$\omega_m = \frac{2V_m}{K\phi}\cos\alpha - \frac{R_a}{K^2}T$	2
3 a)	i) $v_a = E_1 + I_a R_a \quad E_1 = 200 \quad E_2 = 66.66 \quad v_a = E_2 + \frac{I_a}{2}R_a = 76.66$	
	$\alpha = \cos^{-1}\left(\frac{\pi v_a}{2\sqrt{2}V_m}\right) = 68.37$	
	ii) $E_2 = -133.33 \quad v_a = -113.33 \quad v_a = \frac{2V_m}{\pi}\cos\alpha \quad \alpha = 133.19$	
b)	Explanation i) 1φ Rectifier with reversing switch ii) Dual converter	5+5
4 a)	Motor control Circuit diagram + Regenerative braking operation Explanation Explanation	5+5
b)	i) $E_1 = 226 \quad E_2 = 82.4 \quad v_a = E_2 + I_a R_a = 86.4$	
	$\delta = \frac{v_a}{V} = \frac{86.4}{230} = 0.3756$	
	ii) $v_a = E_2 - I_a R_a = 78.4 \quad \delta = \frac{78.4}{230} = 0.34$	
	iii) $v_a = 218.5 \quad E_2 = 226.5 \quad N_2 = \frac{E_2}{E_1}(N_1) = 962$	
	Power $= v_a I_a = 218.5(400) = 87.4$ kW	

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - III, DECEMBER 2022

Semester : VII **Subject: INDUSTRIAL DRIVES & APPLICATIONS** **Sub Code: 18EE741**
Max Marks: 40 Date: 30-12-2022 Duration: 1½ Hours

NOTE: Answer any two full questions

1 a) What is single phasing? Explain the operation of a 3-phase induction motor with unbalanced voltages. 10 Marks[CO5]
b) Explain any 3 methods of starting of an induction motor 10 Marks[CO5]
2 a) Explain the operation of voltage source inverter fed induction motor drives. 10 Marks[CO5]
b) Explain the starting & pull in process in synchronous motor operation from fixed frequency supply. 10 Marks[CO5]
3 a) Explain the self controlled synchronous motor drive employing load commutated thyristor inverter 12 Marks[CO5]
b) Explain the operation of a synchronous motor shifting from motoring to regenerative braking. 08 Marks[CO5]
4 a) Explain drive requirements for i) Steel rolling mill ii) Cranes & Hoists 06 Marks[CO5]
b) Explain the operation of textiles mills. 07 Marks[CO5]
c) Explain the operation of steel rolling mills. 07 Marks[CO5]

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - III, DECEMBER 2022

Semester : VII **Subject: INDUSTRIAL DRIVES & APPLICATIONS** **Sub Code: 18EE741**
Max Marks: 40 Date: 30-12-2022 Duration: 1½ Hours

NOTE: Answer any two full questions

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b) Explain the operation of textiles mills. 07 Marks[CO5]
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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - III, DECEMBER 2022

Semester : VII **Subject: INDUSTRIAL DRIVES & APPLICATIONS** **Sub Code: 18EE741**
Max Marks: 40 Date: 30-12-2022 Duration: 1½ Hours

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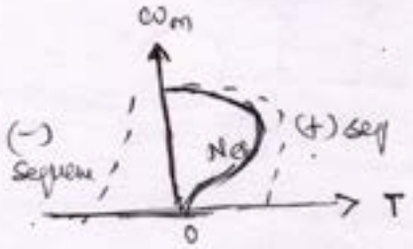
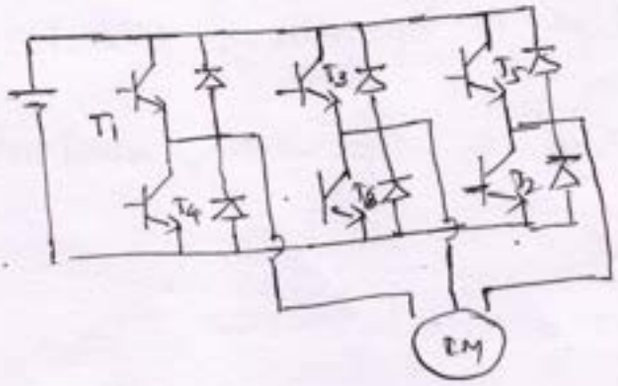
SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: I DA **Scheme & Solution** **Course Code:** 18EE741

Question Number	Solution	Marks Allocated
1 a)	 Any one phase fails in 3-phase supply is called "Single Phasing"	4
	Torque produced due to single-phasing is pulsating in nature. The pulsating torque causes vibrations which reduces the life of motor and produce hum. While the torque is reduced, copper losses & core losses are increased. Thus unbalanced operation substantially reduces the motor torque capability & efficiency	6
	To prevent burning of the motor, it is not allowed to run for a prolonged period. when the unbalance in voltages is more than 5%.	
b)	Explanation of any 3 methods of starting	10
2a)		3
	Explanation	7

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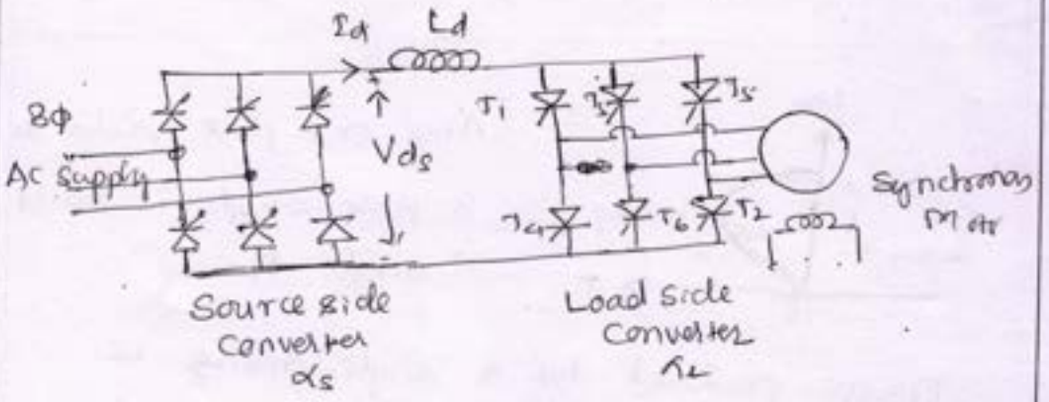
Question Number	Solution	Marks Allocated
2 b)	Explanation about pull-in process	10
3 a)		(4)
	Explanation	8
b)	$I_{sb} = \frac{KE}{\sqrt{R_B^2 + (KX_s)^2}}$ $P_B = \frac{3K^2E^2}{R_B^2 + (KX_s)^2}$	(2)
	$T_B = \frac{P_B}{K\omega_{ms}} = \frac{3R_BKE^2}{\omega_{ms}(R_B^2 + K^2X_s^2)}$	(2)
	Motoring: δ is (+)ve, E lags V Regenerative Braking: δ is (-)ve E leads V	(2)
4 a)	i) Requirements for steel rolling mills	(3)
	ii) Requirements for cranes & Hoists	(3)
b)	Explanation about the operation of textiles mills	(7)
c)	Explanation about the operation of steel rolling mills	(7)

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - II, APRIL 2023

Semester : VIII | **Subject:** Power System Operation & Control | **Sub Code:** 18EE81
Max Marks: 40 | **Date:** 18-04-2023 | **Duration:** 1½ Hours

NOTE: Answer two full questions

1 a) Explain state space model of two area systems. 10 Marks [CO2]
b) Explain the function of important components and their transfer function of automatic voltage regulator of a generator with a neat diagram 10 Marks [CO4]

OR

2 a) Explain the load frequency control with Generation Rate Constraints(GRCs) with a neat diagram. 08 Marks [CO2]
b) Describe the effect of the speed governor dead band on AGC. 06 Marks [CO2]
c) Explain the decentralized control in interconnected power system. 06 Marks [CO2]

3 a) Explain in detail Tie line oscillations with assumptions. 10 Marks [CO2]
b) Two generating areas have capacities of 500MW and 1000MW respectively. They are interconnected by a short line. The percentage speed regulation from no-load to full load of the two stations are 3% and 4% respectively. If the load on each station is 250MW. Find the power generation of each station and tie line power. 10 Marks [CO2]

OR

4 a) Explain the different methods of voltage control by reactive power injection. 10 Marks [CO4]
b) Derive the equations to get the relation between voltage, power & reactive power at a node 10 Marks [CO4]

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - II, APRIL 2023

Semester : VIII | **Subject:** Power System Operation & Control | **Sub Code:** 18EE81
Max Marks: 40 | **Date:** 18-04-2023 | **Duration:** 1½ Hours

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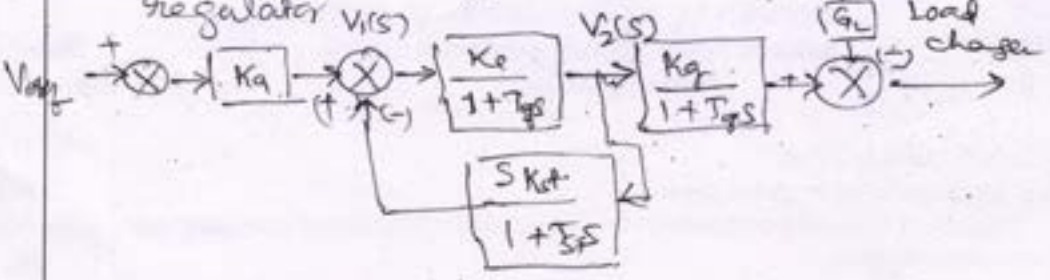
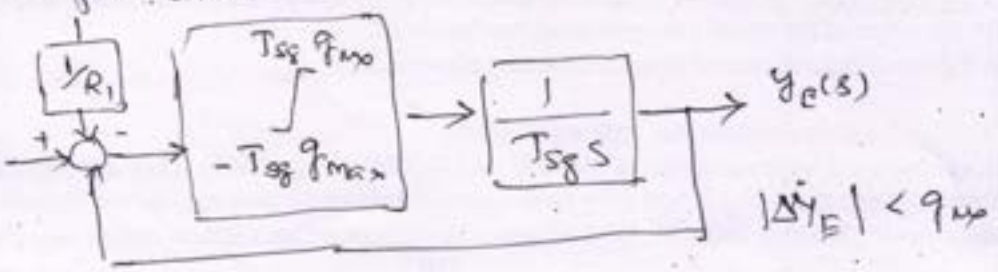
Course Title: PSOC **Scheme & Solution** **Course Code:** 18EE81

Question Number	Solution	Marks Allocated
1 a)	$x_1 = \Delta f_1 \quad u_1 = \Delta P_{G1} \quad w_1 = \Delta P_{d1}$ $x_2 = \Delta P_{G1} \quad u_2 = \Delta P_{C2} \quad w_2 = \Delta P_{d2}$ $\dot{x}_1 = -\frac{1}{T_{PS1}} x_1 + \frac{K_{PS1}}{T_{PS1}} x_2 - \frac{K_{PS1}}{T_{PS1}} x_7 - \frac{K_{PS1}}{T_{PS1}} w_1 \quad -①$ $\dot{x}_2 = -\frac{1}{T_{t1}} x_2 + \frac{1}{T_{t1}} x_3 \quad -②$ $\dot{x}_3 = \frac{-1}{R_1 T_{PS1}} - \frac{1}{T_{PS1}} x_3 + \frac{1}{T_{PS1}} u_1 \quad -③$ $\dot{x}_4 = \frac{-1}{T_{PS2}} x_4 + \frac{K_{PS2}}{T_{PS2}} x_5 + \frac{a_{12} K_{PS2}}{T_{PS2}} x_7 - \frac{K_{PS2}}{T_{PS2}} w_2 \quad -④$ $\dot{x}_5 = \frac{-1}{T_{t2}} x_5 + \frac{1}{T_{t2}} x_6 \quad -⑤$ $\dot{x}_6 = \frac{-1}{R_2 T_{sg2}} x_4 - \frac{1}{T_{sg2}} x_6 + \frac{1}{T_{sg2}} u_2 \quad -⑥$ $\dot{x}_7 = 2\pi T_{12} x_1 - 2\pi T_{12} x_4 \quad -⑦$ $\dot{x}_8 = b_1 x_1 + x_7 \quad -⑧$ $\dot{x}_9 = b_2 x_4 - a_{12} x_7 \quad -⑨$	⑨
	Matrix Form	②
b)	Schematic Diagram of Automatic Voltage regulator 	② ③
	Explanation	⑤
2 a)		⑨
	Explanation about load Frequency control with Generation Rate constraints	⑥
b)	Explanation about Dead-Band & its Effect on ACE	6

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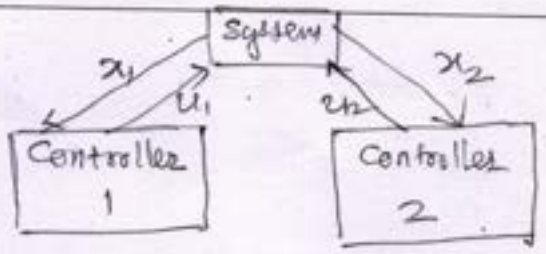
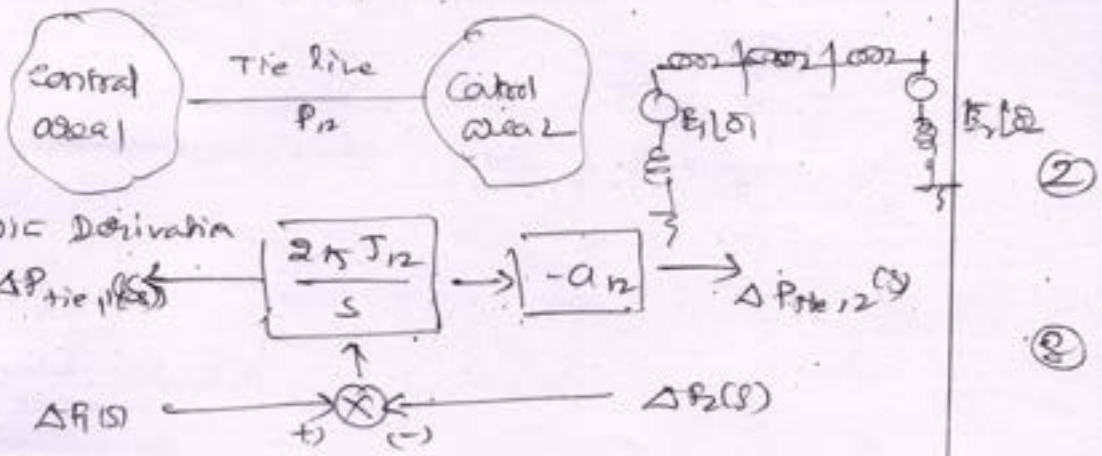
Course Title: **Scheme & Solution** **Course Code:**

Question Number	Solution	Marks Allocated
2 c)	 Decentralised Control Explanation	(2) (4)
3 a)		(2) (2)
b)	$R_1 = 0.03 \times \frac{50}{500} = 0.003$ Hz/MW $R_2 = 0.04\left(\frac{50}{1000}\right) = 0.002$ Hz/MW $P_{G1} + P_{G2} = 500$ MW $P_{G1} = 200$ MW $P_{G2} = 500$ MW	(2) (2) (3+3)
4 a)	i) By using static shunt reactor & capacitor ii) By using static series capacitor iii) By using Synchronous Compensators (Phase Modifier) iv) By series injection v) SVC (static VAR Compensator) Explanation Any two explanation	(2) (4+4)
b)	$\left(\frac{\partial P}{\partial v}\right)\cdot\left(\frac{\partial v}{\partial P}\right) = 1$ and $\left(\frac{\partial Q}{\partial v}\right)\left(\frac{\partial v}{\partial Q}\right) = 1$	(1)

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Question Number	Solution	Marks Allocated
	$dV = \frac{dP}{\left(\frac{\partial P}{\partial V}\right)} + \frac{dQ}{\left(\frac{\partial Q}{\partial V}\right)}$ — (1)	(2)
	$\Delta V = E - V$; $(E-V)V - RP - XQ = 0$ — (2)	
	$\frac{\partial P}{\partial V} = \frac{E-2V}{R}$ — (3) $\frac{\partial Q}{\partial V} = \frac{E-2V}{X}$ — (4)	(2)
	$dV = \frac{dP}{\left(\frac{E-2V}{R}\right)} + \frac{dQ}{\left(\frac{E-2V}{X}\right)} = \frac{dP \cdot R + dQ \cdot X}{E - 2V}$	(2)
	For constant V and ΔV $dQ = \frac{-R}{X} dP$	(2)
	$\therefore \frac{\partial Q}{\partial V} = \frac{E}{X}$	
	The magnitude of $\left(\frac{\partial Q}{\partial V}\right)$ = short circuit current I_{sc} when E = V	(1)

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INTERNAL ASSESSMENT - I, MARCH 2023

Semester : VIII **Subject: POWER SYSTEM PLANNING** **Sub Code: 18EE824**
Max Marks: 40 Date: 20 - 03 -2023 Duration: 1½ Hours
NOTE: Answer two full questions

1 a) Explain in detail the planning process.Explain components of planning.	10 Marks[CO1]
b) write short note on reactive load and peak load fore cast.	10 Marks [CO1]
OR	
2 a) Explain the forecasting technique in detail.	10 Marks[CO1]
b)with help of flow chart explain the least cost utility planning.	10 Marks[CO1]
3 a)Write a note on private participation in power sector.	10 Marks [CO2]
b) Explain Electrical Investment.	10 Marks[CO2]
OR	
4 a)Explain clean concept of clean coal techniques.	10 Marks [CO2]
b)Explain renovations and modrenizationof power plants.	10 Marks [CO2]

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Signature of staff **Signature of HOD** **Signature of principal**

Power System Planning. 18EE824.
Internals I

Scheme and Solution

1) a) Explain in details the planning process explain components of planning.

Ans Planning process →

Basically planning is taking a decision carefully the main input to planning is quality of systematic thought that you into a decision. The systematic decision is normally aided by brainstorming sessions or by appointing a working group. The central electricity authority entrusted with preparing national power plans adopts the latter approach establishing a power industry is a capital intensive and time consuming task. The planning saves project time and assures the resources are used most economically.

Planning is the process of selecting vision, value mission objectives and deciding what should be done to attain them. What diverse planning activities have in common an uncertainty about the future many alternatives action choices and many goals and constraints. The planning can be seen as consisting of three cyclical components. 2 M

a) Learning about the environment the relevant issues and failures features scenario in order to identify.

*) Strategic goals
*) Decision criteria & constraints
*) Technological and opportunities. 4 M

2) Thinking about available strategic options the associated costs and risks and their complecations. This involves.

*) Investment resources
*) Possible unforseen factors.
*) Reliability of outcome. 2M

3) Action that involves choosing preferred plans or strategies on the basic of supporting analyses. The following characteristics make the planning process particularly challenging for power system.

*) The power system is most capital-intensive.
*) Rationalise and experiences developed in advanced countries are difficult to apply for expanding a large system with diverse options.
*) The learning and thinking activities of tend to diverge broadly finally converging.

2M

1)b) Write a short note on reactive load and peak load forecast.

Ans Reactive load forecast. 5M

Reactive loads are difficult to predict than active loads as reactive loads are made up of not only reactive components of loads, but also transmission and distribution networks and VAR devices. In such cases historical data may not work as reactive load changes with change with network configuration during varying operating condition usage of active load forcast with power factor prediction may give somewhat satisfactory result but here too only very recent past data can be used thus assuming steady state network configuration. Forecast of reactive load are adopted with

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current reactive requirements of N/w including VAR devices.

Peak load forecast →. 5M

Peak load forecast determines the load growth rate and the time when a capacity is to be added. With the major categories of energy sales forecast, remote points established, intermediate values fixed and trends determined, the total requirement of energy is obtained by adding certain minor items of consumption such as public lightning, waterworks, sewage pumping, railway traction in generating stations and a reasonable allowance for losses including supply and demand management measures. The total loss and supply / demand side energy saving measures are expressed as percentage of the total energy accounted for after all adjustments have been made. the final estimate of the energy requirements can again be checked for accuracy by a direct projection of the energy requirement which goes back several years.

2)a) Explain the forecasting technique in detail.

Ans Forecasting techniques.

The need to understand the proper use of forecasting techniques has increased as computing capability has moved out of the hands of excipts into those of users in an organisation.

Forecasting continues to gain importance due to the increasing security of electrical energy along with the availability of lower cost and more powerful computing equipment and software. Trends identified nowadays are →.

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a) Industrial or information society
b) National to world economy.
c) Short to long term thinking.
d) Centralization to decentralization
e) Either or to multiple options. 3M

The above trends underline the importance of continuity development. In particular they emphasis the necessity of developing more and more sophisticated methods of dealing with uncertainties of future events.

Time-Series →

Time series analysis is a good technique involving the necessity of using sound judgement along with on analysis of past history.

Typical power system load curves can be represented by the equation,

$$Y = T \times C \times S \times I$$

where, T → long term trend
C → cyclical trend
S → seasonal trend
I → Irregular movement. 3M

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Moving average →

Each point of a moving average of a time series is the arithmatic or weighted average of a number of consecutive points of the series where the number of data points is chosen so that the effects of season or irregularity or both are eliminated.

Trend projections :-

This technique fits a trend line to a mathematical equation and then projects it into the future by means of this equation. There are several variations. The slope characteristics method, polynomials, logarithm and so on. 4M.

Econometric model :-

An econometric model is a system of interdependent regression equations that describe energy sales. The parameters of the regression equation are usually estimated simultaneously.

2)b) With the help of flowchart. Explain the least cost utility planning.

Ans :- Least cost utility planning :- 2M

It is the strategy to provide suitable electrical services at the lowest overall cost with a mix of supply side and demand side resources. The option can be and use energy efficiency load management, transmission and distribution options conventional centralised generation source and decentralized source power generation.

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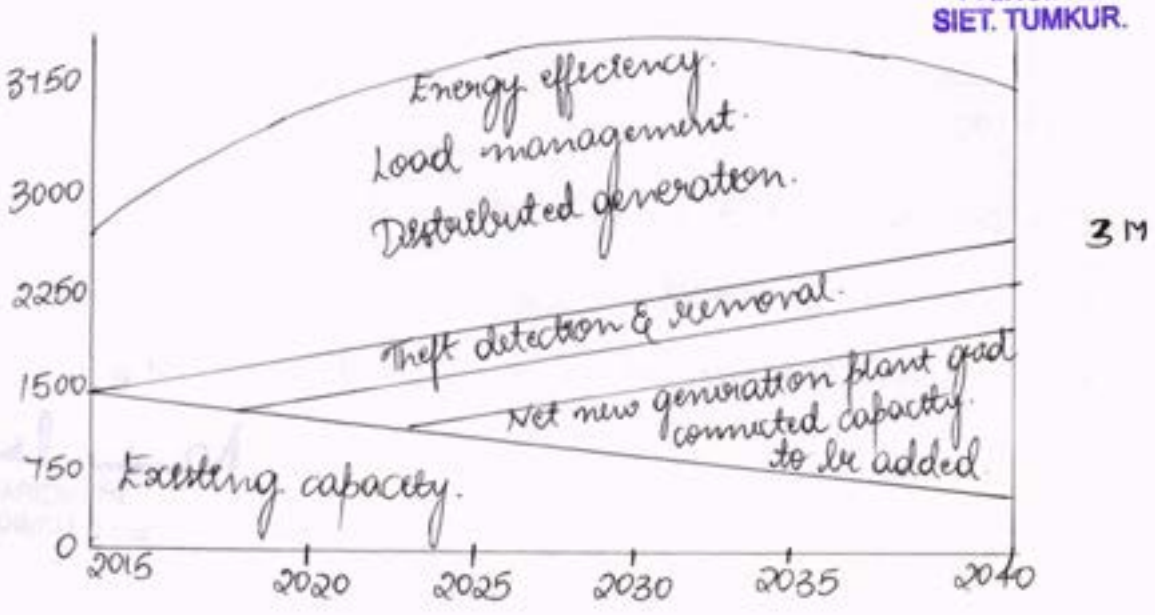
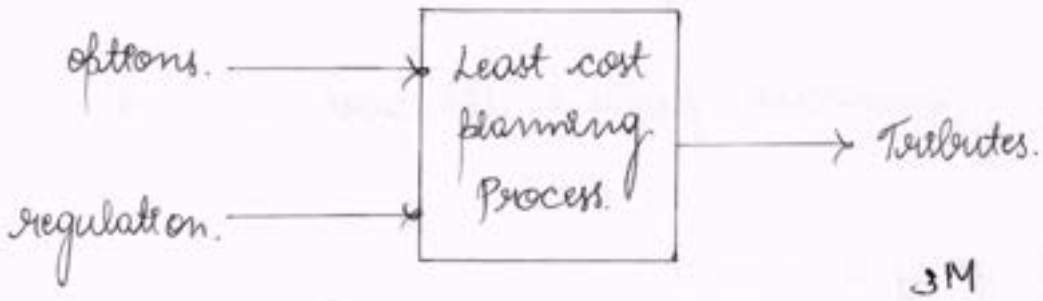


3M

Least cost utility is a planning and a regulatory process can greatly reduce the uncertainties and risks found by utilities. The logic for least cost planning is shown in figure 2 for any investment to be lead cost it is the lifetime costs that are referred to this include capital cost, interest on capital fuel costs operational and maintenance costs. 2M

All three cost should be reconciled at the appropriate discount rate. In case of capital cost will be the cost of equipment purchased operating cost will be the cost of power and frequency.



3M

3)a) Write a note on private participation in power sector.

Ans Financial parameters for investment as notified by the central electricity regulatory commission are capitalisation of interest during construction is at the actual cost for private sector from the existing schedule interest rate applicable to state and central power utilizes. The interest percentage during construction is, $\frac{C \times R \times N}{2 \times 12 \times 100}$.

where, C = cost of project in Rs.

R = rate of interest.

N = Commissioning period in months. 5M

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With different debt-equity ratios & rate of return as indicated above, the private sector cost of energy would go up. The rate of depreciation are notified by the central electricity regulatory commission on real-ste basecs from time to time. The private power generating companies would have to be assured of guarantees by state government or by the central government or by any legal institution or expanded form of an escow account and letter of credit for timely payments of the dues on account of power sale to the various electricity utilizes or timely payment of loan to the lender respectively. Provision of direct supply by private companies of HT consumers or exclusive distribution area may be another option. 5M.

3)b) Explain Electrical Investment. $5 \times 1 = (5\,M)$

Ans Policy goals depend upon investment in particular technolo-gy and policy must be designed with the investment risks just technology costs. The delivery of government policy goals in the electricity sector requires investment in technologies that differ from those that would be delivered by the market forces alone.

Policy goal such as security of supply reducing Co_2 emissions or decreasing price volatility might favour nuclear power coal with CO_2 capture or renewable energy. However in many countries that market will continue to favour gas fired electricity generation.

Policy makers cannot dictate which technologies the electri-city should build. Government can set a framework and provide incentives decisions. Hence the effectiveness of centres in shaping investment determines whether energy policy goals will be met. (5M)

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An important category of revenue risks result from electricity price fluctuations. These risks do not fall equally on all types of power station. For a range of reasons some options have a degree of control over prices and the ability to pass high fuel prices through to their customers.

4)a) Explain concept of clean coal technique. 2M

Ans Clean coal technologies are several generations of technology advances that have led to more efficient combustion of coal with reduced emissions of sulphur dioxide & nitrogen dioxide. The US department of energy administrates the CCT program to encourage and support public / private partnerships to research develop & demonstrate clean coal technologies that ultimately can be brought to large scale commercial deployment. In the first generation of CCT private industry was required to provide half of the funding for each project but historically contributed significally more. Example of technologies that are deployed today and continue to be improved upon include.

Fluidized bed combustion → 3M

Limestone and dolomite are added during the combustion process to sulphur dioxide formation. There are 440 of these units deployed in the U.S and 400 throughout the world.

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Integrated gasification combined cycle (IGCC) :- 2M

Heat and pressure are used to coal into gas or liquid that can be further refined and used cleanly. The heat energy from the gas turbine also powers a steam turbine. IGCC has the potential to improve coal fuel efficiency ratio to 50%.

Washed coal :- 3M

Indian coal contains 30 to 50% ash. At present only 10% 15% coal is used in the country as washed. Washed coal with ash content less than 18% will be supplied in future to the new thermal plant. Coal washing needs to be mandatory. The coal washing process reduces the cost of coal by about 10% as washed coal burns longer & provides more energy.

4)b) Explain renovations & modernization of power plant.

Ans Renovations and modernization of power plant :- 5M

Large equipment in service in power plants age and lead to decline in output and increase in tendency to break down. The magnitude, frequency & durations of outages increase with time, thereby reducing the availability of the plant, progressively, diminishing the average o/p & raising the maintenance and repair cost. Economic appraisal as necessary to compare the costs of rehabilitation or updating with an equivalent capacity of the new plant.

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Government of India has drawn up a very ambitous target of adding 100,000MW during the 12th plan which means adding two third of the existing capacity in just five years. In fact the nation is facing the uphill task of meeting the following national objectives.

5x1 = 5M

*) Availability of power for all by 2012.

*) Per capita consumption to be enhanced from 600 Kwh to 1000 Kwh by 2012.

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INTERNAL ASSESSMENT - II, MARCH 2023

Semester : VIII **Subject: POWER SYSTEM PLANNING** **Sub Code: 18EE824**
Max Marks: 40 Date: 18-04-2023 Duration: 1½ Hours
NOTE: Answer two full questions

1 a)	Explain substation and various busbar scheme.	10 Marks[CO3]
b)	Explain in detail transmission planning criteria.	10 Marks[CO3]
	OR	
2 a)	Explain the planning criteria a for reactive power compensation.	10 Marks[CO3]
b)	Explain Tariff & its types..	10 Marks[CO3]
3 a)	Explain demand response programme.	10 Marks [CO4]
b)	Explain principle of Electric Market.	10 Marks [CO4]
	OR	
4 a)	Explain benefits of deregulation..	10 Marks [CO4]
b)	Explain concept of reliability by suitable model.	10 Marks [CO4]

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Signature of staff G. H Ram **Signature of HOD** **Signature of Principal**

Internals II

1) a) Explain Substation and various bus bar scheme.

Ans Substation :- 5M

General factors to be considered for planning are the following.

1) Historical data of worst floods are taken into account to avoid water logging of the sub stations in case of possibility.
2) Atmospheric conditions like salt and suspended chemical contaminants influence selection of equipment & maintenance authority.
3) Interference with communication signals
4) Electric and magnetic field strength are of particular concern especially for ultra high voltage (UHV) system at 765 KV, 1200 KV or above.
5) To comply for approval of forest and wildlife sanctuary the usual process takes time to get approval from concerned authorities.

Substation Bus-bars scheme :-

1) Single bus system :- 5M

It is the cheapest arrangement and is used for small sub-stations where power outage for short period for maintenance and repairs is permissible.

2) Duplicate Bus System :-

This arrangement is commonly used in large system with many feders. There is a coupling switch for the circuit breaker b/w the two bus bar. Isolate and circuit breakers are

connected so as to have power flow without interruption.

3) Transfer Bus Arrangement.

With this arrangement, one circuit breaker can be taken out for maintenance and repairs without interruption of supply.

4) Breaker and a half system.

The arrangement is suitable for system where power outage is not permissible for any reason whatsoever. The supply has to be kept uninterrupted even in case of bus fault and the bus can be taken out for maintenance.

1)b) Explain in detail transmission planning criteria.

Ans Transmission planning criteria :- 2M

*) In the national approach N-2 criteria may be adopted for a large generating complex and multi line corridors on case to case basis, whereas regional planning may be contained with N-1 criteria However while N-1 would be applied to test withstand without necessitating load shedding or rescheduling of generation during steady state operation, N-2 would be applied to test with stand without necessitating load shedding but with rescheduling of generation during steady state operation.

*) The adequacy of the transmission system should be tested for different load generation scenario corresponding to one or more of the following so as to test the scenario of maximum burden on the transmission system.

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a) Summer peak load
b) Summer off peak load
c) Winter peak load
d) Winter off peak load
e) Monsoon peak load
f) Monsoon off peak load.

(2M)

Despatch scenario for maximising transfer in specific inter regional corridors should be considered to determine the adequancy of a transmission system to take care of the requirement of regional diversity inter-regional export / import.

a) Withstand without necessitating load shedding or rescheduling of generation during steady state operation. (6M)
1) outage of 132KV D/C line
2) outage of 220KV DC line
3) outage of 400KV S/C line
4) outage of 400KV S/C line with series compensation or
5) outage of single interconnecting transformer.

b) Withstand without necessating load shedding but with rescheduling of generation during steady state operation.
1) outage of a 400KV S/C line with TCSC
2) outage of a 400KV D/C line or
3) outage of a 765KV S/C line with series compensation.
4) outage of a both poles of HVDC line.

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2) a) Explain the planning criteria a for reactive power compensation.

Ans Planning criteria for reactive power compensation may be adopted as follows →

1) Reactive power should not be transported over long distances.
2) In normal intact network situations reactive power should be produced & consumed locally.
3) The network should be operated at upper voltage limit in high load conditions to achieve higher stability margins and to reduce active reactive power transmission losses.
4) The amount of reactive power reserves should be sufficient to ensure acceptable transmission capacities in the NW during system disturbance conditions.

There are two important aspects which distinguish reactive power planning from the planning of active power →.

1) Transmission of reactive power over long distance will have both active & reactive-power losses and voltage drop compensation to maintain be provided in the vicinity.
2) Investment cost related to reactive power reaches only a few percent of corresponding value for active power transmission equipment. The reactive planning procedure cannot be performed as a total optimisation.

Reactive-power sources →

Reactive power is generated or absorbed by all major component of a power system like →.

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a) Generators

b) Transformers, HVDC converters

c) Loads

d) Reactive power compensating device such as capacitors etc.

2)b) Explain biomass gasification with a neat figure.

Ans

This is basically conversion of solid biomass into combustionable gas mixture normally called producer gas involving partial combustion of such biomass. The partial combustion process occurs when air supply is less than adequate for combustion of biomass to be completed given that biomass contains, carbon, hydrogen and oxygen molecules. complete combustion would produce CO_2 and H_2O partial combustion produces CO as well as H_2 both combustible gases. Conversion of the

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same biomass to a combustible gas mixture like producer gas ~~which is the most of~~ involving partial combustion of such biomass. The partial combustion process occurs when air supply is less than adequate for combustion of biomass to be completed. Given that biomass contains carbon, hydrogen and oxygen molecules complete combustion would produce CO_2 and H_2O partial combustion produces CO as well as H_2 both combustible gases. Conversion of the same biomass to a combustible gas mixture like producer gas removes the most of these problems with the use of solid biomass fuels.

3) a) Explain demand response programme.

Ans Demand response programme. 5x2 = 10

a) Advanced Meter Infrastructure (AMI).

This provide significant platforms for engaging consumer response to extra ordinary demand response events. A building energy management system on potentially enable DR applications for residential consumers.

b) Peak - Hour restriction.

Consumers receive a discounted rate for agreeing to reduce load on request during peak hours.

c) Interruptible | certailable (I|C) loads.

Certailment options integrated into retail tariffs provide a rate discount or bill credit for agreeing to reduce load.

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d) Off day restrictions.

Consumers receive incentive payments for one day off in a staggered manner to industrial, consumer load reductions.

e) Buy back programmes.

Consumer offer bid to curtail load when wholesale market prices are high.

f) Power Market Ancillary services.

To support operation of the electric power grids auxillary services large consumers receive payments from a system.

g) Time of use (TOU) pricing.

These are rates with fixed price blocks that differ by time of day.

3) b) Explain principle of Electric Market. 10 x 1 = 10M

Ans The principles for the electricity market are the following :-

1) The marketic mission is growth.
2) Electricity by its nature difficult to store & has to be available on demand.
3) Electricity is a commodity with a highly seasonal, inelastic demand this combined with weather dependent generation and demand is to short-time price volatility.
4) Electricity markets provide generator with incentives to reduce costs and increase productivity and thereby induce expectations of lower electricity prices to consumers.
5) Electricity does not behave like a normal commodity if the price of red apples is high you buy green apple but what do you do about electricity.
6) Electricity flows from the power plant to the consumers at 200,000 km/sec. Some power plant must constantly change their output.

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7) The power market operates on the bases of long term short term days-ahead or commitments.

8) The most fundamental difference is that electrical energy is in linked with a physical power system that function much faster than any manual.

9) The main feature of price formation in wholesale spot markets is the instantaneous nature of electricity the physical laws that determine the power delivery across and grid requires synchronized energy.

10) Markets encourage investment signals to investors in generation and transmissions.

4) a) Explain benefits of deregulation. 5 X 2 = 10M

Ans The competitive environment offers a good range of benefits for the customers as well as private entities. It is claimed that some of the significant benefits of power industry deregulation would include.

1) Electricity price will go down it is a common understanding that the competitive prices are lower than the monopost prices.

2) Choice of customer. The customer will have choice for its retailer. The retailer will compete not only on the price offered but also on the other facilities.

3) Customer centric service, the retailer provided to the customer these could include better plans better reliability better quality etc.

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4) Innovation, the regulatory process and lack of competition give electric utilities no incintive to improve or to take risks on new ideas that might increases the customer value.

4)b) Explain concept of reliability by suitable model.

Ans Reliability Model → 5×2 = 10M

A power grid is planned and operated in a coordinate manner to perform reliably under normal and abnormal conditions as per the grid code.

1) For reliable power system operation the three monitoring system are necessary.

2) Personnel responsibilities for planning & operating interconnected built bulk power system are trained qualified & have responsibility and authority to implement action in the form of an independent body.

3) Cost effective demand response resources have the potential to enhance electric system reliability while also increasing the system ability to absorb intermittent renewable resources.

4) Energy efficiency in addition to energy savings can reduce peak demand & differ the need for new investments.

5) The energy system will be more reliable and resilient because energy storage, distributed and modular renewable systems are less prone to large scale failures.

6) The probability of consumers being disconnected however can be reduced by increased investment on a power system by providing high quality equipment and better maintenance.

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and reliability constraints are conflicting in nature.

7) The reliability of supply to consumers is judged from the frequency of interruptions, the duration of each interruption and the value a consumer places on the supply of electricity at the time that service is not provided.

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - III, MARCH 2023

Semester : VIII **Subject: POWER SYSTEM PLANNING** **Sub Code: 18EE824**
Max Marks: 40 Date: 12/5/2023 Duration: 1½ Hours
NOTE: Answer two full questions

1 a)	Write a short note on a) Smart Power Plant b) Power Pool	10 Marks[CO4]
	b) With a relevant block diagram explain the importance of energy efficiency.	10 Marks[CO4]
	OR	
2 a)	Name different types of Power Market.	10 Marks[CO4]
	b) What are the principles for the electricity market.	10 Marks[CO4]
3 a)	What is Demand response? Explain demand response planning with block diagram.	10 Marks[CO5]
	b) With block diagram explain energy efficiency programme.	10 Marks[CO5]
	OR	
4 a)	What is differential electricity? Expalin the in detail. Of procedure of differential.	10 Marks[CO5]
	b) Write a short note on energy.	10 Marks[CO5]

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Signature of staff **Signature of HOD** **Signature of Principal**

Internals [II]

1) a) Write a short note on a) Smart Power Plant.
b) Power Pod.

Ans → Smart Power Market →

3 X 2M = 5M

* Increasing power market effecency requires new set up of tools and processes to fully enable consumers dynamic participation with the shift toward competitive electrecity markets integrating renewable power and demand response has become an important tool to be used by various utilities and system operators to enhance grid reliability and increase consumers values.

* The evolution of the same grid will be particularly relevance in the development of destributed generation end use effecency & load management including demand response. The enrolment of a consumer has been limited to open premise for the installation of the smart meter.

* A possible further development is that a destributor agrees with the local power utility company about the ability to disconnect or connect some demand on request during a certain period of time. The aim of electrecity market reforms is to meet the significant long term challenge.

b) Power Pool :- 3x2M=5M

* The indian power market is a power pool model. The power pool model different generation selling to a pool and destributions. Power exchange traders and large consumers buying from it. The pools are designed to maximize competition in generation compete on price, not cost and remain open to all markets participants. Pool deal in spot and real time trading. The pool operation also transacts bilateral contracts. A no of power exchanges in the country mean a no of power pool.

* An electricity pool is not a physical location rather it is a set of rules and procedures managed by under mandatory trading arrangement, bidding & settlement procedure. It is not possible to distinguish which generator produces the electricity consumed by a particular consumer.

* Hence it is the concept of a central pool of generation to supply total consumer demand. Typically pool rules require generating and supply companies to submit day ahead bid packages and demand reservation for each half hour period during the next day or 7 days.

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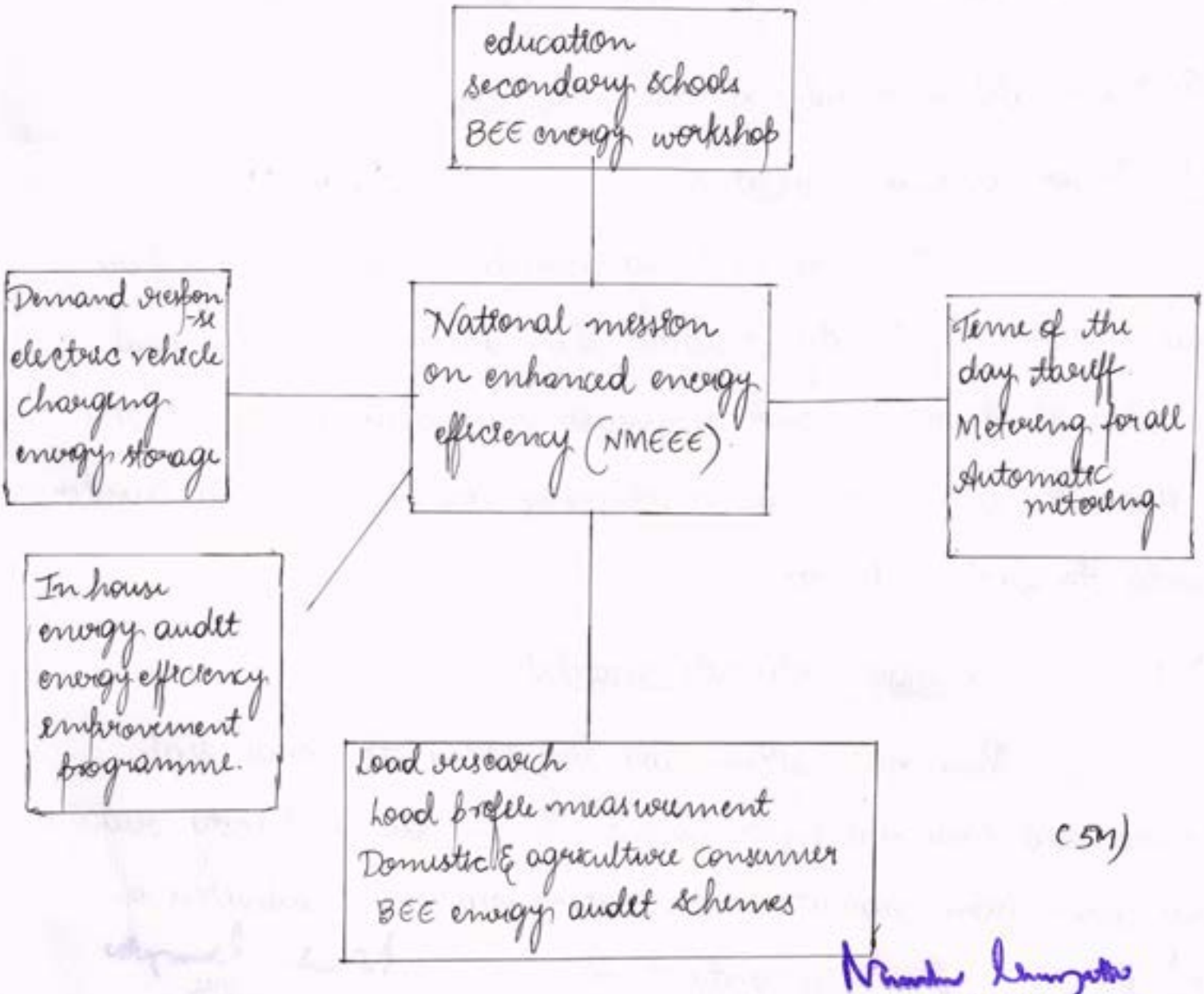
2)b) With a relvant block diagram. Explain the importance of energy efficiency.

Ans Energy efficiency :-

Energy efficiency programme should be considered as one considered as one of the resources during the planning stage. Energy efficiency is the least expensive course of action as the power industry can take given the current economic & environment situation energy efficiency savings made are equal to a capacity of 1.3 times Kwh of the generation plants. 2M



(5M)

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The ISO 50001 International Standard for energy management enable power utilities to establish the system and processes necessary to improve energy performance including energy efficiency use and consumption. Implementation of this std is intended to lead to reduction in green house gas emissions, energy cost and other related environmental impacts through systematic management of energy.

This international standard is based on the plan-do-check act continual improvement framework and incorporates energy management into everyday organisational practices. (3M)

2) a) Name different types of Power market.

Ans Power exchange market :- 5 x 1M = 5M

The power exchange market is a market where buyers, sellers electricity traders, open-access consumers and members of power exchange transact on standardised contracts

Here the power exchange or clearing corporation is a counter party to such contracts.

b) Renewable energy certificate market :-

Renewable system are less prone to large scale failure and save the environment. The central electricity regulat-ory commission regulation 2010 introduced the modalities of REC in the Indian electricity sector.

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c) Retail Market :-

A retail electricity market exists when end use consumers can choose their supplier from competing electricity retailer A separate issue for electricity market is whether or not consumers face real time pricing or a price that is set in some other way.

d) Real time market :-

A real time market is the ultimate nature where the price represents the system's capability to balance generation and consumption in real time.

e) Generation Capacity market :-

The capacity market are contacts designed to ensure sufficient reliable capacity is available to ensure reliability and security of electricity supply in times of system stress.

2)b) What are the principles for the electricity market.? 5x2M=10M

Ans The principle for the electricity market are the following :-

a) The marketic mission is growth.

b) Electricity by its nature, difficult to store and has to be available on demand.

c) Electricity is a commodity with a highly seasonal, inelastic demand. This combined with weather dependent generation & demand is prone to short time price volatility

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d) Electricity market provide generators with incentives to reduce costs and increase productivity and thereby induce expectations of lower electricity prices to consumers.

e) Electricity does not behave like a normal commodity. If the price of red apples is high, you buy green apples but what do you do about electricity? You cannot live in society without it. It is essential to everyone's daily life.

f) The power market operates on the basis of long term short term day ahead or intra day commitments.

g) The most fundamental difference is that electrical energy is inextricably linked with a physical power system that function much faster than any market.

h) Market encourage investment signals to investors in generation and transmission

3) a) What is demand response? Explain demand response planning with block diagram.

Ans Demand response Market :- 2 M.

Demand response is the consumers ability to reduce electricity consumption at their location when wholesale prices are high or the reliability of the electric grid is threatened.

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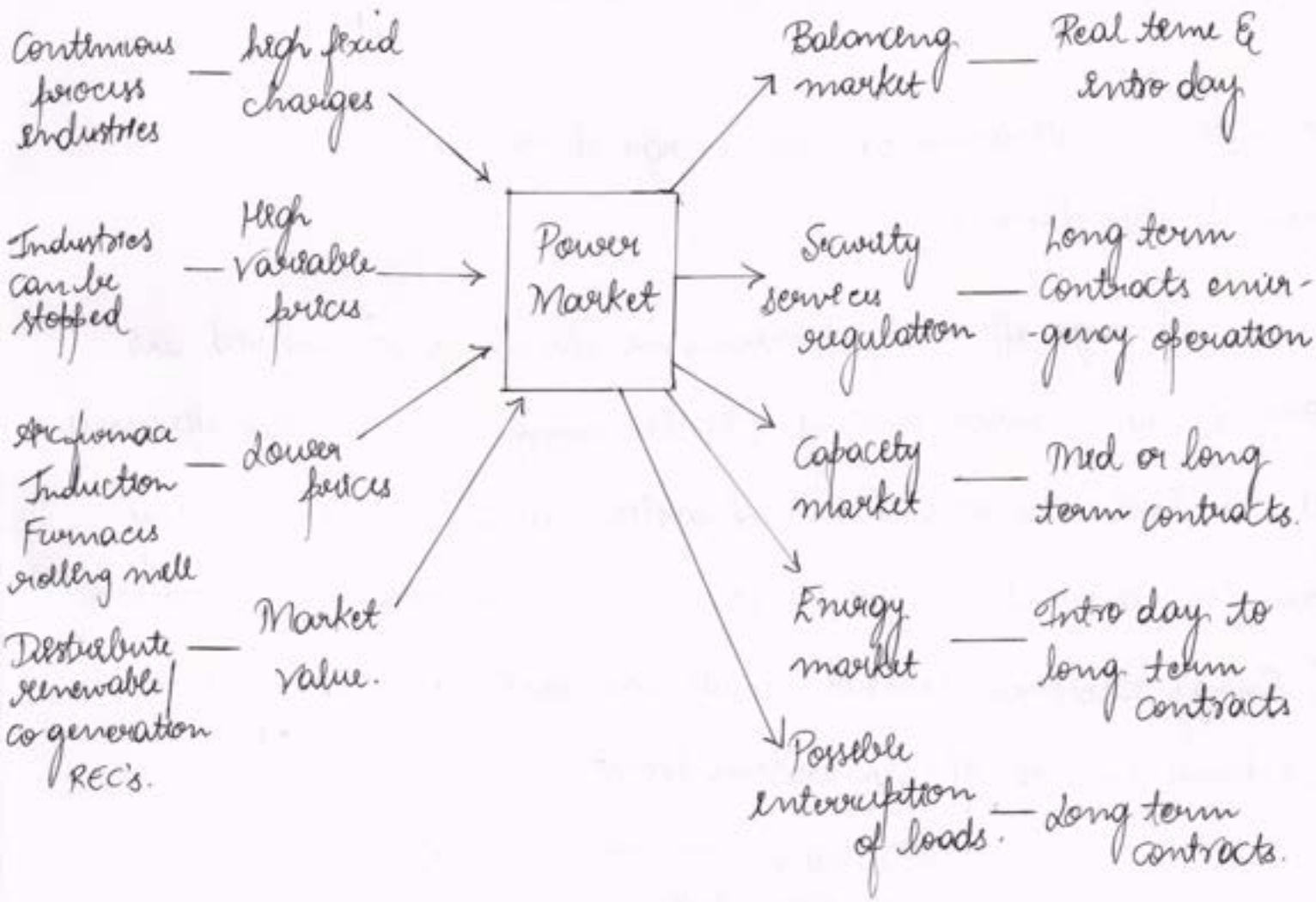
Demand response is important because it is another competetive resources that can be used to maintain demand & supply in balance for good operations & the associated wholesale markets.

(SM)



At present power supply continue to be less in elastic given the general shortage of generation capacity. The soln is large investments in the power sector to make the power market more efficient and to make the demand responsive as demand has elasticity. Historically the balancing of electricity supply and to.

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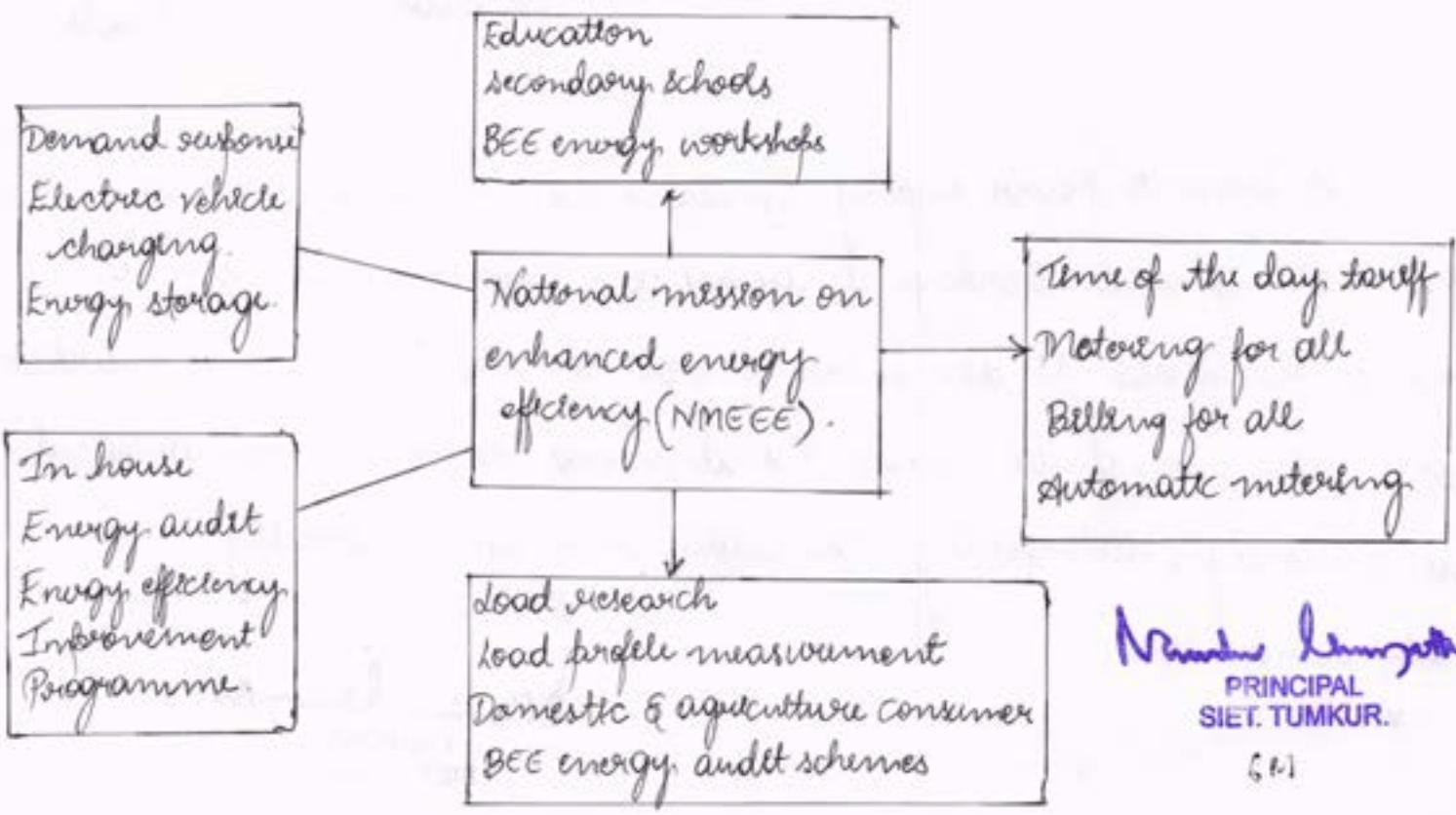
Demand response was oregenally developed by electric vehicles utilities In order to increase flexibility on the demand side by temporarily shifting or reducing peak energy demand thereby avoiding costly energy procurements & capacity investments for small no of hours of need. 3M.

3)b) With block diagram explain energy efficiency?

Ans Energy efficiency →

Energy efficiency programme should be considered as one of the resource during the planning stage. Energy efficiency is the least expensive course of action as the power industry can take given the current economic & environment situation.

Energy efficiency savings made are equal to a capacity of 1.3 times Kwh of the generation plant. 2M



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5M

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This international std is based on the plan do-check act contenual improvement framework and incorporates energy management into every day organisational practices. 2M.

2 x 5M = 10M

4)a) What is differential electricity? Explain.

Ans Consumers cannot detect the specific source of the electricity that is powering their homes because of the way electricity is pooled by the national grids so traders and suppliers have found it difficult to differentiate their products.

Some consumers would be prepared to pay more for electricity from a specific, sustainable source & generators and suppliers could benefit from such demands. Thus an electricity trading company or supplier might be able to offer its consumers electricity generated exclusively from wind farms because that is what it has contracted for on its bilateral contract with a windfarm generator. The consumer do not need to detect this

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at home they simply need a system they can trust. This would work so long as particular wind power generator is paid only for exactly the energy at generator and its wind power are charged for the same amount.

4)b) Write a short note on energy audit. 2×5M = 10M

Ans * An energy audit identifies where the potential for improvement lies. Energy audit are now mandatory as per energy conservation ACT 2001 for the designated consumer as identified by the Bureau of energy efficiency. India's energy intensity per unit of GDP is higher compared to Japan, USA & asia as a whole by 3.7 1.6 & 1.5 times respectively.

* The Industrial sector in India is a major energy user accounting for about 40% of the total consumption. There are wide variations in energy consumptions among different units within the same industry using comparable technology. The energy saving potential in this sector may be as high as 25% making this sector have maximum potential in the economy.

* An energy audit should ensure that every unit of energy and power gives the maximum in terms of production just as a financial audit ensures badly that every paisa goes the farthest.

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INTERNAL ASSESMENT TEST: I **DATE: 09/12/22**

COURSE: Computer Organization and Architecture (21CS34) **MAX MARKS: 40**

SEM: III A & B **TIME:90 min**

NOTE: Answer the TWO full questions

1) a. With a neat diagram. Analyze the basic operational concepts of a computer. Give the operating steps. **6M-CO1**

   b. Explain the following:
   (i)Byte addressability (ii) Big-endian assignment (iii) little-endian assignment. **6M-CO1**

   c. What is an addressing mode? Explain any four types addressing modes with example. **8M-CO1**

or

2) a. Explain Instruction Execution and Straight-Line sequencing, with diagram. **7M-CO1**

   b. Show how the below expression will be executed in one address, two address and three address Processors in an accumulator organization. X=A*B+C*D. **7M-CO1**

   c. What is performance measurement? Explain the overall SPEC rating for the computer in a program suite **6M-CO1**

3) a. With a neat diagram. Explain the basic input output Operations? **7M-CO2**

   b. Explain how the I/O devices should be organized in a priority structure **7M-CO2**

   c. Write the Scenario when the interrupt are enabled. **6M-CO2**

or

4) a. Draw single bus structure, Discuss about memory mapped I/O. **6M-CO2**

   b. Illustrate a program that reads one line from the keyboard, stores it in memory buffer, and echoes it back to the display in an I/O Interfaces **8M-CO2**

   c. Demonstrate the DMA and its implementation and show how the data is transferred between memory and I/O devices using DMA Controller. **6M-CO2**

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Name of the Staff: Prof. Chethan M S

Signature:.....

HOD Signature.....

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INTERNAL ASSESMENT TEST: I — Scheme and Solution

COURSE: Computer Organization Architecture (21CS34)

1a) Diagram- 2M
Operating Steps -4M

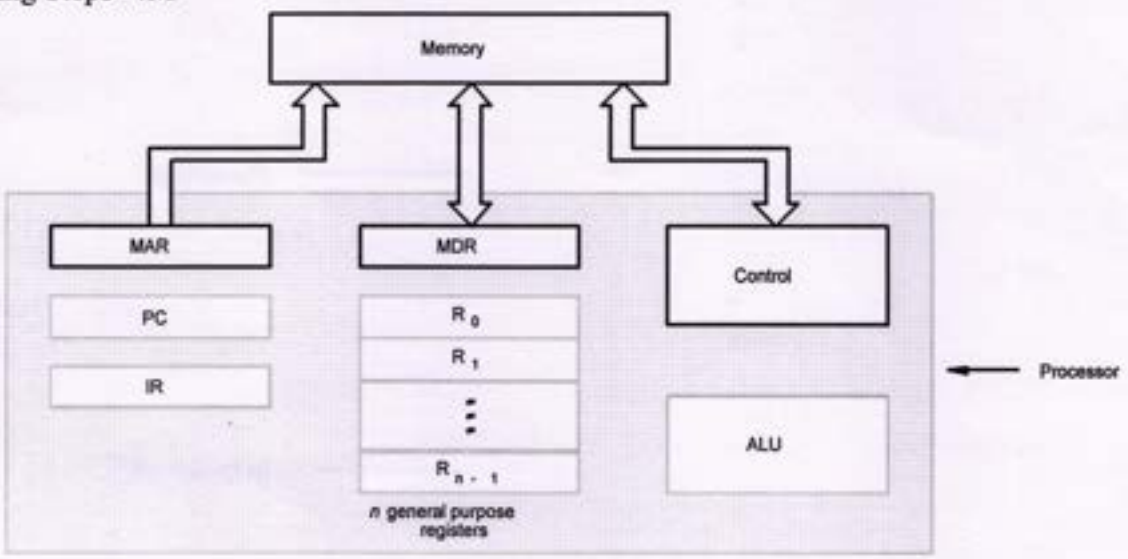

Figure 1.2. Connections between the processor and the memory.

MAIN PARTS OF PROCESSOR

- The **processor** contains ALU, control-circuitry and many registers.
- The processor contains „n" general-purpose registers **R0** through **Rn-1**.
- The **IR** holds the instruction that is currently being executed.
- The **control-unit** generates the timing-signals that determine when a given action is to take place.
- The **PC** contains the memory-address of the next-instruction to be fetched & executed.
  During the execution of an instruction, the contents of PC are updated to point to next instruction.
- The **MAR** holds the address of the memory-location to be accessed.
- The **MDR** contains the data to be written into or read out of the addressed location.
- MAR and MDR facilitates the communication with memory.

(IR □ Instruction-Register, PC □ Program Counter)
(MAR □ Memory Address Register, MDR□ Memory Data Register)

STEPS TO EXECUTE AN INSTRUCTION

1) The address of first instruction (to be executed) gets loaded into PC.
2) The contents of PC (i.e. address) are transferred to the MAR & control-unit issues Read signal to memory.
3) After certain amount of elapsed time, the first instruction is read out of memory and placed into MDR.
4) Next, the contents of MDR are transferred to IR. At this point, the instruction can be decoded &executed.
5) To fetch an operand, it's address is placed into MAR & control-unit issues Read signal. As a result, the operand is transferred from memory into MDR, and then it is transferred from MDR to ALU.
6) Likewise required number of operands is fetched into processor.
7) Finally, ALU performs the desired operation.
8) If the result of this operation is to be stored in the memory, then the result is sent to the MDR.
9) The address of the location where the result is to be stored is sent to the MAR and a Write cycle is initiated.
10) At some point during execution, contents of PC are incremented to point to next instruction in the

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program.

1b) Byte addressability- 2M
Big-endian assignment-2M
Little-endian assignment-2M

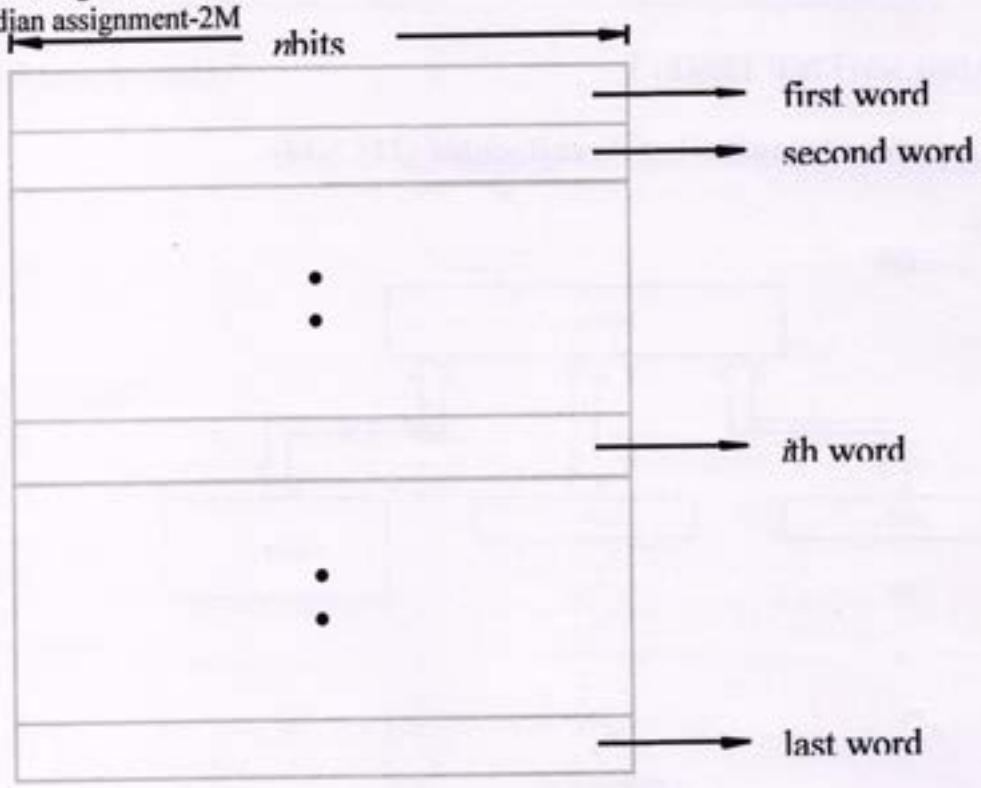
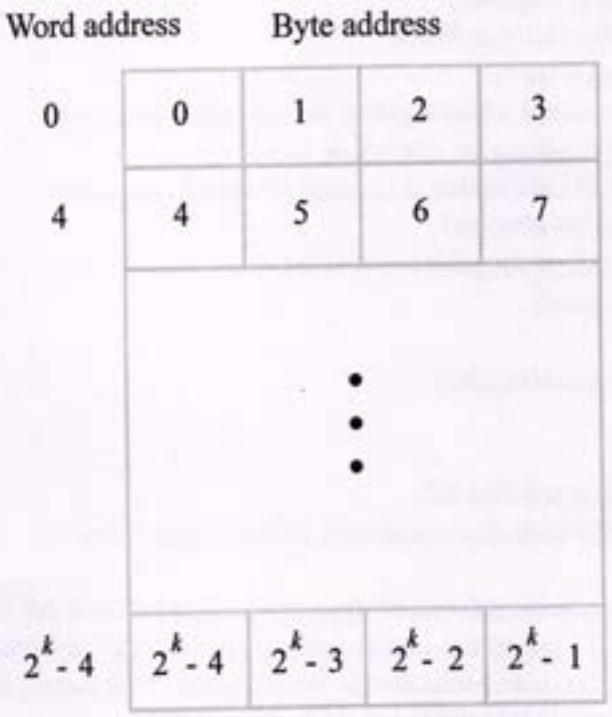
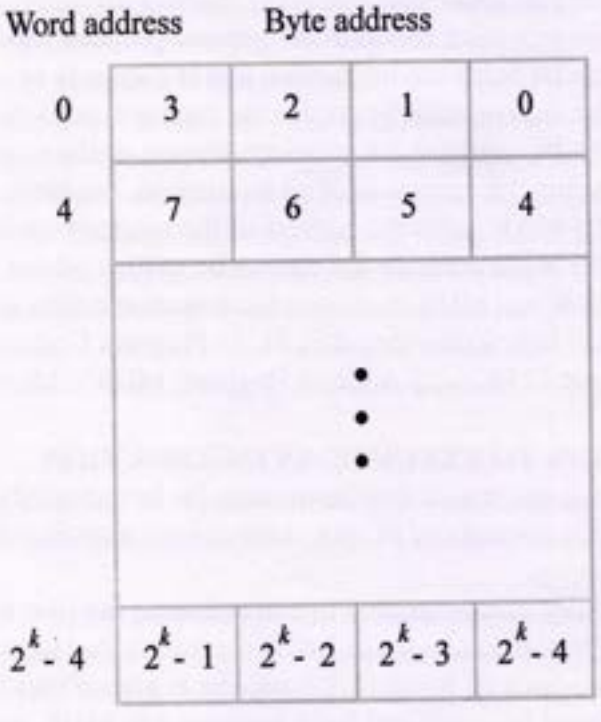


Figure 2.5.Memory words.

- In byte-addressable memory, successive addresses refer to successive byte locations in the memory.
- Byte locations have addresses 0, 1, 2. . . . .
- If the word-length is 32 bits, successive words are located at addresses 0, 4, 8. . with each word having 4 bytes.



(a) Big-endian assignment



(b) Little-endian assignment

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1) Big-Endian: Lower byte-addresses are used for the more significant bytes of the word.
2) Little-Endian: Lower byte-addresses are used for the less significant bytes of the word
• In both cases, byte-addresses 0, 4, 8. . . . . are taken as the addresses of successive words in thememory.

1c) Definition of addressing mode-3M
4 addressing modes and Example-5M

The **addressing mode** is the method to specify the operand of an instruction. The job of a microprocessor is to execute a set of instructions stored in memory to perform a specific task.
Operations require the following:

1. The operator or opcode which determines what will be done
2. The operands which define the data to be used in the operation

Types of Addressing Modes

Register Mode
• The operand is the contents of a register.
• The name (or address) of the register is given in the instruction.
• Registers are used as temporary storage locations where the data in a register are accessed.
• For example, the instruction
Move R1, R2 ;Copy content of register R1 into register R2.

Absolute (Direct) Mode
• The operand is in a memory-location.
• The address of memory-location is given explicitly in the instruction.
• The absolute mode can represent global variables in the program.
• For example, the instruction
Move LOC, R2 ;Copy content of memory-location LOC into register R2.

Immediate Mode
• The operand is given explicitly in the instruction.
• For example, the instruction
Move #200, R0 ;Place the value 200 in register R0.

• Clearly, the immediate mode is only used to specify the value of a source-operand.

Relative Mode:
• This is similar to index-mode with one difference:
The effective-address is determined using the PC in place of the general purpose register Ri.
• The operation is indicated as X(PC).
• X(PC) denotes an effective-address of the operand which is X locations above or below the current contents of PC.
• Since the addressed-location is identified "relative" to the PC, the name Relative mode is associated with this type of addressing.
• This mode is used commonly in conditional branch instructions.
• An instruction such as

Branch > 0 LOOP ;Causes program execution to go to the branch target location

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2a) Diagram-2M
Program Explanation- 5M

- The program is executed as follows:
  1) Initially, the address of the first instruction is loaded into PC (Figure 2.8).
  2) Then, the processor control circuits use the information in the PC to fetch and execute instructions, one at a time, in the order of increasing addresses. This is called *Straight-Line sequencing*.
  3) During the execution of each instruction, PC is incremented by 4 to point to next instruction.
- There are 2 phases for Instruction Execution:
  1) Fetch Phase: The instruction is fetched from the memory-location and placed in the IR.

Execute Phase: The contents of IR is examined to determine which operation is to be performed. The specified-operation is then performed by the processor

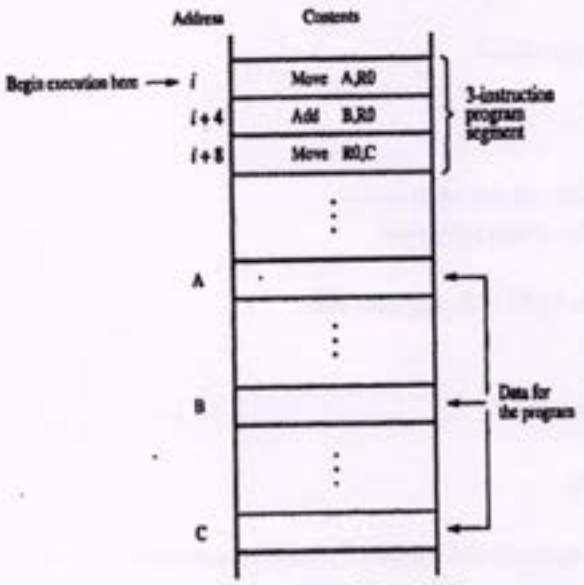

Figure 2.8 A program for C ← [A] + [B].

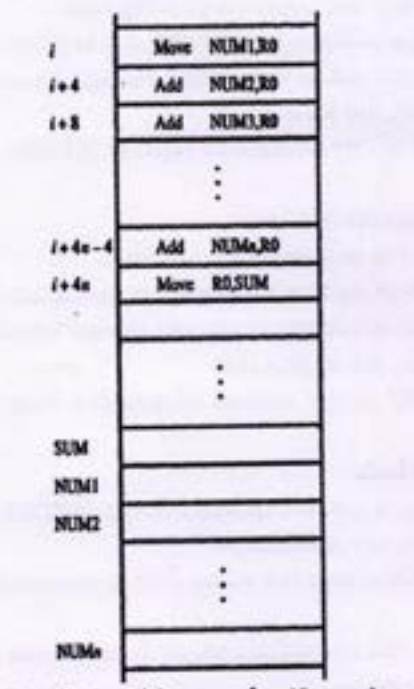

Figure 2.9 A straight-line program for adding n numbers.

2b) Instructions . X=A*B+C*D. –7M

2c) Diagram—2M
Explanation----5M

- Benchmark refers to standard task used to measure how well a processor operates.
- The Performance Measure is the time taken by a computer to execute a given benchmark.
- SPEC selects & publishes the standard programs along with their test results for different applicationdomains. (SPEC □ System Performance Evaluation Corporation).
- SPEC Rating is given by
- SPEC rating = 50 □ The computer under test is 50 times as fast as reference-computer.
- The test is repeated for all the programs in the SPEC suite.Then, the geometric mean of the results is computed.
- Let SPECi = Rating for program „i' in the suite.
  Overall SPEC rating for the computer is given by
  where n = no. of programs in the suite

3a) Diagram- 2M
Explanations- 5M

- Consider the problem of moving a character-code from the keyboard to the processor
- For this transfer, buffer-register DATAIN & a status control flags(SIN) are used.
- When a key is pressed, the corresponding ASCII code is stored in a **DATAIN** register associated withthe keyboard.
  - **SIN=1** □ When a character is typed in the keyboard. This informs the processor that a validcharacter is in DATAIN.
  - **SIN=0** □ When the character is transferred to the processor.
- An analogous process takes place when characters are transferred from the processor to the display.For this transfer, buffer-register DATAOUT & a status control flag SOUT are used.
  - **SOUT=1** □ When the display is ready to receive a character.
  - **SOUT=0** □ When the character is being transferred to DATAOUT.
- The buffer registers DATAIN and DATAOUT and the status flags SIN and SOUT are part of circuitrycommonly known as a **device interface.**

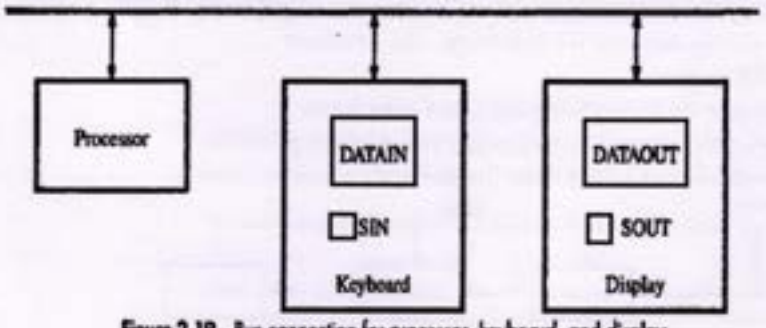

Figure 2.19 Bus connection for processor, keyboard, and display.

Program to read a line of characters and display it			
	Move	#LOC,R0	Initialize pointer register R0 to point to the address of the first location in memory where the characters are to be stored.
READ	TestBit	#3,INSTATUS	Wait for a character to be entered
	Branch=0	READ	in the keyboard buffer DATAIN.
	MoveByte	DATAIN,(R0)	Transfer the character from DATAIN into the memory (this clears SIN to 0).
ECHO	TestBit	#3,OUTSTATUS	Wait for the display to become ready.
	Branch=0	ECHO	
	MoveByte	(R0),DATAOUT	Move the character just read to the display buffer register (this clears SOUT to 0).
	Compare	#CR,(R0)+	Check if the character just read is CR (carriage return). If it is not CR, then
	Branch≠0	READ	branch back and read another character.

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3b) Priority Struture—2M
Explanations'- 5M

This problem can be overcome by using interrupt initiated I/O. In this when the interface determines that the peripheral is ready for data transfer, it generates an interrupt. After receiving the interrupt signal, the CPU stops the task which it is processing and service the I/O transfer and then returns back to its previous processing task.

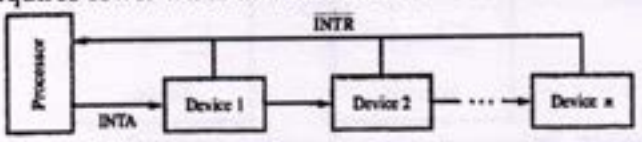
VECTORED INTERRUPTS

- A device requesting an interrupt identifies itself by sending a special-code to processor over bus.
- Then, the processor starts executing the ISR.
- The special-code indicates starting-address of ISR.
- The special-code length ranges from 4 to 8 bits.
- The location pointed to by the interrupting-device is used to store the staring address to ISR.
- The staring address to ISR is called the **interrupt vector**.
- Processor
  - → loads interrupt-vector into PC &
  - → executes appropriate ISR.
- When processor is ready to receive interrupt-vector code, it activates INTA line.
- Then, I/O-device responds by sending its interrupt-vector code & turning off the INTR signal.
- The interrupt vector also includes a new value for the Processor Status Register.

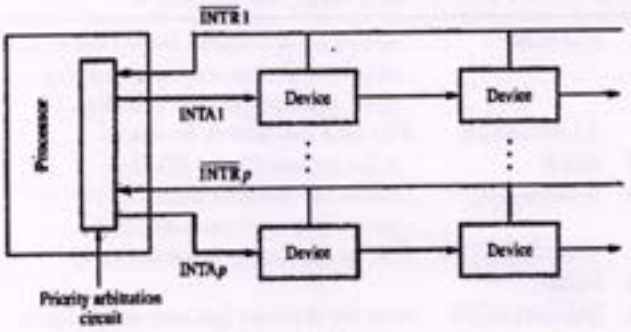
SIMULTANEOUS REQUESTS

- The processor must have some mechanisms to decide which request to service when simultaneous requests arrive

- INTA line is connected in a daisy-chain fashion.
- INTA signal propagates serially through devices.
- When several devices raise an interrupt-request, INTR line is activated.
- Processor responds by setting INTA line to 1. This signal is received by device 1.
- Device-1 passes signal on to device 2 only if it does not require any service.
- If device-1 has a pending-request for interrupt, the device-1
  - → blocks INTA signal &
  - → proceeds to put its identifying-code on data-lines.
- Device that is electrically closest to processor has highest priority.
- **Advantage:** It requires fewer wires than the individual connections.



(a) Daisy chain



(b) Arrangement of priority groups

Figure 4.8 Interrupt priority schemes.

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3c) Interrupt Enable with Explanation- 6M

- All computers fundamentally should be able to enable and disable interruptions as desired.
- The problem of infinite loop occurs due to successive interruptions of active INTR signals.
- There are 3 mechanisms to solve problem of infinite loop:
  1) Processor should ignore the interrupts until execution of first instruction of the ISR.
  2) Processor should automatically disable interrupts before starting the execution of the ISR.
  3) Processor has a special INTR line for which the interrupt-handling circuit.
     Interrupt-circuit responds only to leading edge of signal. Such line is called edge-triggered.
- Sequence of events involved in handling an interrupt-request:
  1) The device raises an interrupt-request.
  2) The processor interrupts the program currently being executed.
  3) Interrupts are disabled by changing the control bits in the processor status register (PS).
  4) The device is informed that its request has been recognized.
     In response, the device deactivates the interrupt-request signal.
  5) The action requested by the interrupt is performed by the interrupt-service routine.

Interrupts are enabled and execution of the interrupted program is resumed

4a) Diagram—2M

Explanation----M

- A **single bus-structure** can be used for connecting I/O-devices to a computer.
- Each I/O device is assigned a unique set of address.
- Bus consists of 3 sets of lines to carry address, data & control signals.
- When processor places an address on address-lines, the intended-device responds to the command.
- The processor requests either a read or write-operation.
- The requested-data are transferred over the data-lines.

Figure 7.1 A single-bus structure.

There are 2 ways to deal with I/O-devices: 1) Memory-mapped I/O & 2) I/O-mapped I/O.

1) Memory-Mapped I/O

- Memory and I/O-devices share a common address-space.
- Any data-transfer instruction (like Move, Load) can be used to exchange information.
- For example,

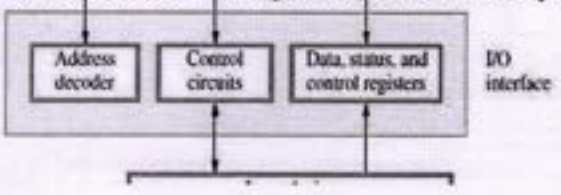
Move DATAIN, R0; This instruction sends the contents of location DATAIN to register R0.
Here, DATAIN □ address of the input-buffer of the keyboard.

2) I/O-Mapped I/O

- Memory and I/0 address-spaces are different.
- A special instructions named **IN** and **OUT** are used for data-transfer.
- Advantage of separate I/O space: I/O-devices deal with fewer address-lines.

I/O Interface for an Input Device

1) Address Decoder: enables the device to recognize its address when this addressappears on the address-lines (Figure 7.2).
2) Status Register: contains information relevant to operation of I/O-device.
3) Data Register: holds data being transferred to or from processor. There are 2 types:
i) DATAIN □ Input-buffer associated with keyboard.
ii) DATAOUT □ Output data buffer of a display/printer.



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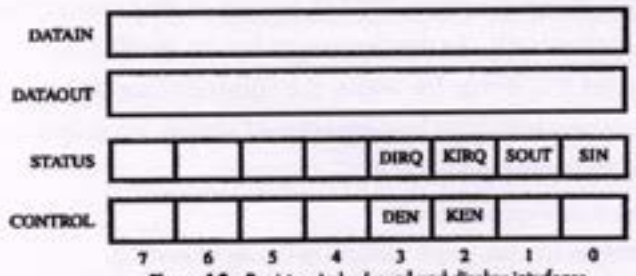


Figure 4.3 Registers in keyboard and display interfaces.

4b) Program- 8M

```
        Move      #LINE,R0          Initialize memory pointer.
WAITK   TestBit   #0,STATUS         Test SIN.
        Branch=0  WAITK             Wait for character to be entered.
        Move      DATAIN,R1         Read character.
WAITD   TestBit   #1,STATUS         Test SOUT.
        Branch=0  WAITD             Wait for display to become ready.
        Move      R1,DATAOUT        Send character to display.
        Move      R1,(R0)+          Store character and advance pointer.
        Compare   #$0D,R1           Check if Carriage Return.
        Branch≠0  WAITK             If not, get another character.
        Move      #$0A,DATAOUT      Otherwise, send Line Feed.
        Call      PROCESS           Call a subroutine to process the
                                      the input line.
```

Figure 4.4 A program that reads one line from the keyboard, stores it in memory buffer, and echoes it back to the display.

4c) Diagram- 2M
Explanations- 4M

DIRECT MEMORY ACCESS (DMA)

- The transfer of a block of data directly b/w an external device & main-memory w/o continuous involvement by processor is called DMA.
- DMA controller

→ is a control circuit that performs DMA transfers (Figure 8.13).
→ is a part of the I/O device interface.
→ performs the functions that would normally be carried out by processor.

- While a DMA transfer is taking place, the processor can be used to execute another program.

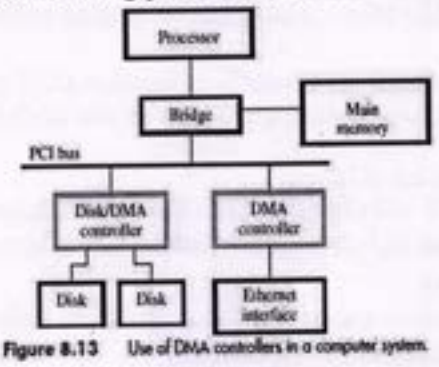
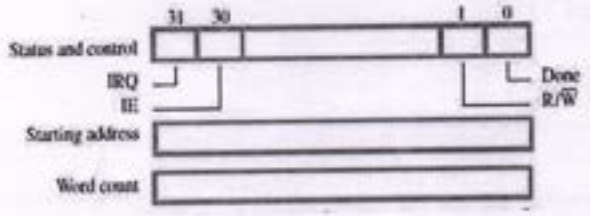


Figure 8.13 Use of DMA controllers in a computer system.



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- DMA interface has three registers
  1) First register is used for storing starting-address.
  2) Second register is used for storing word-count.
     Third register contains status- & control-flags
- The R/W bit determines direction of transfer.
  If R/W=1, controller performs a read-operation (i.e. it transfers data from memory to I/O), Otherwise, controller performs a write-operation (i.e. it transfers data from I/O to memory).
- If Done=1, the controller
  → has completed transferring a block of data and
  → is ready to receive another command. (IE □ Interrupt Enable).
- If IE=1, controller raises an interrupt after it has completed transferring a block of data.
- If IRQ=1, controller requests an interrupt.
- Requests by DMA devices for using the bus are always given higher priority than processor requests.
- There are 2 ways in which the DMA operation can be carried out:
  1) Processor originates most memory-access cycles.
  ➢ DMA controller is said to "steal" memory cycles from processor.
  ➢ Hence, this technique is usually called **Cycle Stealing**.
  2) DMA controller is given exclusive access to main-memory to transfer a block of data withoutany interruption. This is known as **Block Mode** (or burst mode).

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ESTD: 2002

INTERNAL ASSESMENT TEST: II **DATE: 14/01/23**

COURSE: Computer Organization and Architecture (21CS34) **MAX MARKS: 40**

SEM: III A & B Section **TIME:90 min**

NOTE: Answer the TWO full questions

1) a. What is DMA Bus Arbitration? Briefly explain different bus arbitration techniques. **6M-CO2**
   b. Explain Synchronous Bus and Asynchronous Bus with neat Timing diagrams. **7M-CO2**
   c. Explain with neat circuit diagram of Input Interface Circuit in parallel port. **7M-CO2**

or

2) a. With a block diagram, explain a general 8-Bit parallel interface.. **6M-CO2**
   b. Explain with neat circuit diagram of Serial Interface Circuit in Serial Port. **7M-CO2**
   c. Explain the organization of 1K*1 memory Chip. **7M-CO3**

3) a. With a neat diagram briefly explain the internal organization of 2M*8 dynamic memory chip. **7M-CO3**
   b. Explain synchronous DRAM with a block diagram. **7M-CO3**
   c. Analyze how data are written into Read Only Memories (ROM). Discuss different types of Read Only Memories. **6M-CO3**

or

4) a. Which Replacement Algorithm in better in cache? Explain in detail. **6M-CO3**
   b. What is Locality of reference? Explain Direct Mapping technique and Set Associative Mapping Technique. **8M-CO3**
   c. What is Virtual memory? Explain virtual memory organization with neat diagram. **6M-CO3**

*****

Name of the Staff: Prof. Chethan M S

Signature:..... **HOD Signature**.....

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INTERNAL ASSESMENT TEST: II — Scheme and Solution

COURSE: Computer Organization Architecture (21CS34)

1a) DMA Bus Arbitration-2M
Different bus arbitration techniques-4M

The device that is allowed to initiate data-transfers on bus at any given time is called bus-master.
• There can be only one bus-master at any given time.
• Bus Arbitration is the process by which
→ next device to become the bus-master is selected &
→ bus-mastership is transferred to that device.
• The two approaches are:
1) Centralized Arbitration: A single bus-arbiter performs the required arbitration.
2) Distributed Arbitration: All devices participate in selection of next bus-master.
• A conflict may arise if both the processor and a DMA controller or two DMA controllers try to use the bus at the same time to access the main-memory.
• To resolve this, an arbitration procedure is implemented on the bus to coordinate the activities of all devices requesting memory transfers.
• The bus arbiter may be the processor or a separate unit connected to the bus.

1) Centralized Arbitration:
• A single bus-arbiter performs the required arbitration (Figure: 4.20).
• Normally, processor is the bus-master.
• Processor may grant bus-mastership to one of the DMA controllers.
• A DMA controller indicates that it needs to become bus-master by activating BR line.
• The signal on the BR line is the logical OR of bus-requests from all devices connected to it.
• Then, processor activates BG1 signal indicating to DMA controllers to use bus when it becomes free.
• BG1 signal is connected to all DMA controllers using a daisy-chain arrangement.
• If DMA controller-1 is requesting the bus,
Then, DMA controller-1 blocks propagation of grant-signal to other devices.
Otherwise, DMA controller-1 passes the grant downstream by asserting BG2.
• Current bus-master indicates to all devices that it is using bus by activating BBSY line.
• The bus-arbiter is used to coordinate the activities of all devices requesting memory transfers.
• Arbiter ensures that only 1 request is granted at any given time according to a priority scheme.
(BR □ Bus-Request, BG □ Bus-Grant, BBSY □ Bus Busy).

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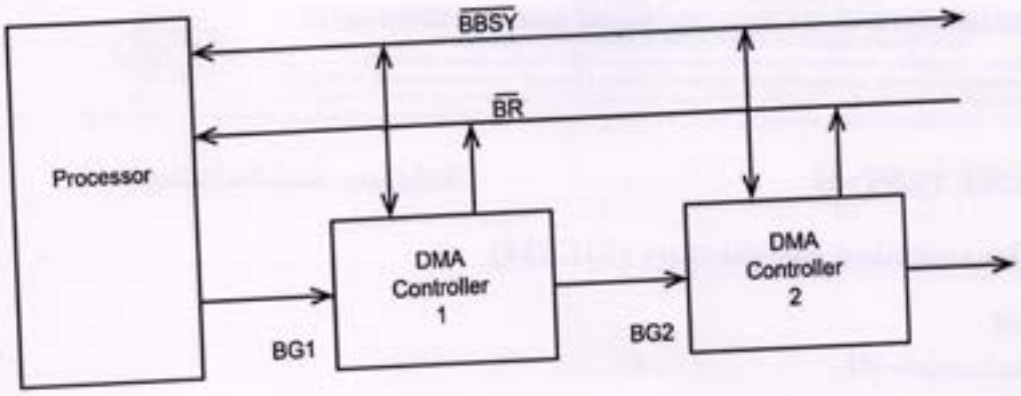


2) Distributed Arbitration:

All device participate in the selection of next bus-master (Figure 4.22).

- Each device on bus is assigned a 4-bit identification number (ID).
- When 1 or more devices request bus, they

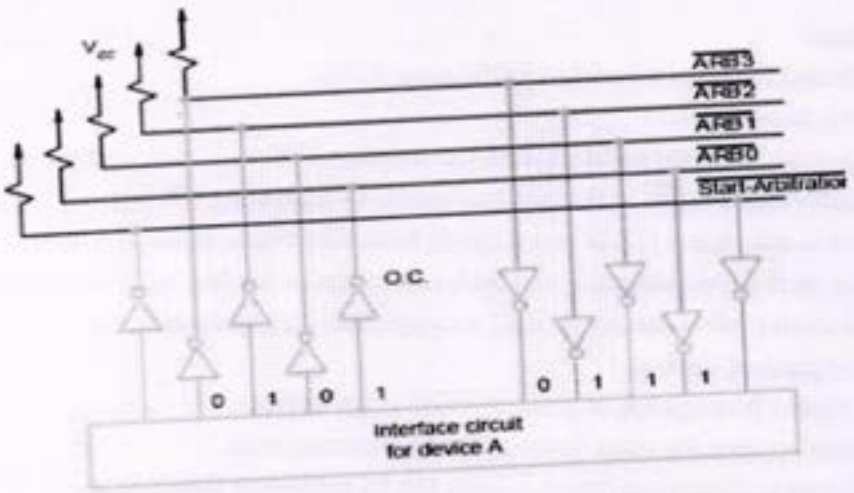
→ assert Start-Arbitration signal &

→ place their 4-bit ID numbers on four open-collector lines ARB 0 through ARB 3 .

- A winner is selected as a result of interaction among signals transmitted over these lines.
- Net-outcome is that the code on 4 lines represents request that has the highest ID number.
- Advantage:

This approach offers higher reliability since operation of bus is not dependent on any single device.

Distributed arbitration



1b) Synchronous Bus and Asynchronous Bus Definition-2M
Synchronous Bus and Asynchronous timing diagram-5M

SYNCHRONOUS BUS

- All devices derive timing-information from a common clock-line.
- Equally spaced pulses on this line define equal time intervals.
- During a "bus cycle", one data-transfer can take place.

A sequence of events during a read-operation

- At time t0, the master (processor)

→ places the device-address on address-lines &

→ sends an appropriate command on control-lines (Figure 7.3).

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• The command will
→ indicate an input operation &
→ specify the length of the operand to be read.
• Information travels over bus at a speed determined by physical & electrical characteristics.
• Clock pulse width(t1-t0) must be longer than max. propagation-delay b/w devices connected to bus.
• The clock pulse width should be long to allow the devices to decode the address & control signals.
• The slaves take no action or place any data on the bus before t1.
• Information on bus is unreliable during the period t0 to t1 because signals are changing state.
• Slave places requested input-data on data-lines at time t1.
• At end of clock cycle (at time t2), master strobes (captures) data on data-lines into its input-buffer
• For data to be loaded correctly into a storage device data must be available at input of that device for a period greater than setup-time of device.

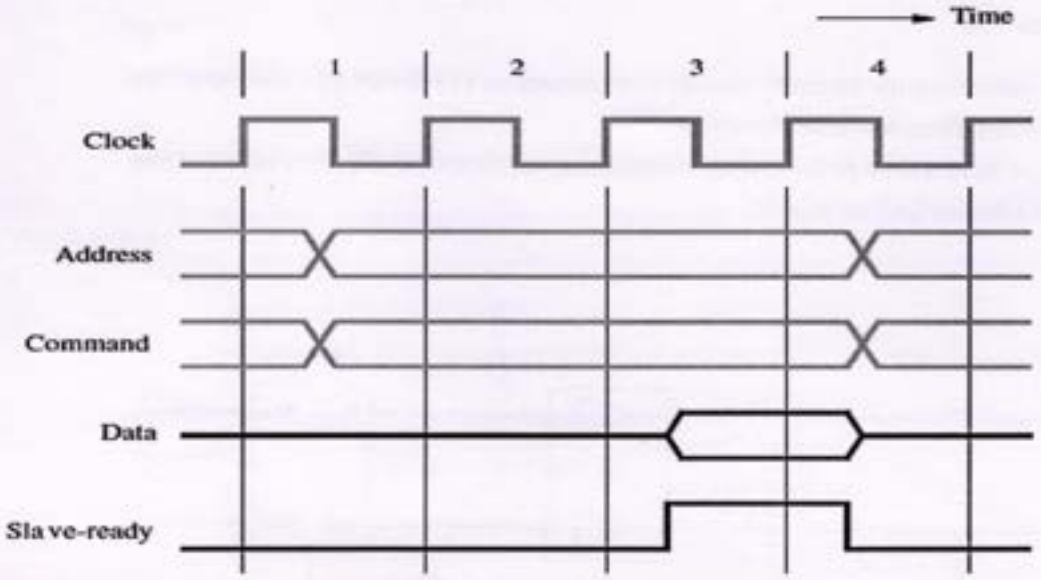

Figure 7.5 An input transfer using multiple clock cycles.

ASYNCHRONOUS BUS

• This method uses handshake-signals between master and slave for coordinating data-transfers.
• There are 2 control-lines:
1) Master-Ready (MR) is used to indicate that master is ready for a transaction.
2) Slave-Ready (SR) is used to indicate that slave is ready for a transaction.
The Read Operation proceeds as follows:
• At t0, master places address/command information on bus.
• At t1, master sets MR-signal to 1 to inform all devices that the address/command-info is ready.
  - MR-signal =1 causes all devices on the bus to decode the address.
  - The delay t1 – t0 is intended to allow for any skew that may occurs on the bus.
  - Skew occurs when 2 signals transmitted from 1 source arrive at destination at different time
  - Therefore, the delay t1 – t0 should be larger than the maximum possible bus skew.
• At t2, slave
→ performs required input-operation &
→ sets SR signal to 1 to inform all devices that it is ready (Figure 7.6).
• At t3, SR signal arrives at master indicating that the input-data are available on bus.
• At t4, master removes address/command information from bus.
• At t5, when the device-interface receives the 1-to-0 transition of MR signal, it removes data and SR signal from the bus. This completes the input transfer.

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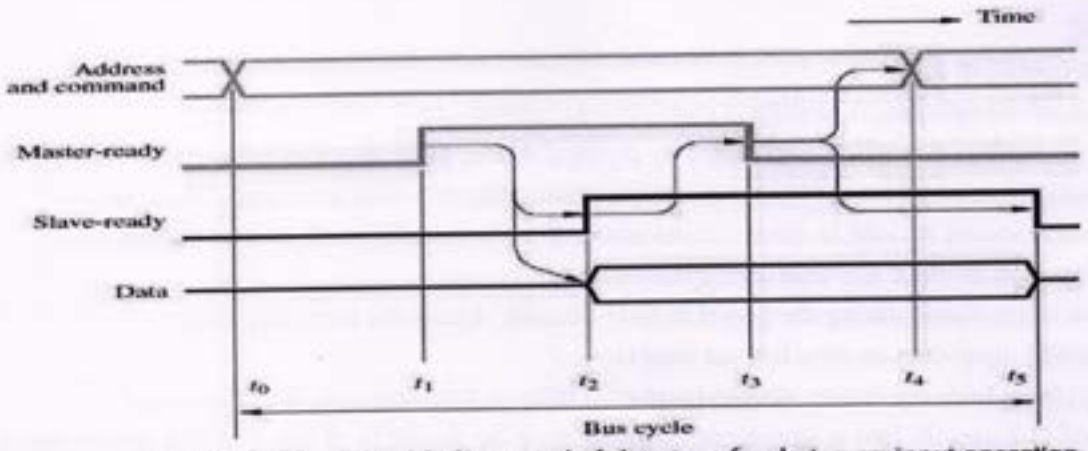


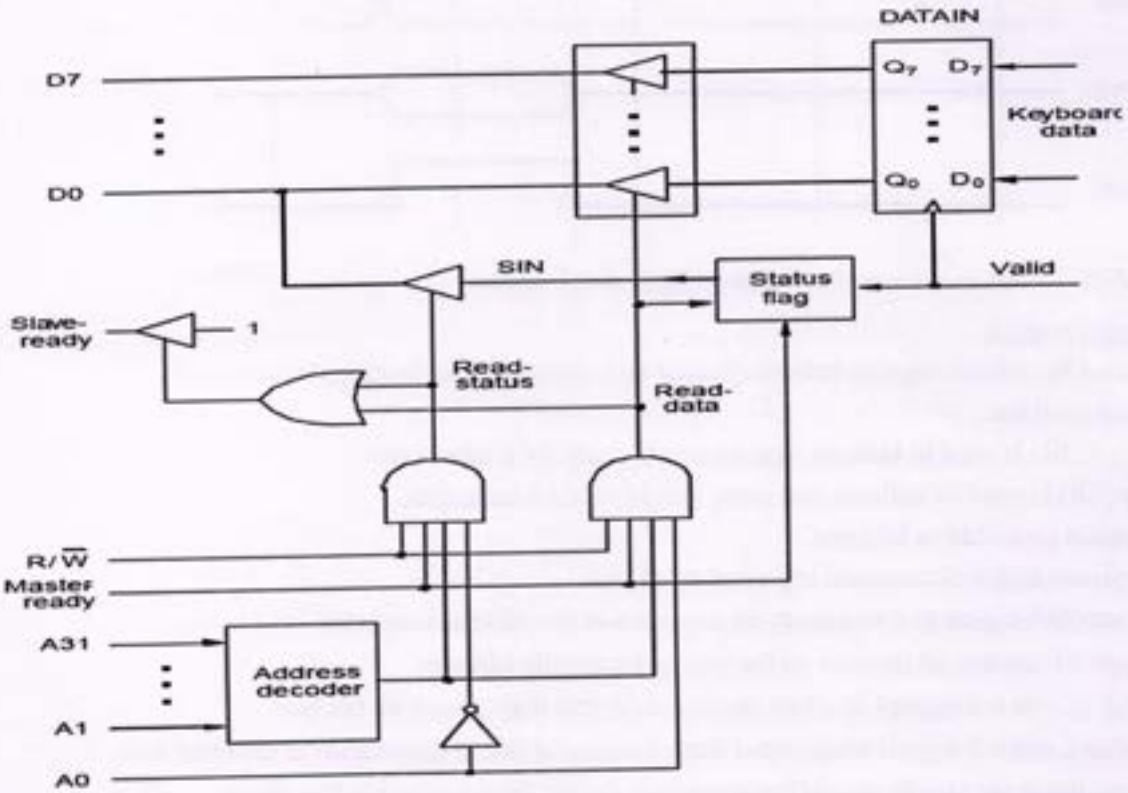
Figure 7.6 Handshake control of data transfer during an input operation.

1c) Diagram- 2M

Explanation- 7M

- An I/O Interface consists of the circuitry required to connect an I/O device to a computer-bus.
- On one side of the interface, we have bus signals.

On the other side, we have a data path with its associated controls to transfer data between the interface and the I/O device known as port.



- Output lines of DATAIN are are connected to the data lines of the bus by means of 3 state driver
- Drivers are turned on when the processor issues a read signal and the address selects this register.
- SIN signal is generated using a status flag circuit.
- It is connected to line D_0 of the processor bus using a three-state driver.
- Address decoder selects the input interface based on bits A_1 through A_{31}.
- Bit A0 determines whether the status or data register is to be read, when Master-ready is active.

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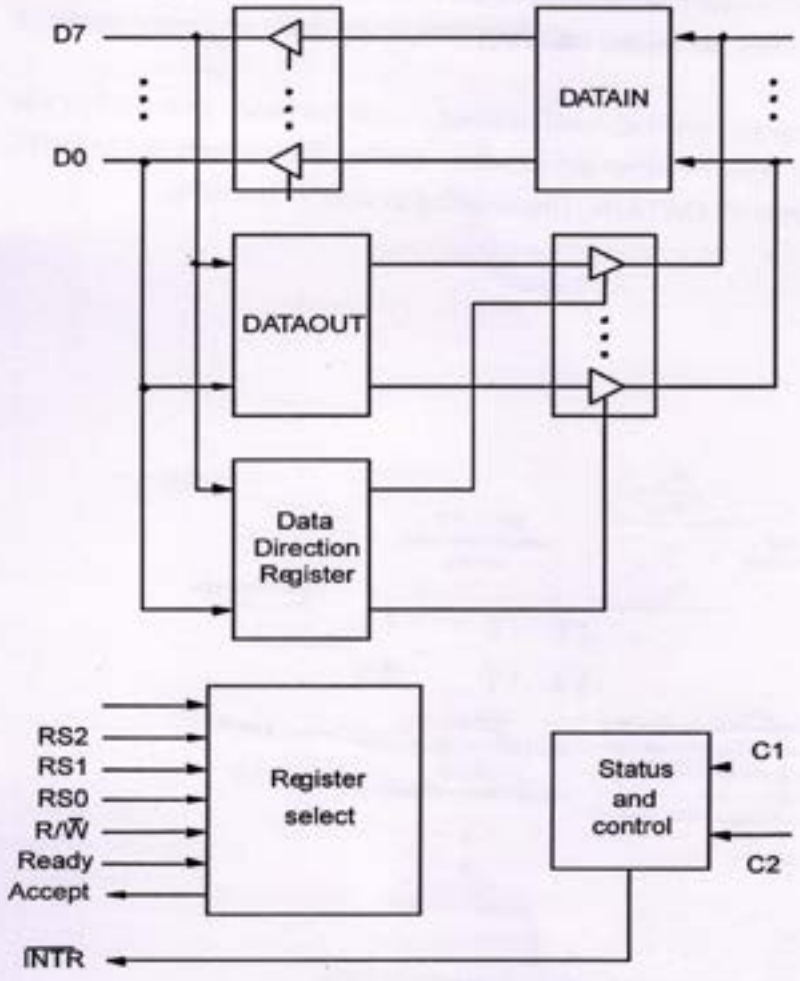
- In response, the processor activates the Slave-ready signal, when either the Read-status or Read-data is equal to 1, which depends on line A_0.

2a) Diagram- 2M

Explanation-4M

- Data lines to I/O device are bidirectional.
- Data lines P7 through P0 can be used for both input, and output.
- In fact, some lines can be used for input & some for output depending on the pattern in the Data Direction Register (DDR).
- Processor places an 8-bit pattern into a DDR.
- If a given bit position in the DDR is 1, the corresponding data line acts as an output line, otherwise it acts as an input line.
- C1 and C2 control the interaction between the interface circuit and the I/O devices.
- Ready and Accept lines are the handshake control lines on the processor bus side, and are connected to Master-ready & Slave-ready.
- Input signal My-address is connected to the output of an address decoder.
- Three register select lines that allow up to 8 registers to be selected.



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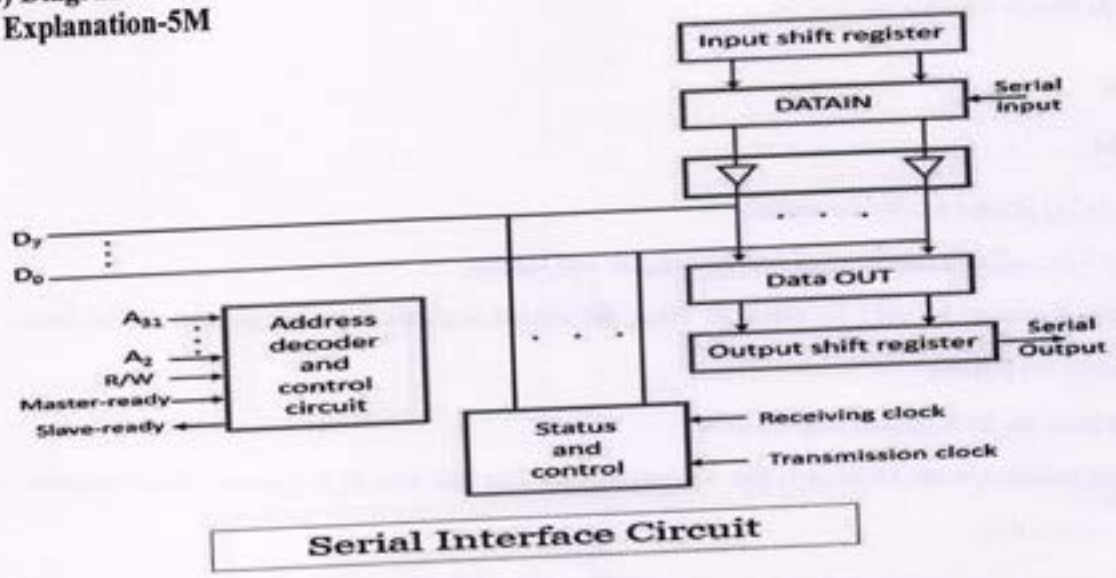
2b) Diagram- 2M
Explanation-5M



- Input shift register accepts input one bit at a time from the I/O device.
- Once all the 8 bits are received, the contents of the input shift register are loaded in parallel into DATAIN register.
- Output data in the DATAOUT register are loaded into the output shift register.
- Bits are shifted out of the output shift register and sent out to the I/O device one bit at a time.
- As soon as data from the input shift reg. are loaded into DATAIN, it can start accepting another 8 bits of data.
- Input shift register and DATAIN registers are both used at input so that the input shift register can start receiving another set of 8 bits from the input device after loading the contents to DATAIN, before the processor reads the contents of DATAIN. This is called as double- buffering

2c) Diagram- 2M
Explanation-5M

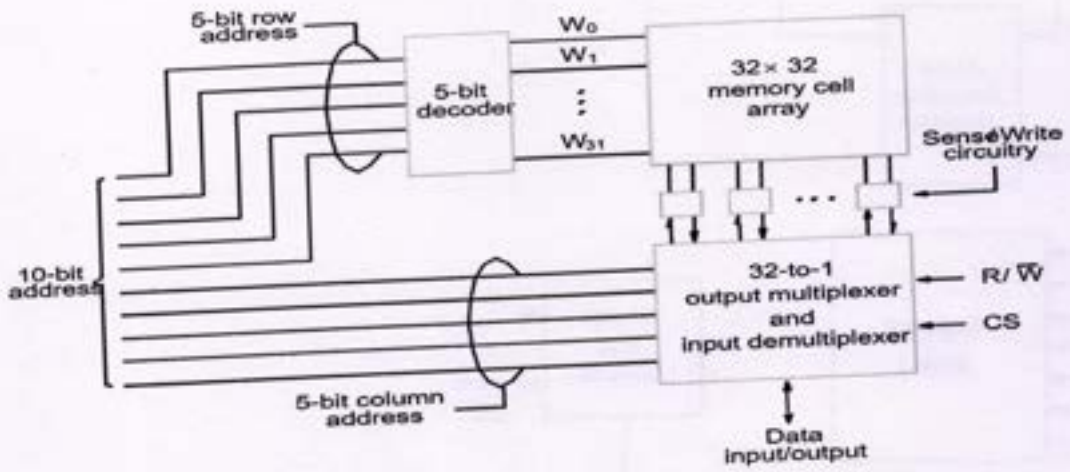


Figure 5.3. Organization of a 1K × 1 memory chip.

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One group is used to form the row address and the second group is used to form the column address. The 10-bit address is divided into two groups of 5 bits each to form the row and column address of the cell array. A row address selects a row of 32 cells, all of which could be accessed in parallel. Regarding the column address, only one of these cells is connected to the external data line via the input output multiplexers.

3a) Diagram- 2M

Explanation-4M

- The cells are organized in the form of a 4k * 4k array.
- Each row can store 512 bytes. 12 bits to select a row, and 9 bits to select a group in a row. Total of 21 bits.
- During read/write operation, First apply the row address, RAS signal latches the row address.
- Then apply the column address, CAS signal latches the address.
- Timing of the memory unit is controlled by a specialized unit which generates RAS and CAS.

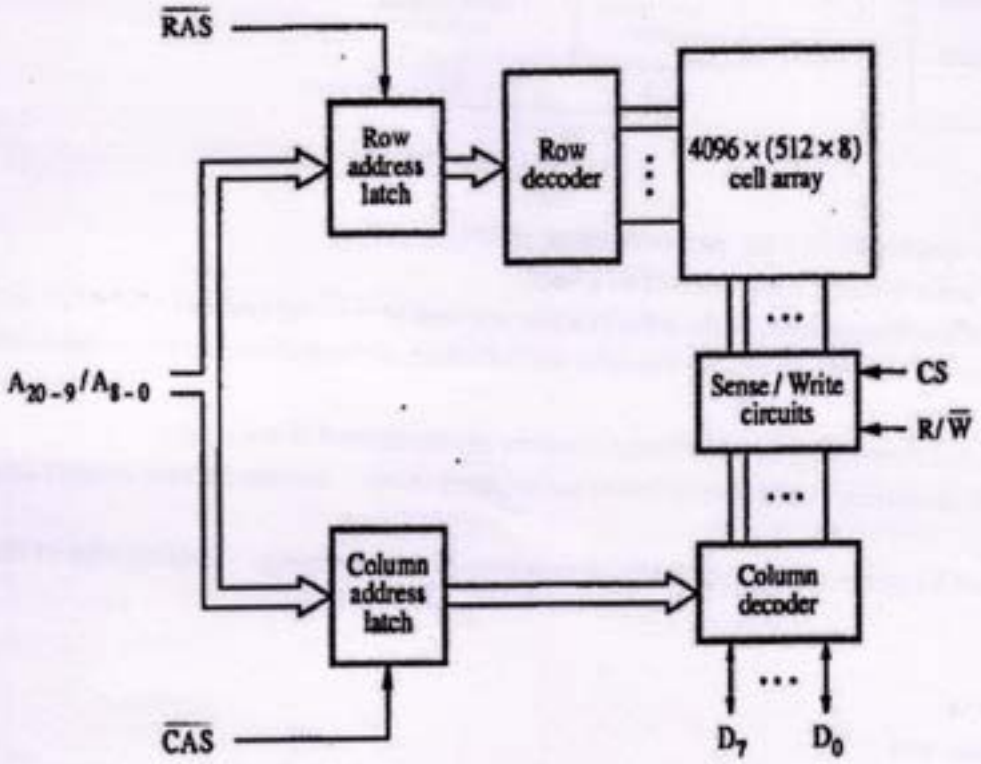

Figure 5.7 Internal organization of a 2M x 8 dynamic memory chip.

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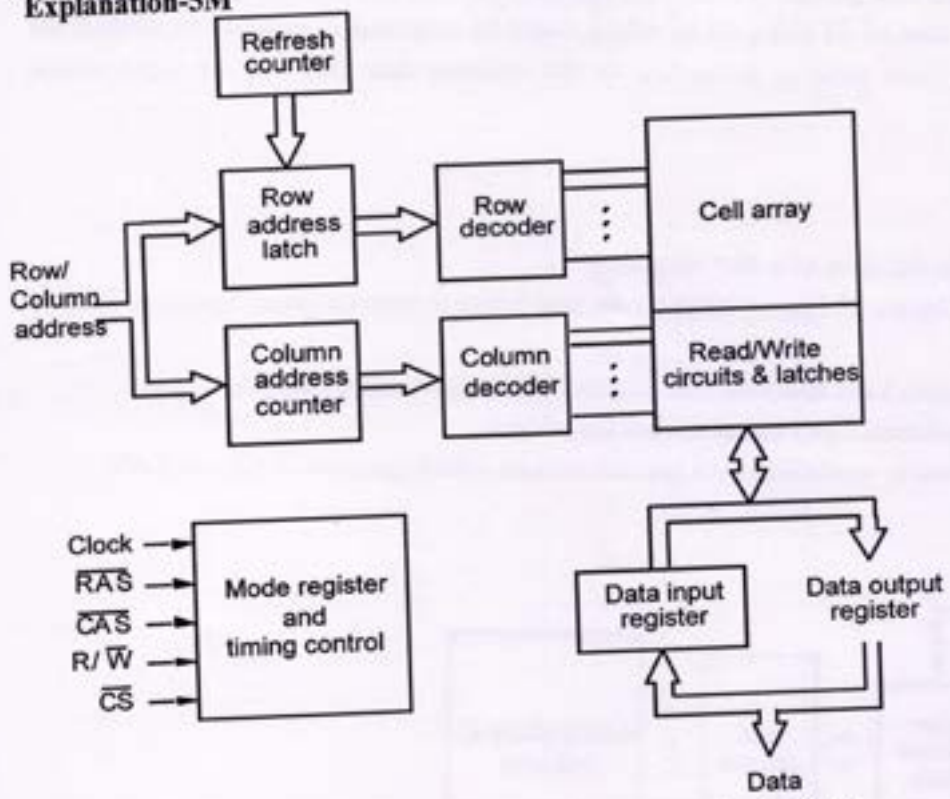
3b) Diagram- 2M
Explanation-5M



- Operation is directly synchronized with processor clock signal.
- The outputs of the sense circuits are connected to a latch.
- During a Read operation, the contents of the cells in a row are loaded onto the latches.
- During a refresh operation, the contents of the cells are refreshed without changing the contents of the latches.
- Data held in the latches correspond to the selected columns are transferred to the output.
- For a burst mode of operation, successive columns are selected using column address counter and clock.
- CAS signal need not be generated externally. A new data is placed during raising edge of the clock.

3c) Definition of ROM- 1M
Types and Explanation- 6M

- Both SRAM and DRAM chips are volatile, i.e. They lose the stored information if power is turned off.
- Many application requires non-volatile memory which retains the stored information if power isturned off.
- For ex:
  OS software has to be loaded from disk to memory i.e. it requires non-volatile memory.
- Non-volatile memory is used in embedded system.
- Since the normal operation involves only reading of stored data, a memory of this type is called ROM.
  - **At Logic value '0'** □ Transistor(T) is connected to the ground point (P). Transistor switch is closed & voltage on bit-line nearly drops to zero (Figure 8.11).
  - **At Logic value '1'** □ Transistor switch is open. The bit-line remains at high voltage.

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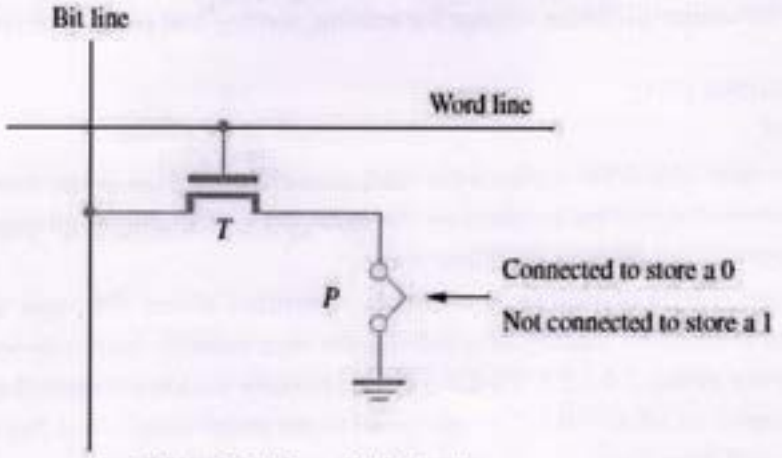


Figure 8.11 A ROM cell.

- To read the state of the cell, the word-line is activated.
- A Sense circuit at the end of the bit-line generates the proper output value.

TYPES OF ROM

- Different types of non-volatile memory are
  1) PROM
  2) EPROM
  3) EEPROM &
  4) Flash Memory (Flash Cards & Flash Drives)

PROM (PROGRAMMABLE ROM)

- PROM allows the data to be loaded by the user.
- Programmability is achieved by inserting a „fuse" at point P in a ROM cell.
- Before PROM is programmed, the memory contains all 0"s.
- User can insert 1"s at required location by burning-out fuse using high current-pulse.
- This process is irreversible.
- **Advantages:**
  1) It provides flexibility.
  2) It is faster.
  3) It is less expensive because they can be programmed directly by the user.

EPROM (ERASABLE REPROGRAMMABLE ROM)

- EPROM allows
  → stored data to be erased and
  → new data to be loaded.
- In cell, a connection to ground is always made at „P" and a special transistor is used.
- The transistor has the ability to function as
  → a normal transistor or
  → a disabled transistor that is always turned „off".
- Transistor can be programmed to behave as a permanently open switch, by injecting charge into it.
- Erasure requires dissipating the charges trapped in the transistor of memory-cells.This can be done by exposing the chip to ultra-violet light.
- **Advantages:**
  1) It provides flexibility during the development-phase of digital-system.
  2) It is capable of retaining the stored information for a long time.
- **Disadvantages:**
  1) The chip must be physically removed from the circuit for reprogramming.
  2) The entire contents need to be erased by UV light.

EEPROM (ELECTRICALLY ERASABLE ROM)

- **Advantages:**
  1) It can be both programmed and erased electrically.
  2) It allows the erasing of all cell contents selectively.

- **Disadvantage:** It requires different voltage for erasing, writing and reading the stored data.

4a) Replacement Algorithm LRU

With Example- 6M

The LRU page replacement algorithm replaces the least recently used page in the memory with a new page. The LRU page replacement algorithm is based on the assumption that among all pages in the memory, the least recently used page will not be used for a long time.

In Least Recently Used (LRU) algorithm is a Greedy algorithm where the page to be replaced is least recently used. The idea is based on locality of reference, the least recently used page is not likely

Let say the page reference string 7 0 1 2 0 3 0 4 2 3 0 3 2 . Initially we have 4 page slots empty.

Initially all slots are empty, so when 7 0 1 2 are allocated to the empty slots —> 4 Page faults

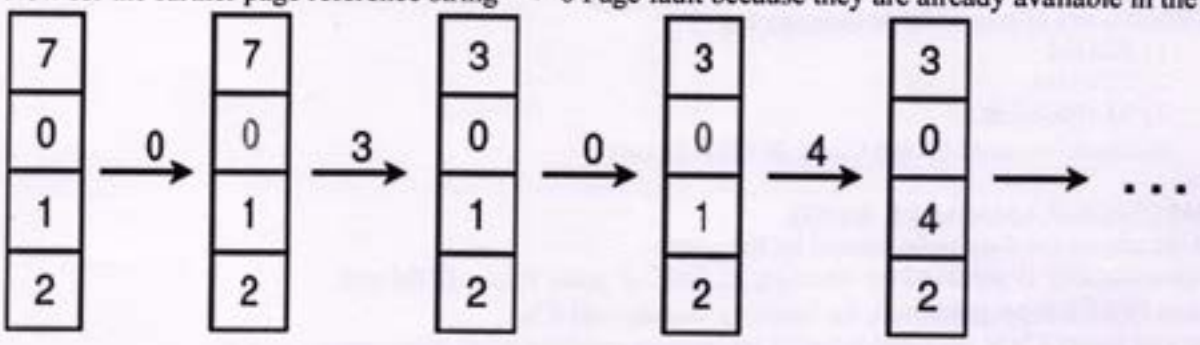
0 is already there so —> 0 Page fault.

when 3 came it will take the place of 7 because it is least recently used —>1 Page fault

0 is already in memory so —> 0 Page fault.

4 will takes place of 1 —> 1 Page Fault

Now for the further page reference string —> 0 Page fault because they are already available in the memory.

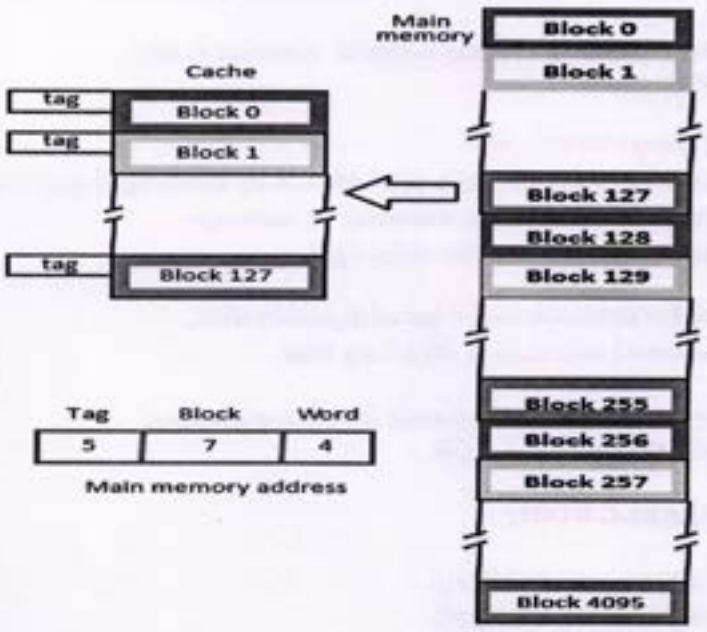


Total Page faults = 6

4b) Definition of Locality Reference- 2M

Types of Mapping- 5M

- Analysis of programs indicates that many instructions in localized areas of a program are executed repeatedly during some period of time, while the others are accessed relatively less frequently.
- These instructions may be the ones in a loop, nested loop or few procedures calling each other repeatedly. This is called "locality of reference".



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4c) Definition of Virtual Memory

Explanation- 5M

Virtual memory in computer organization architecture is a technique and not actually a memory in physical form present in computer system. This is the reason it is known as virtual memory.

Advantages of Virtual memory

Listed below are major advantages of using virtual memory techniques:

Virtual memory technique helps in efficient utilization of main memory. As larger size programs are divided into blocks and partially each block is loaded into main memory as per need. This makes simultaneous execution of multiple program possible.

Virtual memory helps in efficient CPU utilization

Virtual memory helps to improve overall throughput.

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- Block j of the main memory maps to j modulo 128 of the cache. 0 maps to 0, 129 maps to 1.

- More than one memory block is mapped onto the same position in the cache.
- May lead to contention for cache blocks even if the cache is not full.
- Resolve the contention by allowing new block to replace the old block, leading to a trivial replacement algorithm.
- Memory address is divided into three fields:

- Low order 4 bits determine one of the 16 words in a block.
- When a new block is brought into the cache, the next 7 bits determine which cache block this new block is placed in.
- High order 5 bits determine which of the possible 32 blocks is currently present in the cache. These are tag bits.

- Simple to implement but not very flexible.

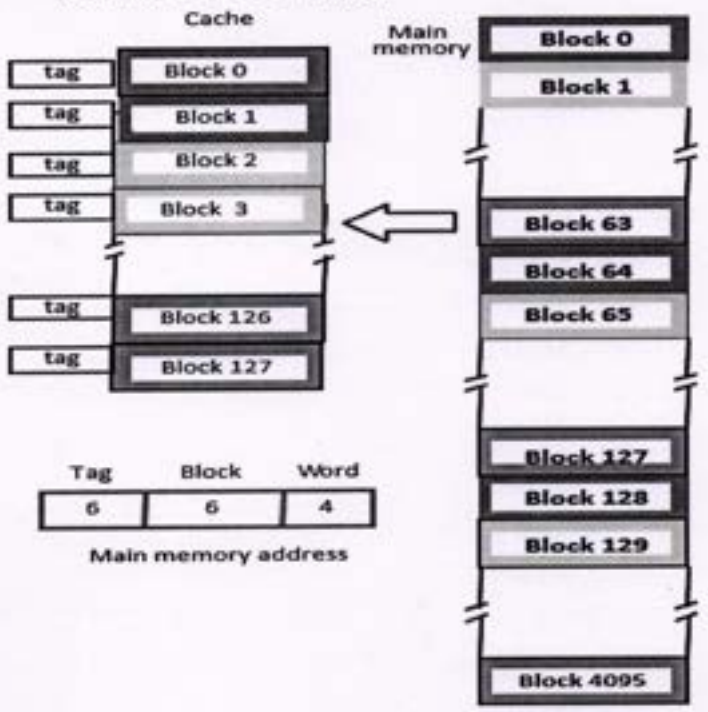
Set-Associative mapping

- Blocks of cache are grouped into sets.
- Mapping function allows a block of the main memory to reside in any block of a specific set.
- Divide the cache into 64 sets, with two blocks per set.
- Memory block 0, 64, 128 etc. map to block 0, and they can occupy either of the two positions.
- Memory address is divided into three fields:

- 6 bit field determines the set number.
- High order 6 bit fields are compared to the tag fields of the two blocks in a set.

- Set-associative mapping combination of direct and associative mapping.
- Number of blocks per set is a design parameter.

- One extreme is to have all the blocks in one set, requiring no set bits (fully associative mapping).
- Other extreme is to have one block per set, is the same as direct mapping



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INTERNAL ASSESMENT TEST: I — **Date:10/12/2023**

COURSE: Data Structures and Applications(21CS32) — **MAX MARKS 40**

SEM: III SEM A/B/C section [CSE/ISE/AI&DS] — **TIME: 90 min**

NOTE: Answer the TWO **full** questions **Q1 or Q2 and Q3 or Q4**

1) a. Define data Structure? Explain the classification of data structure with example. **06M[CO1]**

   b. What is Dynamic memory allocation? Explain malloc(), calloc(), realloc(), and free() . **08M[CO1]**

   c. Write a program to create and display an array. **06M[CO1]**

OR

2) a. Explain Abstract data type for Array. **05M[CO1]**

   b. Explain Polynomial representation? With an example. **05M[CO1]**

   c. What is structure? How it is different from array? Explain different types of structure. declaration with examples and give differences between union and structures. **10M[CO1]**

3) Define stack? Give the implementation of Push, Pop and Display functions. Include check for empty and full conditions. **10M[CO2]**

   b. Write the Postfix form of the following expression using stack:

   (1). A$B*C-D+E|F|(G+H)

   (2). A-B|(C*D$E) **10M[CO2]**

OR

4) a. Write an algorithm to evaluate a postfix expression and apply the same for the given expression ABC-D*+E$F+ and assume A=6, B=3, C=2, D=5, E=1 and F=7 **10M[CO2]**

   b. Define Recursion? Write a recursive function for the following

   (1) Factorial of a number

   (2) Tower of Hanoi **10M[CO2]**

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Data Structures and Applications

① Define data structure? Explain the classification of data structure with Example.

Data structure is a way of organizing the data along with relationship among data The Study of data structures

Classification of data Structures

1. primitive data Structures
→ These are the fundamental Standard data types
→ These are used to represent Single values
Eg: int, float, char, double

2. Non-primitive data Structures
→ These are derived from primitive data
→ These are used to Store group of view
Eg: Arrays, Stacks, Queues, Linked list, Trees etc
* Non-primitive data Structures are further classified into linear and non-linear Data Structure.

a. Linear data Structure: A data Structure is said to nonlinear if its elements are stored in a Sequential order.
Eg: Arrays, Stacks, Queues, Linked list.

b. Non-Linear Data Structure: A data Structure is said to be non-linear if the data is not arranged in a sequential order
Eg: Trees, graph.
→ Elements are stored on hierarchial relationship are the data.
Eg: Trees.

Graphs: Used to represent the data that has relationship between pair of elements.
Eg: Graphs, roots, networks

② Explain the dynamic memory allocation functions Supports by 'C' with Syntax and Example.
→ There are four functions used to dynamic memory allocation

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1. malloc(): Allocate a block of memory

* It is used to allocate memory space as per requirement
* Function allocations memory and returns a pointer of type void to start of memory block
* If function fails it returns null.
* It is necessary to verify pointer returned is not null. This function doesnot initialize the memory allocated during execution It causes garbage value.

Syntax :- ptr = (data type *) malloc (size);

```
#include<stdio.h>
#include<stdlib.h>
int main()
{
 int i, n, s=0, *p;
 printf("enter size n");
 scanf("%d", &n);
 p = (int*) malloc (n* size of the (int));
 printf("enter the elements");
 for(i=0; i<n; i++)
 {
 scanf("%d", p+i);
 s = s+*(p+i);
 }
 printf("sum = %d", s);
 free(p);
 return 0;
 }
```

2. calloc(): Allocate multiple blocks of memory

* It is similar to malloc, but it initializes the allocated memory to zero.

Syntax: ptr = (data type*) calloc (n, size)

```
#include<stdio.h>
#include<stdlib.h>
int main()
{
```

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```
int i,n,S=0,*p;
printf("enter size");
scanf("%d",&n);
p=(int*) calloc(n,sizeof(int));
printf("enter the element");
for(i=0;i<n;i+1)
{
scanf("%d",p+i);
s=s+*(p+i);
}
printf("sum:%d",S);
free(p);
return 0;
}
```

3. realloc(): used to modify the size of allocated block by malloc(), calloc() to new size.

* If allocated memory space is not sufficient then additional memory can be used to taken using realloc()
* can also be used to reduce the size of already allocate memory.

Syntax: ptr=(data type*) realloc(ptr, size);

Eg: Char* Str;
Str=(Char*) malloc(10);
Str=(char*) realloc(Str,40);

4 Free(); deallocate the allocated memory which was done using malloc, calloc or realloc()

Syntax: Free(pointer name)

Eg: free(Str);

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③ write a program to create and display an array. (4)

```
#include<stdio.h>
#include<stdlib.h>
int a[20];
int n,i, valpos;
void create();
void display();
int main()
{
 int choice=1;
 while(choice)
 {
 printf("\n\n---- MENU---\n");
 printf(" 1. CREATE\n");
 printf(" 2. DISPLAY\n");
 printf(" 3. EXIT\n");
 printf("-------");
 printf("\n ENTER YOUR CHOICE\n");
 scanf("%d",&choice);
 switch(choice)
 {
 case 1: create();
         break;
 case 2: display();
         break;
 case 3: exit(0);
 default : printf("\n Invalid choice:\n");
         break;
    }
}
 return 0;
 }
 void create()
```

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```
{
printf("\n Enter the size of the array elements:\n");
scanf("%d", &n);
printf("\n Enter the elements for the array:\n");
for(i=0; i<n; i++)
{
scanf("%d", &a[i]);
}
}
void display()
{
int i;
printf("\n The array elements are :\n");
for(i=0; i<n; i++)
{
printf(" %d\t", a[i]);
}
}
```

(4) Explain Abstract data type for Array.

→ An ADT of array provides details of array implementation and various operations that can be performed on an array

Object : A set of pairs <index, value> where value is data stored at index position in an array for 1D array index value are [0, 1, 2 ---- n-1]

for 2D array index values are

[(0,0), (0,1), (0,2), (1,0), (1,1), (1,2), (2,0), (2,1), (2,2)]

Functions : A∈Array i.e. index, x∈Item, n∈Integer.

return type	function name	Operation
Array	Create(n,a)::=	return array of size n
Item	return (a, i)::=	if it index, then return Item stored in array at index position i

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Array Store (a,i,z) ::= If it index then return array A by storing x at index position i in a

(5) Explain polynomial representation? with an example

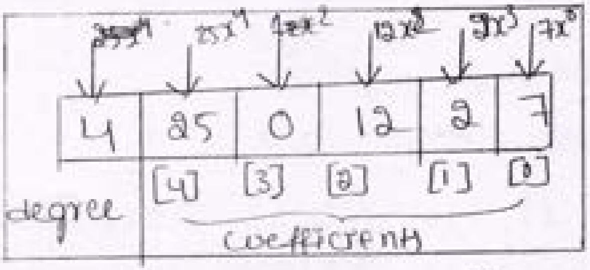
Polynomial is representation in a sum of terms where each term has a form.

Polynomial representation: polynomial can be represented in C using a structure as shown below.

```
#define MAX-DEGREE 10
typedef struct
{
  int degree;
  float coeff[MAX-DEGREE];
} polynomial;
polynomial a, b;
```

* using the variable a, the degree of the polynomial can be accessed using a degree and the coefficients can be accessed using a coeff[i] for i = 0, 1, 2 - - -

Eg: The polynomial $a(x) = 25x^4 + 12x^2 + 2x + 7$ with degree 4 can be represented as shown:



Structure a

(6) What is Structure? How it is different from array? Explain different types of structure declaration with examples and give differences between union and structures.

* A structure is a user-defined datatype

* It is defined as a group of dissimilar or heterogeneous data items, where items can be of a different datatypes.

Structure declaration

Syntax:
```
Struct tagname
{
type1 var1;
type2 var2;
  :   :
type n  var n;
};
```

Ex:
```
Struct Student
{
char name[30];
int age;
int rno;
};
```

Structure	Array
* A datatype that stores different data types in the same memory location.	* A data structure considering of a collection of elements each identified by the array index.
* A data stores in different types as a single unit.	* Stores a set of data elements of the same data type in contigious memory location.
* It is possible to access a property of a structure using the structure name and the dot operator.	* It is possible access an array element using the index
* 'struct' keyword used	* No Keyword
* Size of the elements can be different	* Each element has the same size
* requires more time to access.	* Requires less time to access.

Different types of Structure Declaration

Two ways to declare variable.

①
```
Struct Student
{
------
------
------
};
Struct Student(cse,cse)
```

②
```
Struct Student
{------
------
------
}cse,ese;
```

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Memory representation of Structure: CSE & ISE is as follow

CSE

name	30 bytes
age	2 bytes
rno	2 bytes

ISE

name	30 bytes
age	2 bytes
rno	2 bytes

34 bytes of memory is allocated each for the Structure variable cse, ise

⑦ Define Stack? Give the implementation of Push, Pop and Display functions. Include Check for empty and full conditions.

* Union keyword is used to define the union type	* Structure keyword is used to define the union type
* Memory is allocated as per largest member	* memory is allocated for each member
* All field share the same memory allocation	* each member have their independent memory
* Flexible array is not supported by the union	* Flexible array is supported by the Structure.

⑦ Define Stack? Give the implementation of push, pop and display functions. Include Check for empty and full Conditions.

```
#include<stdlib.h>
#include<stdio.h>
#include<string.h>
#define max_size 3
int stack[max_size], top=-1;
void push();
void pop();
void display();
int main()
{
  int choice;
```

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```
while (choice)
{
printf("\n\n---- STACK OPERATIONS ---\n");
printf(" 1. push\n");
printf(" 2. pop\n");
printf(" 3. Dipplay\n");
printf(" 4. Exit\n");
printf(" ------");
printf("\n Enter your choice:\t");
Scanf("%d", &choice);
Switch (choice)
{
 case 1: push();
         break;
 Case 2: pop();
         break;
 Case 3: Dipplay();
         break;
  Case 4: Exit();
         break;
default: printf("\n Invalid choice:\n");
         break;
    }
}
return 0;
}
 void push()
 {
  int item, n;
  if(top==(max_size-1))
  {
  printf("\n Stack Overflow:");
  }
  else
  {
```

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```
printf("Enter the element to be inserted:\t");
scanf("%d", &item);
top = top+1;
stack[top] = item;
}
}
void pop()
{
int item;
if(top == -1)
{
printf("Stack Underflow:");
}
else
{
item = stack[top];
top = top-1;
printf("\n the poped element: %d\t", item);
}
}
void display()
{
int i;
if(top == -1)
{
printf("\n Stack is empty:");
}
else
{
printf("\n the stack elements are:\n");
for(i=top, i>=0; i--)
{
printf("%d\n", stack[i]);
}
}
```

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(8) write the postfix from the following expressions using stack.

(i). A$B*C-D+E/F/(G+H)

Symbol	Post	Stack
A	A	
$	A	$
B	AB	$
*	AB$	*
C	AB$C	*
-	AB$C*	-
D	AB$C*D	-
+	AB$C*D-	+
E	AB$C*D-E	+
/	AB$C*D-EF	+/
F	AB$C*D-EF/	+/
/	AB$C*D-EF/	+/(
(	AB$C*D-EF/G	+/(
G	AB$C*D-EF/G	+/(
+	AB$C*D-EF/G	+/(+
H	AB$C*D-EF/GH	+/(+
)	AB$C*D-EF/GH+	
	AB$C*D-EF/GH+/+	

(ii) A-B/(C*D$E)

Symbol	Post	Stack
A	A	-
-	A	-
B	AB	-/
/	AB	-/(
(	AB	-/(
C	ABC	-/(
*	ABC	-/(*
D	ABCD	-/(*
$	ABCD	-/(*$
E	ABCDE	-/(*$
)	ABCDE	-/(*$

ABCD$*(/-

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9. Write an algorithm to evaluate a postfix expression and apply the same for the given expression ABC-D*+E$F+ and assume A=6, B=3, C=2, D=5, E=1 and F=7

Algorithm:

Step 1: Scan the given expression from left to right

Step 2: a) If the symbol is an operand the pull its value onto to the stack

b) If the symbol is an operator then pop out two values from the stack and assigns them respectively to opnd 1 & opnd 2. Then perform the required operator i.e;

res = opnd 1 * opnd 2

push the result back to the stack

Step 3: Repeat step 2 until all the symbols are over

Step 4: pop out the result & print it

6 3 2 - 5 * 1 $ 7 +

Symbol	Opnd 1	Opnd 2	Stack
6			6
3			6, 3
2			6, 3, 2
-	3	2	6, 1
5			6, 1, 5
*	1	5	6, 5
+	6	5	11
1			11, 1
$	4	1	11
7			11, 7
+	11	7	18

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10. Define Recursion? write a recursive function for the following

1) Factorial of a number

2) Tower of Hanoi

Recursion: It is a programming technique in which in which the functions calls by itself.

1) Factorial of a number:

Denoted by $n! = 1, 2, 3, \ldots\ldots (n-2)(n-1)n$

factorial function can be defined as:

(a) If $n=0$, then $n! = 1$

(b) If $n>0$, then $n! = n(n-1)!$

program;

```
int fact(int n)
{
if(n==0)
return 1;
else;
return(n*fact(n-1));
}
main()
{
int n;
printf(" enter a number\n");
scanf("%d", &n);
printf(" factorial = %d", fact(n));
}
```

output:

fact(5)

↓

5* fact(4)

↓

4*fact(3)

↓

3*fact(2)

↓

2*fact(1)

↓

1* fact(0)

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2) Tower of Hanoi

Recursion may be used as a tool in solving the problem of tower of Hanoi.

program:

```
void main()
{
int n;
char a,b,c;
printf("enter the number of disc");
scanf("%d",&n);
printf("tower of hanoi of %d disc\n");
tower(n,'a','b','c');
}
void tower(int n, char beg, char aux, char end)
{
if(n<=0)
printf("\n illegal entry");
else if(n==1)
printf("\n move disc from %c to %c", beg, end);
else
{
tower(n-1, beg, end, aux);
tower(1, beg, aux, end);
tower(n-1, aux, beg, end);
}
}
```

output

```
enter the number of disc 3
tower of hanoi of 3 disc
move disc from a to c
move disc from a to b
move disc from c to b
move disc from a to c
move disc from b to a
move disc from b to c
move disc from a to c
```

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ASSSIGNMENT: I

Date:10/12/2023

COURSE: Data Structures and Applications (21CS32)

SEM: III SEM A/B/C section [CSE/ISE/AI&DS]

1. Define data Structure? Explain the classification of data structure with example.
2. What is Dynamic memory allocation? Explain malloc(), calloc(), realloc(), and free() .
3. Write a program to create and display an array.
4. Explain Abstract data type for Array.
5. Explain Polynomial representation? With an example.
6. What is structure? How it is different from array? Explain different types of structure. declaration with examples and give differences between union and structures.
7. Define stack? Give the implementation of Push, Pop and Display functions. Include check for empty and full conditions.
8. Write the Postfix form of the following expression using stack:
9. (1). A$B*C-D+E|F|(G+H)
10. (2). A-B|(C*D$E)
11. Write an algorithm to evaluate a postfix expression and apply the same for the given expression ABC-D*+E$F+ and assume A=6, B=3, C=2, D=5, E=1 and F=7
12. Define Recursion? Write a recursive function for the following
    a)Factorial of a number b) Tower of Hanoi

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

INTERNAL ASSESMENT TEST: 2

COURSE: **Data Structures and Applications(21CS32)**
SEM: III SEM A/B/C section [CSE/ISE/AI&DS]

Date:13/01/2023
MAX MARKS 40
TIME: 90 min

NOTE: Answer the TWO **full** questions **Q1 or Q2 and Q3 or Q4**

1a. What is the disadvantages of a Linear Queue (ordinary Queue). Explain how it can be overcome by circular queue. Write an algorithm to insert and delete an item from a circular Queue. 10M[**CO1**]

b. What is a Queue? Perform the following operations on circular queue of size 4 04M[**CO1**]
i) insert A i) insert B iii)insert C iv) insert D v)delete vi) delete vii) insert D viii) delete

c. What are priority Queue? Explain two different types of priority queue. 06M[**CO1**]

OR

2.a .Define a Sparse matrix. Discuss the representation of Sparse matrix in triples form. Write an algorithm to find the Transpose of a given sparse matrix. **06M[CO1]**

b. Write an algorithm to perform the insertion and deletion operations on ordinary Queue. **08M[CO1]**

c. Explain how multiple stacks can be implemented in a Single dimension array. **06M[CO1]**

3a Define a Linked List. Explain the operations that can be performed on Linked Lists. List different variations of Lists. **06M[CO2]**

b. Discuss the Implementation of Stacks using Linked List. 06M [**CO1**]

c. What is DLL? write an algorithm to perform following operations on DLL. 08M[**CO1**]
i) Insertion of an element at the rear end.
ii) Delete a node whose info part is given.

OR

4a. Write an algorithm to create an ordered linked list. **06M[CO2]**

b. Discuss the Implementation of Queues using Linked List. 06M[**CO1**]

c. What is a Header node? Write an algorithm to perform the following operations on Singly Linked List with header node. **08M[CO2]**
a)Insert at the rear end b)Delete a whose information part is given

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Data Structures and Applications

(21CS32)

Internal Assessment Test - 2 Answers.

1a. What is the disadvantages of a linear Queue (ordinary Queue). Explain how it can be overcome by circular queue. Write an algorithm to insert and delete an item from a circular Queue.

→ We know that when any element is inserted in linear queue for real will be increated by 1 let us assume after insertion operations is shifted to last position (N-1) in queue. It means, now queue is Full. Now if a new element is inserted then overflow condition will occur. Now if we delete some elements from queue then front will be increased.

After deletion memory space occupied by those elements will be blank and it should be reused by other new element. But it cannot be possible because rear is still pointing to the last position (N-1). Hence, we can be able to reuse free memory space present in linear queue and memory is not effectively used. To solve this problem following step is used.

Overcome:

Circular queue is a special type of queue in which last position and first position are assumed as adjacent positions. In circular queue the last node is connected back to the first node to make a circle. The main disadvantage of linear queue using array is that when elements are deleted from the queue, new elements cannot be added in this place in the queue i.e the position cannot be reused. Circular queues overcome the problem of unutilized space in linear queue implemented as an array.

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Algorithm to insert a item from a circular queue:

Step 1: [Queue is already full]
If Front = 1 and REAR = N or if FRONT = REAR + 1
print overflow
exit.

Step 2: [Find new value of Rear]
If FRONT = NULL [Queue is empty]
Set FRONT = 1, REAR = 1
else if REAR N, Set REAR = 1
else set REAR = REAR + 1

Step 3: Set Queue[REAR] = ITEM

Step 4: Exit.

Algorithm to delete from a circular queue:

Step 1: - [Condition for underflow]
If FRONT = NULL then write underflow
exit

Step 2: Set item = CQ[FRONT]

Step 3: [Find new value for FRONT]
If FRONT = REAR then [CQ has only 1 element]
Set FRONT = NULL and REAR = NULL
else if FRONT = N
set FRONT = 1
else FRONT = FRONT + 1

Step 4: - Exit.

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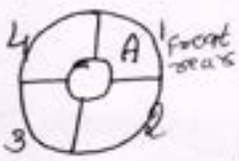
② What is a Queue? Perform the following operations on circular queue of size 4.
i) insert A ii) insert B iii) insert C iv) insert D v) delete vi) delete vii) insert D viii) delete.

→ A queue is a linear list of elements in which deletions can take place only at one end called Front & insertions can take place only at other end called rear. Queue follows first in First out method (FIFO).

Initially rear = 0, Front = 0

i) insert A

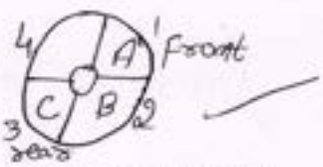


Rear = 1, Front = 1

ii) insert B

Front = 1, rear = 2

iii) insert C

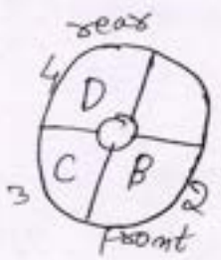


Front = 1, rear = 3

iv) insert D

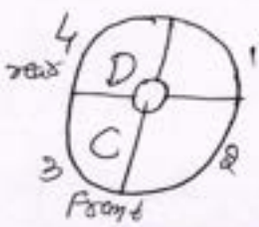
Front = 1 rear = 4

v) delete



Front = 2 Rear = 4

vi) delete



Front = 3 rear = 4

v) insert D

Front = 3 Rear = 1

vi) delete

Front = 4 rear = 1

vii)

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: What are priority Queue? Explain two different types of priority queue.

→ A priority queue is a collection of elements such that each element has been assigned a priority and that order in which element are deleted and processed come from following rules.

① An element of higher priority is processed before any elements of lower priority.

② Two element with same priority are processed according to order in which they are added to the queue.

There are two types of priority queue:

i) Max priority queue:
ii) Min priority queue:

i) Max priority queue:

In max priority queue elements are inserted in the order in which they arrive the queue and the maximum value is always removed first from the queue.

eg: Assume that we insert elements in the order 8, 3, 2 & 5 and they are in the order 8, 5, 3, 2.

Operation performed are:

1. isEmpty() - check whether queue is empty.
2. insert() - Inserts a new value into the queue.
3. findmax() - find maximum value in the queue.
4. remove() - Delete maximum value from the queue.

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ii) Min priority queue:

Min priority queue is similar to max priority queue except fit the removal of maximum element first. we remove minimum element first in the min priority queue

Operation performed are:

1. isEmpty() - check whether queue is empty.
2. insert() - Inserts a new value into the queue.
3. findmax() - Find maximum value in the queue.
4. remove() - Delete min value from the queue.

2a. Define a sparse matrix. Discuss the representation of sparse matrix in triples form. Write an algorithm to find the Transpose of a given sparse matrix.

→ A sparse matrix is a matrix which has number of zero elements or a very few non-zero elements.

Representation

* An element within a matrix can characterize by using triple <row, col, value> This means that, an array of triple is used to represent a sparse matrix.
* Organise the triples so that the row indices are in ascending order.
* The operations should terminate, so we must know the number of rows and columns and the number of non-zero elements in matrix.

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Sparse Matrix Create(max Row, max col)

```
#define MAX.TERMS 101
typedef struct
{
  int col;
  int row;
  int value;
} term;

term a[MAX-TERMS];
```

* The below figure shows the representation of matrix in the array "a" a[0].row contains the number of rows, a[0].col contains the number of columns and a[0].value contains the total number of non zeroes.

* Position 1 through 8 store the triples representing the nonzero entries. The row index is in the field row, the column index is the field col, and value is in field value. The triple are ordered by row and within row by columns.

	[row]	[col]	[value]
a[0]	6	6	8
a[1]	0	0	15
a[2]	0	3	22
a[3]	0	5	15
a[4]	1	1	11
a[5]	1	2	3
a[6]	2	3	-6
a[7]	4	0	91
a[8]	5	2	28

$$\Rightarrow \begin{bmatrix} 15 & 0 & 0 & 22 & 0 & 15 \\ 0 & 11 & 3 & 0 & 0 & 0 \\ 0 & 0 & 0 & 6 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 91 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 28 & 0 & 0 & 0 \end{bmatrix}$$

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Algorithm:-

```
{
Construct sparse matrix, b(rows, col, temp)
as output result:
current B=0;
if (terms>0)
{
for (i=0; c<col/p; c++)
for (i=0; i<temp; i++)
if (sm array[i] col==c)
{
b.sm array[current B]. row= sm array[i]. col;
b. sm array[current B]. col = sm array[i]. row;
b.sm array [current B+1]. value = sm array[i]. value;
}
}
return b
}
```

3. Write an algorithm to perform the insertion and deletion operations on ordinary queue.

-> i) Insertion:

Step 1: If (Rear : Size) there is Queue is full (or)
If rear=max write "OVER" print "Queue" is full
Goto step 4
[End of if]

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step2: If front = -1 & Rear = -1
SET front = rear = 0
else
SET rear = Rear = + 1
[End of If]

Step 3: SET Queue [rear] = num

Step 4: Exit

ii) Deletion :

Step 1: If [front = 0] then
print "Queue is Empty"
Goto step 4
[End of if]

Step 2: Else
ITEM = Queue [front]

Step 3: If [front = rear]
Rear = 0
Front = 0
else
front = front + 1
[End of if]

3. Explain how multiple stacks can be implemented in a single dimension array.

→ To implement multiple stacks in a single array one approach is to divide the array into slots of size n/k each and fix the slots for different stacks, we can use arr[0] to arr[n/k - 1] for first stack, and arr[n/k] to

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arr[2n-1-i] for stack 2 and x on where arr[] is the array of size n.

Algorithm

Step 1: Here we use 2 arrays min[] and max[] to represent the lower and upper bounds for a stack.

Step 2: Array[] stores the elements the top index for each stack.

Step 3: Arrays stores the elements of the stack.

Step 4: Variable ms represents the stack number.

Step 5: Variable size represents the size for each represent array.

Step 6: First we build a function ~~create stacks() to create~~ init() to initialize the stacks values.

Step 7: Then we have a function create stacks() to create the stack.

Step 8: function push() & pop() are use to push and pop and element to and from.

Step 9: function display() is used to display the element in particular stack.

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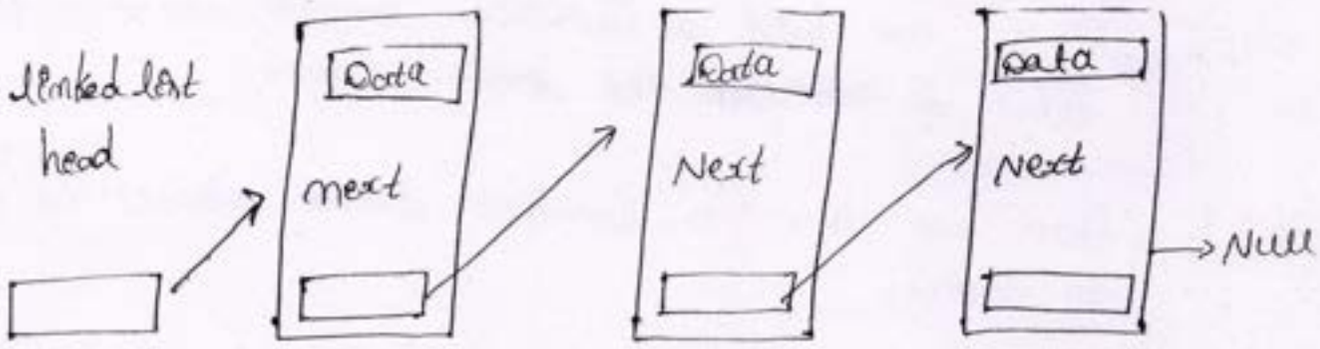
3a. Define Linked list. Explain the operations that can be performed on linked lists. List different variations of lists.

→ Linked list: A linked list is a sequence of data structure which are connected together via links.

Linked list is a sequence of links which contains item each link contains connections to the another link.

link- each link of a linked list store a data called an element Next-Each link of a linked list contain to next linked called next. linked list. A linked list contains the connection link to be first link called first.



→ linked list contains all link element called first.
→ Each link carries a data fields and a link field called next.
→ Each line is linked with next using next link.

Operations :-

Following are the basic operation supported by list:

* Insertion - add an element at the beginning of the list.
* Deletion - delete an element at the beginning of the list.
* search - search an element using given by

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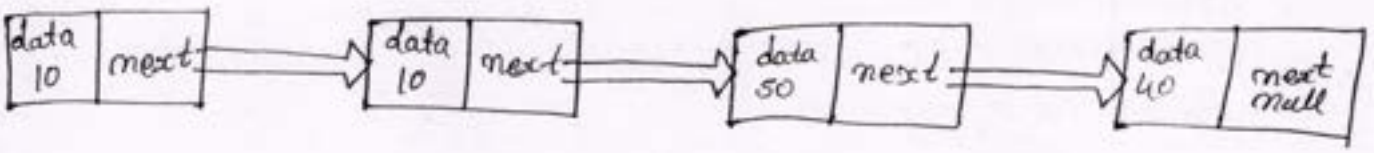
* Delete - Delete an element using given by

Types:

1. singly linked list:

Linked list is one of the fundamental data structures and can be used to implement other data structure. In a linked list there are different number of nodes. Each node is consists of two field holds the value or data and the second fields holds the value or data and the second fields holds the reference to the next node or null is linked lists is empty.



2. Doubly linked list:

A doubly linked list is a sequential structure but consist linked records called nodes.

In doubly linked list, each nodes consist of

1. Two address fields are one pointing to next node and other pointing to the previous pointers.

2. and one data part that is used to store the data of the node.

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6. Discuss the Implementation of Stacks using Linked list.

-> A stack is represented using nodes of a linked list. Each node consists of two parts: data & next. The data part of each node contains the assigned value & the next points to the node containing the next item in the stack. The top refers to the topmost node in the stack. Both the push() & pop() operations are carried out at the Front (top of the linked list and hence take O(1) time.

A stack can also be implemented using arrays. But arrays are of limited size & the size of the stack has to be predetermined, whereas, in a linked list, implementation nodes can be added according to the user's requirement.

```
#include <stdio.h>
#include <stdlib.h>
struct Node
 {
  int data;
  struct Node * next;
 };
Node * top = NULL;
void push (int value)
 {
 struct Node * newNode;
newNode = (struct Node*)malloc (sizeof (struct Node));
newNode -> data = value;
 if (top == NULL)
 {
newNode -> next = NULL;
 }
else
```

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```
{
newNode -> next = top;
}
top = newNode;
printf ("Node is inserted \n");
}
int pop()
{
if (top == NULL)
{
printf ("\n Stack underflow \n");
}
else
{
struct Node *temp = top;
int temp_data = top -> data;
top = top -> next;
free (temp);
return temp_data;
}
}
void display()
{
if (top == NULL)
{
printf ("Stack is underflow \n");
}
else
{
printf ("The stack is \n");
```

```
Struct Node* temp = top;
while (temp->next != NULL)
{
printf ("%d-->", temp->data);
temp = temp->next;
}
printf("%d---> NULL\n", temp->data);
}
}
int main()
{
int choice, value;
printf("\n Implementation of stack using Linked List\n");

while(1)
{
printf(" 1.Push\n 2. Pop\n 3.Display\n 4.Exit\n");
printf("\n Enter your choice:");
scanf("%d", &choice);
switch(choice)
{
case 1: printf("\n Enter the value to insert:");
        scanf("%d", &value);
        push(value);
        break;
case 2: printf("popped element is:%d\n", pop());
        break;

case 3: display();
        break;
```

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```
case 4: exit(0);
        break;
default: printf("\n wrong choice\n");
  }
 }
}
```

~~b. Discuss the~~

C. What is DLL? write an algorithm to perform following operation on DLL.

i) Insertion of an element at the rear end.

ii) Delete a node whose info part is given.

→ i) Insertion of an element at the rear end.

Step 1: If AVAIL=NULL Goto step 11
Step 2: set New_NODE = AVAIL
Step 3: set AVAIL = AVAIL -> Next
Step 4: New NODE -> DATA = VAL
Step 5: set New NODE -> NEXT = NULL
Step 6: set PTR = START
Step 7: Repeat step 8
PTR=START
PTR->NEXT != NULL
Step 8: set PTR = PTR -> NEXT
[END of Loop]
Step 9: SET PTR -> NEXT = NEW_NODE
Step 10: Set NEW_NODE -> PREV = PTR
Step 11: EXIT.

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ii) Delete a node whose info part is given.

Step 1 : If START = NULL
write overflow
Goto step 9
[End of if]

Step 2: set PTR = START

Step 3: Repeat step 4 while
PTR -> NEXT = NULL

Step 4: SET PTR = PTR -> NEXT

Step 5 : SET PTR -> PREV -> NEXT = NULL

Step 6 : FREE PTR

Step 7 : EXIT.

---

6. b. Discuss the Implementation of Queues using Linked List.

→ A queue is a special type of data structure where insertion takes place at one end and elements are deleted at the other end.

Implementing a queue using a linked list allows us to grow the queue as per the requirements i.e., memory can be allocated dynamically.

A queue implemented using a linked list will not change its behaviour and will continue to work according to the FIFO principle.

Steps for implementing queue using linked list:

① Enqueue function:

Enqueue function adds an element to the end of the queue. It take O(1) time. The last element can be tracked using the rear pointer.

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a) Dequeue function;

The dequeue function always removes the first element of the queue. It takes O(1) time. For deque, the queue must contain at least one element, else underflow conditions will occur.

C. What is a Dequeue? Discuss the implementation of Deque using Singly Linked List.

→ A Dequeue is a special type of data structure in which insertion are done from both ends and deletions are done at both ends.

dequeue using SLL

```
insert ~~front~~ rear (NODE first, int item)
{
NODE newnode, cur;
newnode = (NODE) malloc (sizeof (struct node));
new node -> info = item;
new node -> link = null;
    if (first == NULL)
   return newnode;
    cur = first;
while (cur -- link != NULL)
cur = cur -> link;
cur -> link = newnode;
}
Node delete front(NODE first)
{
NODE temp;
if (first == NULL)
{
printf ("empty list - no deletion");
```

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```
return NULL;
}
temp= first;
first= first->link;
printf("\n Delete node info=%d", temp->info);
free (temp);
}
NODE delete_rear (NODE first)
{
if (first==NULL)
{
printf("\n empty list no deletion");
}
if (first->link== NULL)
{
printf("\nItem deleted in %d");
first->info;
free (first);
return NULL;
}
```

3. Write an algorithm to create an ordered linked list.

→
```
NODE insert(int item, NODE first)
{
NODE temp, prev, cur;
temp = getnode();
temp->info=item;
temp->link= NULL;
if (first== NULL) return temp;
if (item<= first->info)
{
temp-> link = first
```

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```
return temp;
}
prev = NULL;
cur = first;
while (cur != NULL && item > cur->info)
{
prev = cur;
cur = cur->link;
}
prev->link = temp;
temp->link = cur;
return first;
}
```

4a) Algorithm to Create Ordered link list.

Step1: Create a node

↳ temp = getnode();
temp→info = item;
temp→link = NULL;

Step2:- Check for Empty list:-

↳ if(first == NULL)
return temp;

Step3:- Inserting an item

↳ temp→link = first;
return temp;
if(item <= first→info)
{
temp→link = first;
return temp;
}

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Step 4:- Inserting middle of list

↳ Prev = NULL;
Cur = first;
while(cur != NULL && item = cur->info)
{
Prev = Cur;
Cur = cur->link;
}

Step 5 : Insert at end

↳ Prev->link = temp;
temp->link = cur;

Step 6 :- return first;

Step 7 :- finished

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DEPT. OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: II

Course Name with code: Analog and Digital Electronics (21CS33) DATE: 14/01/2023
Class : 3rd Semester ('A') **MAX MARKS**: 40
NOTE: Answer TWO full questions.

1 a) Define Static -1 hazard explain how static -1 hazard can be detected and removed with an example. 08M [CO2]

b) Implement the following using 3:8 decoder.
$f1(a,b,c,d) = \Sigma_m(0,4,6,7)$
$f2(a,b,c,d) = \Sigma_m(1,4,5)$ 06M [CO2]

c) Explain simulation and testing of Digital circuits. 06M [CO2]

OR

2 a) What is multiplexer and explain 8:1 mux with the help of logic diagram and corresponding expression. 08M [CO4]

b) Construct SR gates latch using NAND gates and derive the characteristic equation for the same. 08M [CO4]

c) Explain the Importance of 3 state buffer. 04M [CO2]

3 a) Construct 32:1 mux using 8:1 mux and 2:4 decoder. 07 M [CO4]

b) Implement the following Boolean function using an appropriate PLA.
$f1(a,b,c,d) = \Sigma_m(0,4,6,7)$
$f2(a,b,c,d) = \Sigma_m(1,4,5)$ 07M [CO2]

c) With a neat diagram, explain 3 to 8 line decoder. 06 M [CO4]

OR

4 a) Explain the Application of SR latch in switch debouncing technique. 06M [CO4]

b) Explain gated 'D' latch with necessary timing diagram and characteristic equation. 08 M [CO4]

c) Realize a full adder using PAL. 06M [CO2]

****

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INTERNAL ASSESMENT TEST - II

1) a) Define Static - 1 hazard explains how static - 1 hazard can be detected and removed with on example.

=> If in response to any single input change and for some combination of propagation delays a circuit output may momentarily go to 0 when it should remain a constant 1, we say that the circuit has a static 1-hazard.

Detection of static 1 Hazard :- Hazards can be detected using a Karnaugh map (K-map). As seen on the map, no loop covers both minterms ABC and $AB\bar{C}$. So if A = C = 1 and B changes, both terms can momentarily go to 0, resulting in a glitch in F. -4M-

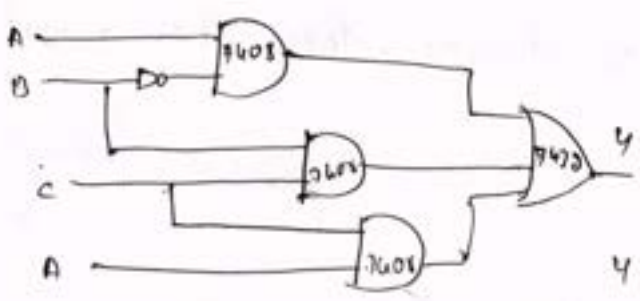
We can detch hazards in two level AND - OR circuit :

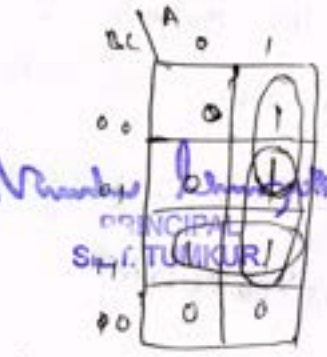
a) write down the sum-of-products expression for the circuit

b) plot each term on the map and loop it

c) If any two adjacent 1's are not covered by the same loop, a 1-hazard exists for transition between the two 1's. For an n-variable map, this transition occurs when one variable changes and other n-1 variables are held constant.

To eliminate static 1-hazard : If we add a loop to the map then add the corresponding gate to the circuit. this eliminates the hazard. The term AC remains 1 while B is changing, so no glitch can appear in the output. Note that F is no longer a minimum sum of produces. -4m.



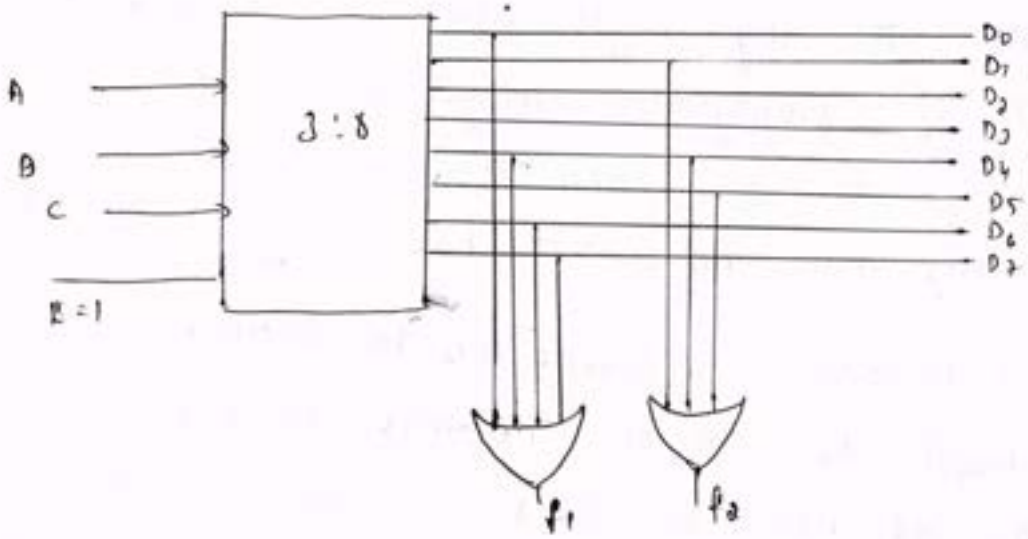


$Y = A\bar{B} + BC + AC$

3) b) Implement the following using 3:8 decoder.

$f_1(a,b,c,d) = \Sigma m(0,4,6,7)$

$f_0(a,b,c,d) = \Sigma m(1,4,5)$



6M

1) c) Explain simulation and testing of Digital circuits

=) Simulation is done for following reasons

i) Verification that the design is logically correct

ii) Verification that the timing of logic signals is correct

iii) Simulation of Faulty components in the circuit as an aid to finding tests for the circuit

1M

A simple simulator for combinational logic works as follows

1) The circuit inputs are applied to the first set of gates in the circuit. and the outputs of those gates are calculated.

2) The outputs of the gates which changed in the previous step are fed into the next level of gate inputs. If the input to any gate has changed. then the output of that gate is calculated.

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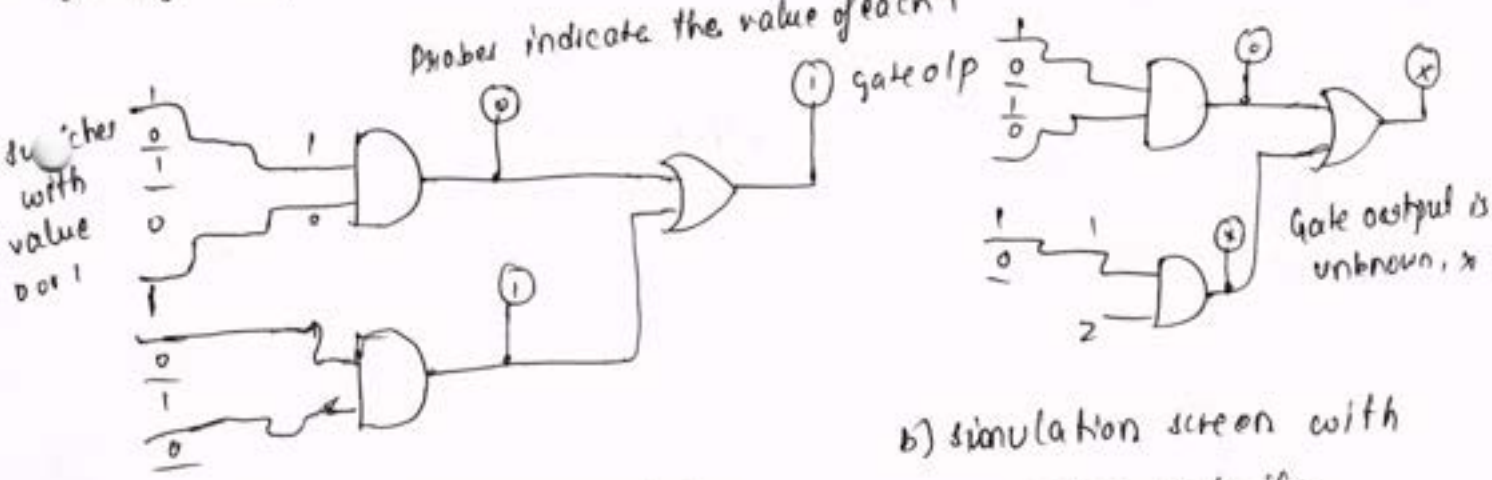
3) Step 2 is repeated until no more changes in gate inputs occurs. The circuit is then in a steady state condition and output may be read.

4). Steps 1 through 3 are repeated every time a circuit input changes

— 2M —

Four valued logic simulation :

The two logic values 0 and 1 are not suffient for simulating logic circuits. At times the value of a gate input or output may be unknown and we will represent this unknown value by x. At other times we may have no logic signal at an input, as in the case of an open circuit when an input is not connected to any output we use the logic value z to represent an open circuit, or high impedence (hi-z) connection.



a) Simulation screen showing switches

b) simulation screen with missing gate i/p

— 2M

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·	0	1	x	z
0	0	0	0	0
1	0	1	x	x
x	0	x	x	x
z	0	x	x	x

+	0	1	x	z
0	0	1	x	x
1	1	1	1	1
x	x	1	x	x
z	x	1	x	x

For an AND gate,

- If one of the inputs is 0, the output is always 0 regardless of the other input
- If one input is 1 and the other input is x, then the output is x.
- If one input is 1 and the other input is z, then the output is x.

For an OR gate

- If one of the input is 1, the output is 1 regardless of the other input.
- If one input is 0 and other input is x or z, the output is unknown.

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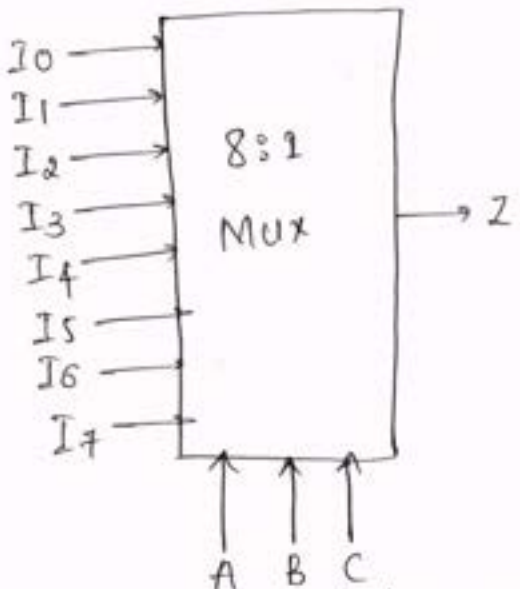
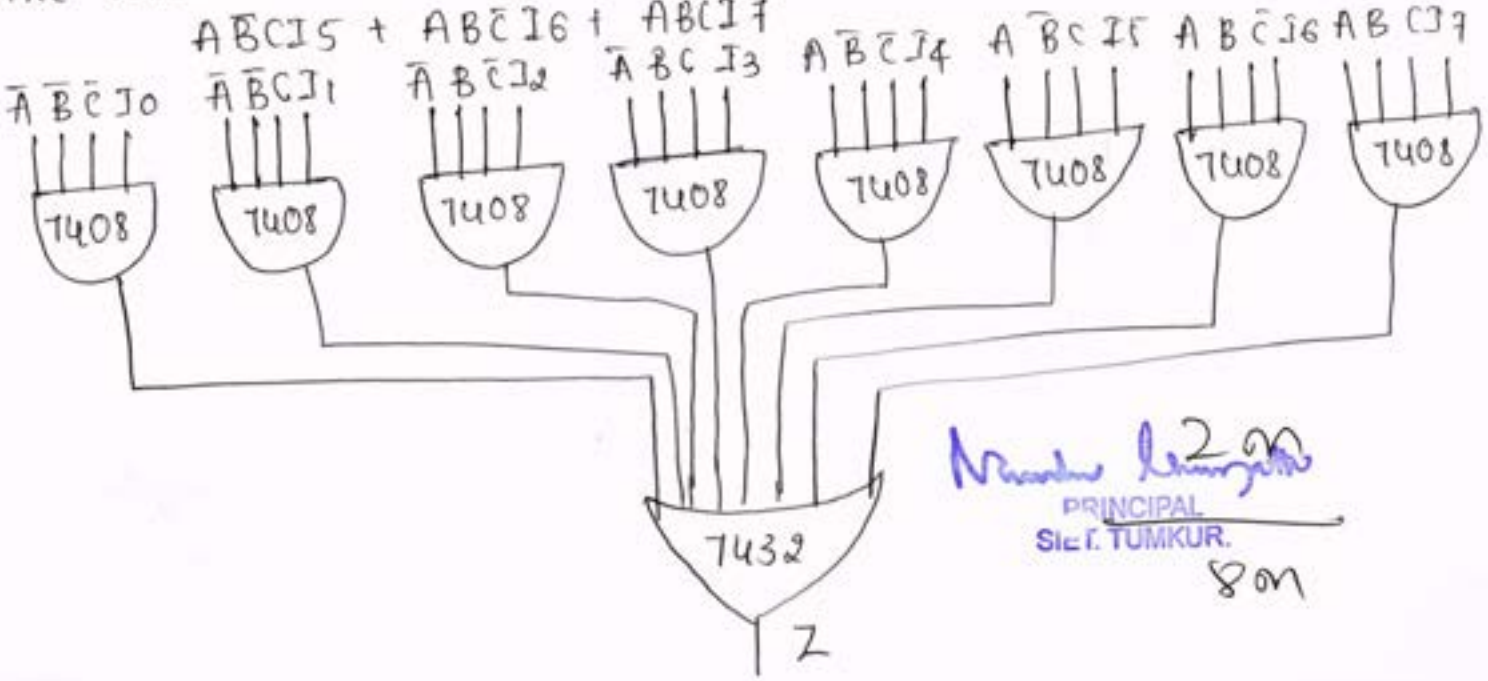
2) a) What is Multiplexer and Explain 8:1 mux with the help of logic diagram and corresponding Expression

⇒ A multiplexer has a group of data inputs and a group of control inputs. The control inputs are used to select one of the data inputs and connect it to the output terminal — 2m



2m

The 8-to-1 mux transmits one of the four inputs to the output Three control inputs (A, B, C) are needed to select one of the eight inputs. If the control input are ABC=000 the output is I0; Similarly, the control input is 001, 010, 011, 100, 101, 110, 111 give outputs outputs of I1, I2, I3, I4, I5, I6 & I7 respectively, to 8-to-1 multiplexer is described by the equation $Z = \bar{A}\bar{B}\bar{C}I_0 + \bar{A}\bar{B}CI_1 + \bar{A}B\bar{C}I_2 + \bar{A}BCI_3 + A\bar{B}\bar{C}I_4 + A\bar{B}CI_5 + AB\bar{C}I_6 + ABCI_7$ → 2m.



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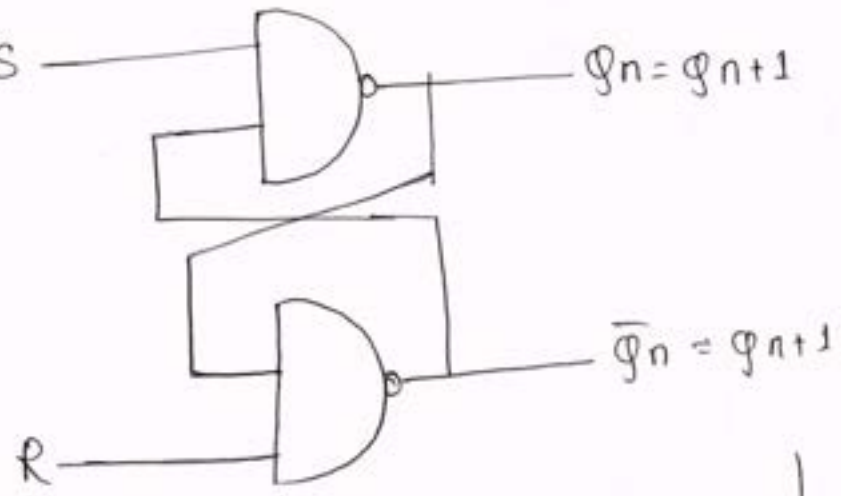
a)
b) Construct SR gate using NAND gates and derive the Characteristic Equation for the same

=>



2m

(i) $S=0 \quad R=0$

$Q_{n+1} = \overline{0 \cdot \bar{Q}_n} = \bar{0} = 1$

$\overline{Q_{n+1}} = \overline{0 \cdot Q_n} = \bar{0} = 1$

(ii) $S=0, \quad R=1$

$Q_{n+1} = \overline{0 \cdot \bar{Q}_n} = \bar{0} = 1$

2m

(iii) $S=1, \quad R=0$

$Q_{n+1} = \overline{1 \cdot \bar{Q}_n} = Q_n$

$\overline{Q_{n+1}} = \overline{0 \cdot Q_n} = \bar{0} = 1$

If $\overline{Q_{n+1}} = 1$

$Q_{n+1} = 0$

(iv) $S=1, \quad R=1$

$Q_{n+1} = \overline{1 \cdot \bar{Q}_n}$

$Q_{n+1} = Q_n$

$\overline{Q_{n+1}} = \overline{1 \cdot Q_n}$

$\overline{Q_{n+1}} = \bar{Q}_n$

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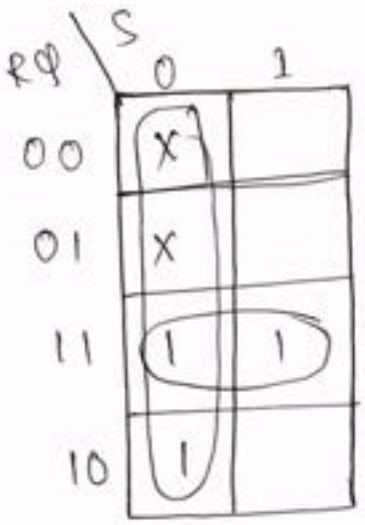
S	R	Q_n	Q_{n+1}	
0	0	0	X	} I.D
0	0	1	X	
0	1	0	1	} Set
0	1	1	1	
1	0	0	0	} Reset
1	0	1	0	
1	1	0	Q_n	} No change
1	1	1	$\bar{Q}_n$	

2m



$Q_{n+1} = \bar{S} + RQ$

2m

8m

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e) Explain the imp

(C) Importance of 3 state Buffers used in

(i) mux
(ii) Combinational circuits
(iii) etc

Any one in brief. Explain - 4m.

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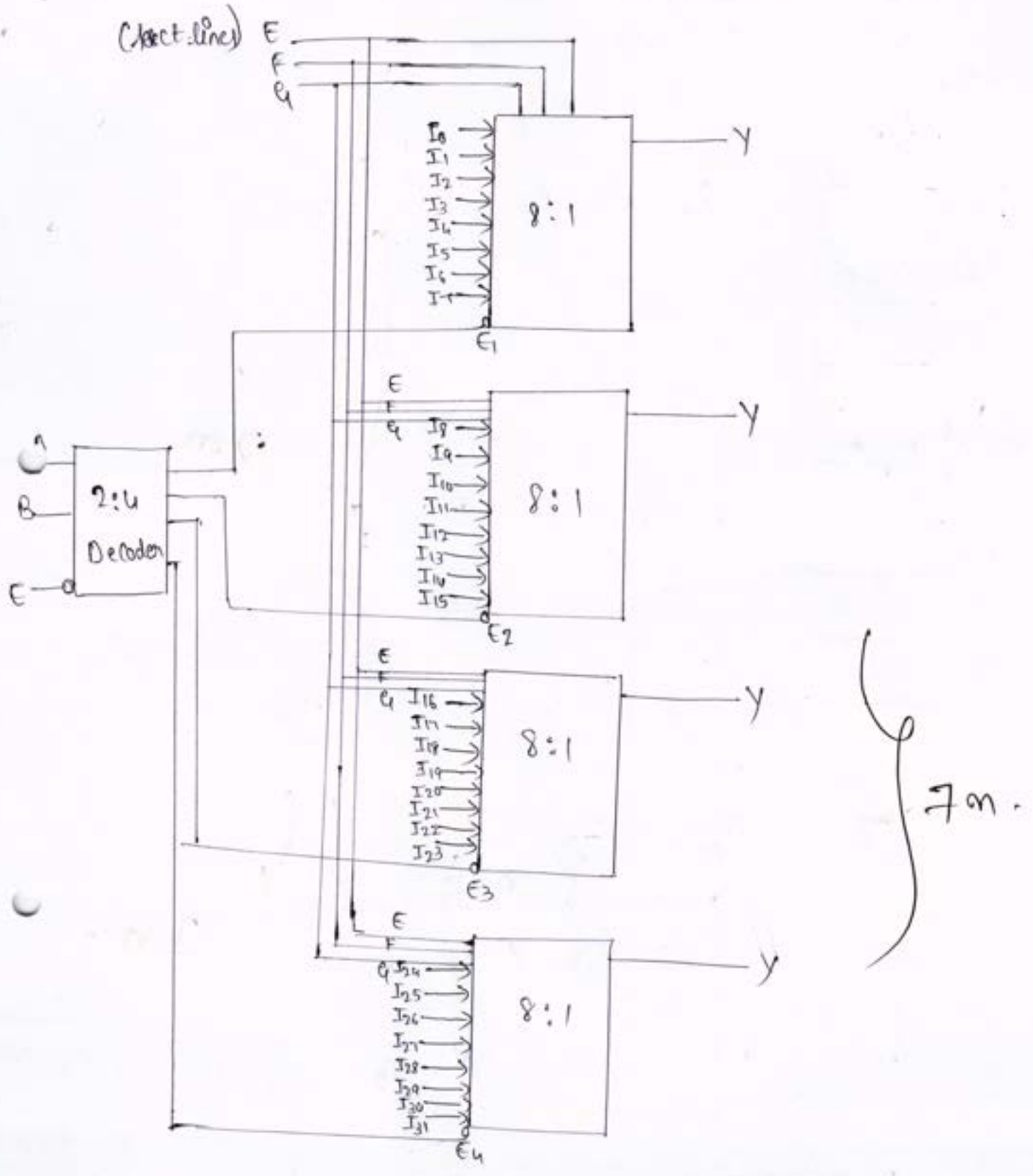
3) (a) Construct 32:1 mux using 8:1 mux and 2:4 decoder.



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3) b) Implement the following Boolean function using an appropriate PLA.

$f_1(a,b,c) = \Sigma_m(0,4,6)$

$f_2(a,b,c) = \Sigma_m(4,6)$

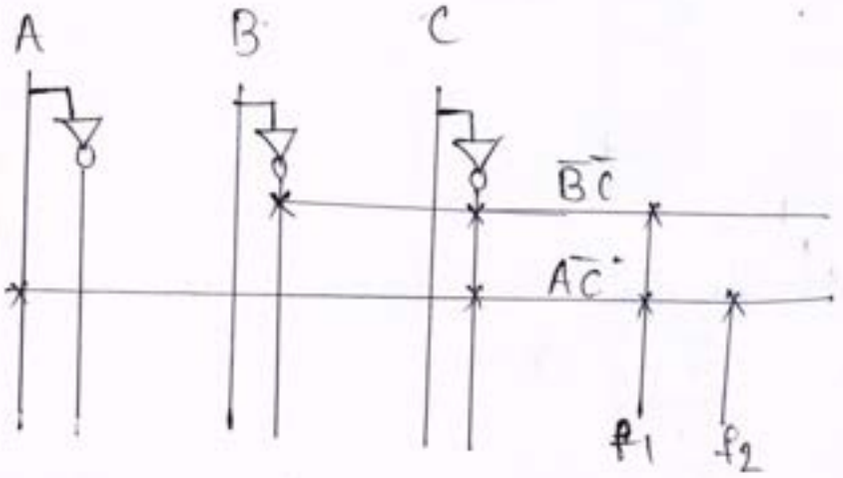
BC \ A	$\bar{A}$	A
$\bar{B}\bar{C}$	1	1
$\bar{B}C$	0	0
BC	0	0
$B\bar{C}$	0	1

$f_1 = \bar{B}\bar{C} + A\bar{C}$

BC \ A	$\bar{A}$	A
$\bar{B}\bar{C}$	0	1
$\bar{B}C$	0	0
BC	0	0
$B\bar{C}$	0	1

$f_2 = A\bar{C}$

2m



3m

Product term	A	B	C	F_1	F_2
$\bar{B}\bar{C}$	–	0	0	1	0
$A\bar{C}$	1	–	0	1	1

2m

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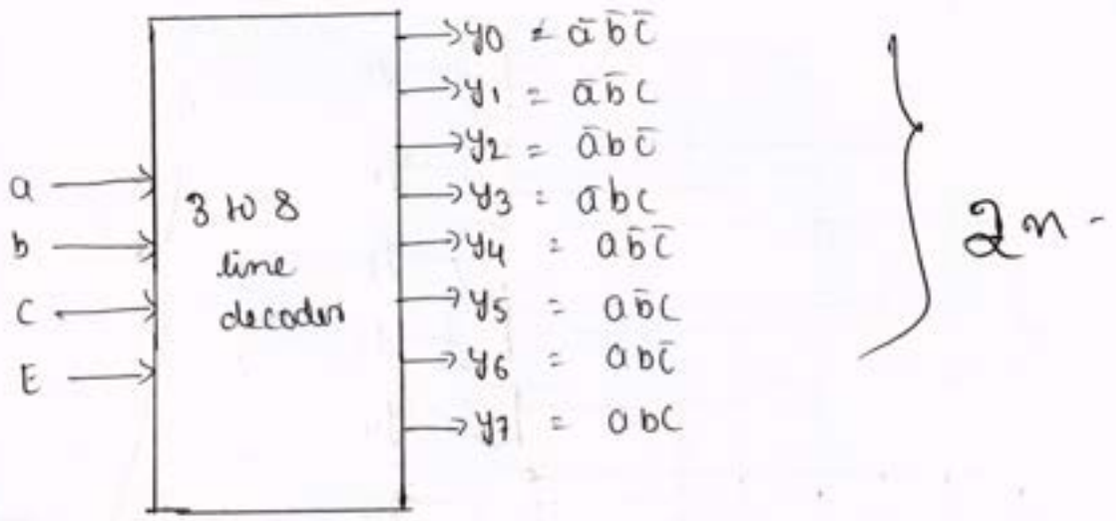
3C] with a neat diagram explain 3 to 8 line decoder



E	a	b	c	y_0	y_1	y_2	y_3	y_4	y_5	y_6	y_7
0	X	X	X	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	0	0	0	0
1	0	0	1	0	1	0	0	0	0	0	0
1	0	1	0	0	0	1	0	0	0	0	0
1	0	1	1	0	0	0	1	0	0	0	0
1	1	0	0	0	0	0	0	1	0	0	0
1	1	0	1	0	0	0	0	0	1	0	0
1	1	1	0	0	0	0	0	0	0	1	0
1	1	1	1	0	0	0	0	0	0	0	1

2n.

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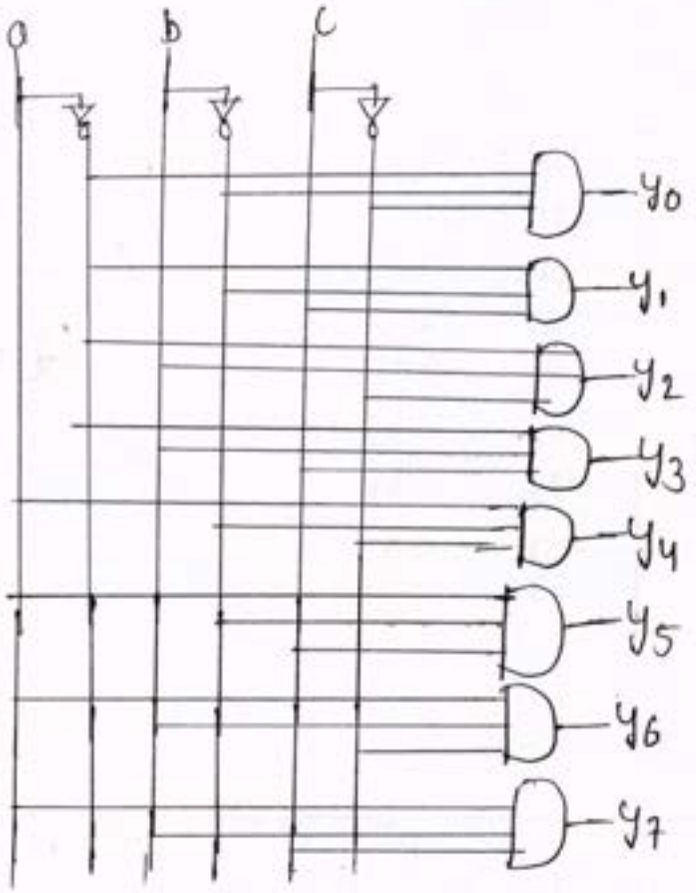

-2 m -

4a] Explain the Application of SR latch in switch debouncing technique

=> When a mechanical switch is opened or closed, the switch contacts tends to vibrate or bounce open and closed several times before settling down to their final position. This produces a noisy transition, and this noise can interface with the proper operation of a logic circuit. The pull-down resistors connected to contacts to logic 0 The pull down resistors connected to contacts a & b ensure that when the switch is blwn a & b the latch inputs S & R will always be at a logic 0 & the latch O/P will not change state.

- 6m -

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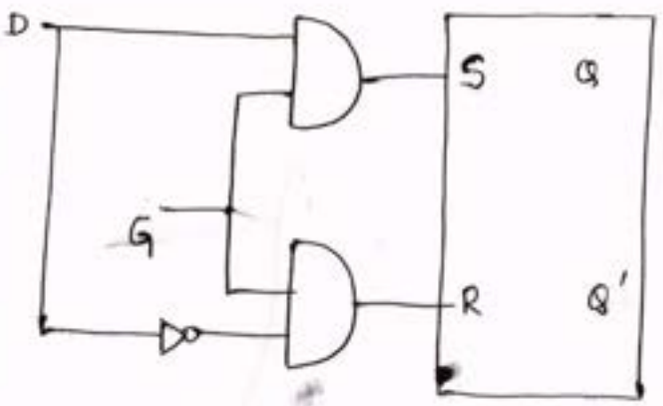
4)
(b) Explain gated 'D' latch with necessary timing diagram and characteristic equation

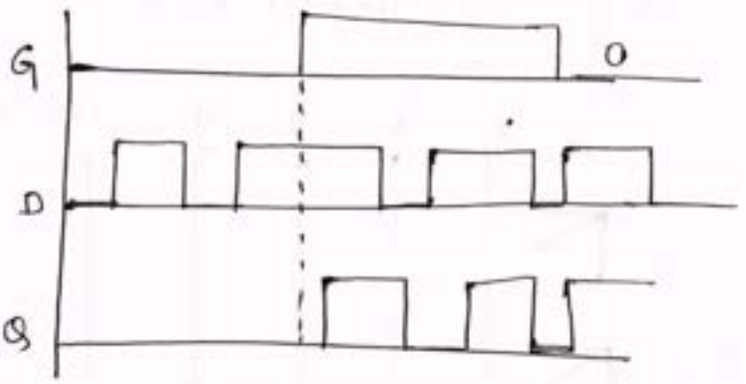
→ * A gated D latch has two inputs - a data input (D) and a gate input (G)

* The D latch can be constructed from an SR latch & gate

* When G=0 S=R=0 Q does not change
* When G=1 & D=1, S=1 & R=0 Q is set to 1
* When G=1 & D=0, S=0 & R=1 Q is reset to 0
* When G=1, the Q output follows the D input
* When G=0, the Q output holds the last value of D

2M

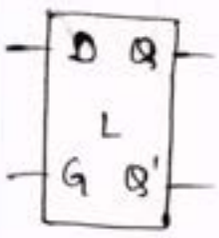




2M

G	D	Q	Q^+
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

2M



Q \ GD	00	01	11	10
0	0	0	1	0
1	1	1	1	0

$$Q^+ = \bar{G}Q + GD$$

→ 2M

4] Realize a full adder using PAL

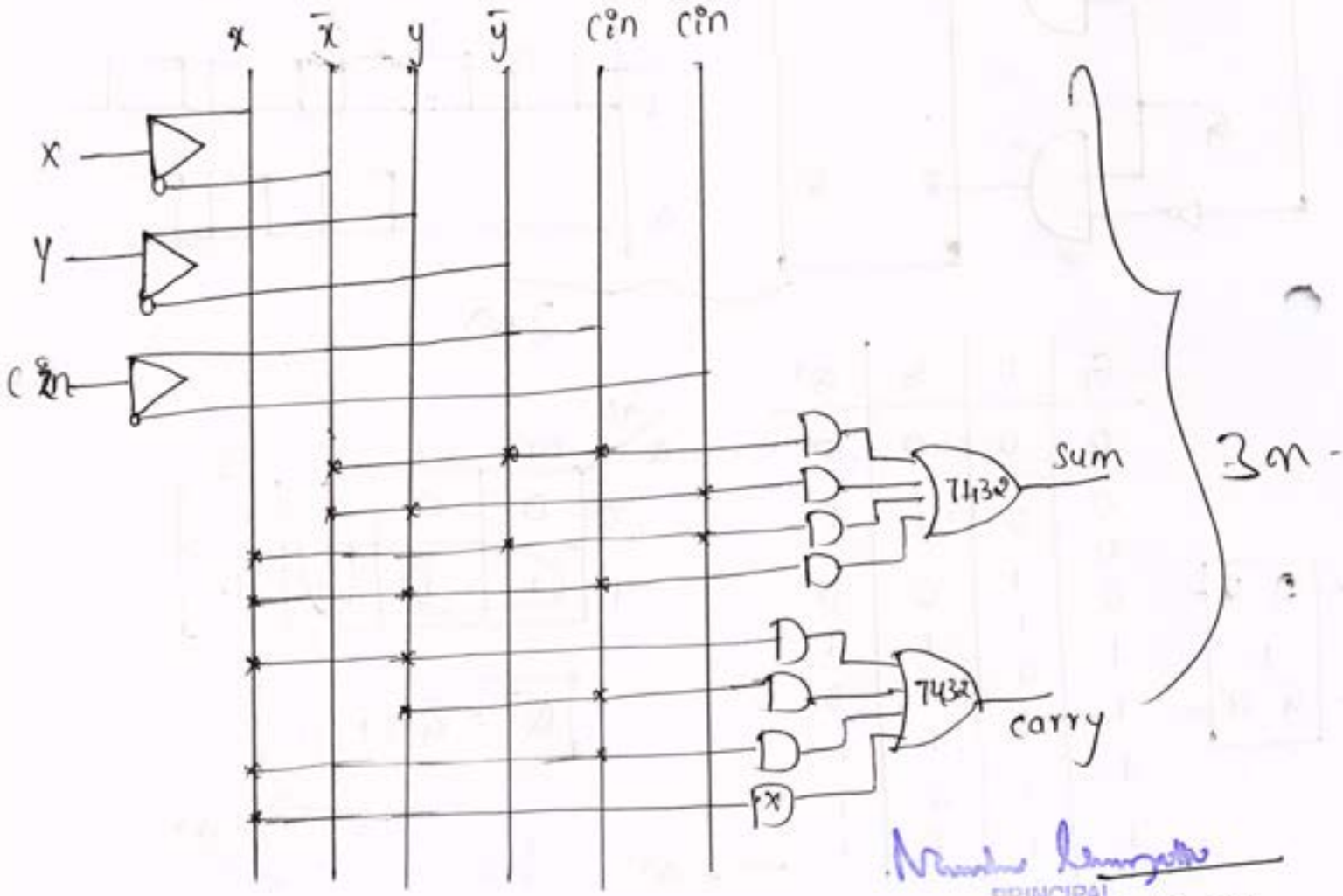
c)

I/P			O/P	
x	y	C-IN	Sum	C-out
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

→ 2m

$Sum = \bar{x}\bar{y}cin + \bar{x}y\bar{cin} + x\bar{y}\bar{cin} + xycin$ → 1m

$Cout = xy + ycin + xcin$



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6m

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INTERNAL ASSESMENT TEST- I DATE: 17/12/2022

Course Name with code: Programming in C++ (21CS382) **MAX MARKS:** 40

Class : 3rd Semester

NOTE: Answer all questions (40*1).

1. Who invented C++?
a) Dennis Ritchie
b) Ken Thompson
c) Brian Kernighan
d) Bjarne Stroustrup

2. What is C++?
a) C++ is an object oriented programming language
b) C++ is a procedural programming language
c) C++ supports both procedural and object oriented programming language
d) C++ is a functional programming languagelk

3. Which of the following is the correct syntax of including a user defined header files in C++?
a) #include [userdefined]
b) #include "userdefined"
c) #include <userdefined.h>
d) #include <userdefined>

4. Which of the following is used for comments in C++?
a) /* comment */
b) // comment */
c) // comment
d) both // comment or /* comment */

5. Which of the following user-defined header file extension used in c++?
a) hg
b) cpp
c) h
d) hf

6. Which of the following is used for implementing the late binding?
a) Operator Functions
b) Virtual Functions
c) Constant Functions
d) All of above

7. Which of the following statement is not true about C++?
a) A class cannot have the private members
b) Members of a class are public by default
c) A structure can have the member functions
d) All of the above

8. Which of the following is not a type of Constructor in C++?
a) Default constructor
b) Parameterized constructor

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c) Copy constructor
d) Friend constructor

9. Which of the following is a correct identifier in C++?
a) VAR_1234
b) $var_name
c) 7VARNAME
d) 7var_name

10. Which of the following approach is used by C++?
a) Left-right
b) Right-left
c) Bottom-up
d) Top-down

11. What happens if the following C++ statement is compiled and executed?
```
int *ptr = NULL;
delete ptr;
```
a) The program is not semantically correct
b) The program is compiled and executed successfully
c) The program gives a compile-time error
d) The program compiled successfully but throws an error during run-time

12. What will be the output of the following C++ code?
```
#include <iostream>
#include <string>
using namespace std;
int main(int argc, char const *argv[])
{
        char s1[6] = "Hello";
        char s2[6] = "World";
        char s3[12] = s1 + " " + s2;
        cout<<s3;
        return 0;
}
```
a) Hello
b) World
c) Error
d) Hello World

13. What happens if the following program is executed in C and C++?
```
#include <stdio.h>
int main(void)
{
        int new = 5;
        printf("%d", new);
}
```
a) Error in C and successful execution in C++
b) Error in both C and C++
c) Error in C++ and successful execution in C
d) A successful run in both C and C++

14. What happens if the following program is executed in C and C++?
```
#include <stdio.h>
```

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```
void func(void)
{
        printf("Hello");
}
void main()
{
        func();
        func(2);
}
```

a) Outputs Hello twice in both C and C++
b) Error in C and successful execution in C++
c) Error in C++ and successful execution in C
d) Error in both C and C++

15) Which of the following C++ code will give error on compilation?

==========code 1==========

```
#include <iostream>
using namespace std;
int main(int argc, char const *argv[])
{
        cout<<"Hello World";
        return 0;
}
```

==========

==========code 2==========

```
#include <iostream>
int main(int argc, char const *argv[])
{
        std::cout<<"Hello World";
        return 0;
}
```

==========

a) Code 1 only
b) Neither code 1 nor code 2
c) Both code 1 and code 2
d) Code 2 only

16) Which of the following type is provided by C++ but not C?
a) double
b) float
c) int
d) bool

17) What will be the output of the following C++ code?

```
1.  #include <iostream>
2.  using namespace std;
3.  int main()
4.  {
5.      char c = 74;
6.      cout << c;
7.      return 0;
8.  }
```

a) I
b) J

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c) A
d) N

18) What is Inheritance in C++?
a) Deriving new classes from existing classes
b) Overloading of classes
c) Classes with same names
d) Wrapping of data into a single class

19) Which of the following symbol is used to declare the preprocessor directives in C++?
a) $
b) ^
c) #
d) *

20) What is meant by a polymorphism in C++?
a) class having only single form
b) class having four forms
c) class having many forms
d) class having two forms

21) What is abstract class in C++?
a) Any Class in C++ is an abstract class
b) Class from which any class is derived
c) Class specifically used as a base class with atleast one virtual functions
d) Class specifically used as a base class with atleast one pure virtual functions

22) Which of the following two entities (reading from Left to Right) can be connected by the dot operator?
a) class member and a class object.
b) class object and a class.
c) class and a member of that class.
d) class object and a member of that class.

23) How can we make a class abstract?
a) By making all member functions constant.
b) By making at least one member function as pure virtual function.
c) By declaring it abstract using the static keyword.
d) By declaring it abstract using the virtual keyword.

24) Which of the following statements is correct when a class is inherited publicly?
a) Public members of the base class become protected members of derived class.
b) Public members of the base class become private members of derived class.
c) Private members of the base class become protected members of derived class.
d) Public members of the base class become public members of derived class.

25) Which of the following access specifies is used in a class definition by default?
a) Protected
b) Public
c) Private
d) Friend

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26) What is the benefit of c++ input and output over c input and output?
a) Both Type safety & Exception
b) Sequence container
c) Exception
d) Type safety

27) Which of the following is the default return value of functions in C++?
a) int
b) char
c) float
d) void

28) An inline function is expanded during _____
a) compile-time
b) run-time
c) never expanded
d) end of the program

29) Which of the following feature is used in function overloading and function with default argument?
a) Encapsulation
b) Polymorphism
c) Abstraction
d) Modularity

30) How many indicators are available in c++ ?
a) 4
b) 3
c) 2
d) 1

31) Which header file is used with input and output operations of C in C++?
a) stdio.h
b) cstdio
c) iostream
d) streamio

32) Which will be used with physical devices to interact from C++ program?
a) Programs
b) Library
c) Streams
d) Iterators

33) How many streams are automatically created when executing a program?
a) 1
b) 2
c) 3
d) 4

34) From which function the execution of a C++ program starts?
a) start() function
b) main() function

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c) new() function
d) end() function

35) Which of the following is important in a function?
a) Return type
b) Function name
c) Both return type and function name
d) The return type, function name and parameter list

36) A constructor that accepts _____ parameters is called the default constructor.
a) one
b) two
c) no
d) three

37) Which of the following statement is correct?
a) Constructor has the same name as that of the class.
b) Destructor has the same name as that of the class with a tilde symbol at the beginning.
c) Both A and B.
d) Destructor has the same name as the first member function of the class.

38) Which of the following statement is incorrect?
a) Constructor is a member function of the class.
b) The compiler always provides a zero argument constructor.
c) It is necessary that a constructor in a class should always be public.
d) Both B and C.

39) Which of the following is not the member of class?
a) Static function
b) Friend function
c) Const function
d) Virtual function

40) Which of the following concepts means determining at runtime what method to invoke?
a) Data hiding
b) Dynamic Typing
c) Dynamic binding
d) Dynamic loading

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Programming in C++ Scheme of Evaluation & Solutions

1) Answer: d
Explanation: Bjarne Stroustrup is the original creator of C++ in 1979 at AT&T Bell Labs.

2) Answer: c
Explanation: C++ supports both procedural(step by step instruction) and object oriented programming (using the concept of classes and objects).

3) Answer: b
Explanation: C++ uses double quotes to include a user-defined header file. The correct syntax of including user-defined is #include "user defined name".

4) Answer: d
Explanation: Both the ways are used for commenting in C++ programming. // is used for single line comments and /* ... */ is used for multiple line comments.

5) Answer: c

Explanation: .h extensions are used for user defined header files. To include a user defined header file one should use #include"name.h" i.e. enclosed within double quotes.

6) Answer: Virtual Functions b)

Explanation:

7) Answer: A structure can have the member functions a)

8) Answer: d
Explanation: Friend function is not a constructor whereas others are a type of constructor used for object initialization.

9) Answer: a
Explanation: The rules for writing an identifier is as follows:
i) may contain lowercase/uppercase letters, digits or underscore(_) only
ii) should start with a non-digit character
iii) should not contain any special characters like @, $, etc.

10) Answer: c
Explanation: C++ is an object-oriented language and OOL uses a bottom-up approach to solve/view a problem.

11) Answer: b
Explanation: The above statement is syntactically and semantically correct as C++ allows the programmer to delete a NULL pointer, therefore, the program is compiled and executed successfully.

12) Answer: c
Explanation: There is no operation defined for the addition of character array in C++ hence the compiler throws an error as it does not understood what to do about this expression.

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13) Answer: c
Explanation: new is a keyword in C++, therefore, we cannot declare a variable with name new but as there is no such keyword new in C, therefore, the program is compiled and executed successfully in C.

14) Answer: d
Explanation: As the func(void) needs no argument during its call, hence when we are calling func(2) with 2 as passed as a parameter then this statement gives the error in both C++ and C compiler.

15) Answer: b
Explanation: Neither code 1 nor code 2 will give an error as both are syntactically correct as in first code we have included namespace std and in second one we have used scope resolution operator to resolve the conflict.

16) Answer: d
Explanation: C++ provides the boolean type to handle true and false values whereas no such type is provided in C.

17) Answer: b
Explanation: The literal value for 74 is J. So it will be printing J.

18) Answer: a
Explanation: Inheritance is the concept of OOPs in which new classes are derived from existing classes in order to reuse the properties of classes defined earlier.

19) Answer: c
Explanation: # symbol is used to declare the preprocessor directives.

20) Answer: c
Explanation: Polymorphism is literally meant class having many forms.

21) Answer: d
Explanation: An abstract class is defined as a class which is specifically used as a base class. An abstract class should have atleast one pure virtual function.

22) Answer: Option D

23) Answer: Option B

24) Answer: Option D

25) Answer: Option C

26) Answer: a
Explanation: C++ input and output are type safety that means we don't need to specify the type of variable we are printing.
eg:
in C we need to specify %d showing that an integer will be printed, whereas in C++ we just cout the variable.

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printf("%d", a);
cout<<a;

27) Answer: a

Explanation: C++ uses int as the default return values for functions. It also restricts that the return type of the main function must be int.

28) Answer: a
Explanation: An inline function is expanded during the compile-time of a program.

29) Answer: b
Explanation: Both of the above types allows a function overloading which is the basic concept of Polymorphism.

30) Answer: b
Explanation: There are three indicators are available in C++. They are Error indicator, End-Of-File indicator and Position indicator.

31) Answer: b
Explanation: Input and Output operations of c can be performed in C++ using the C Standard Input and Output Library.

32) Answer: c
Explanation: C++ library uses streams to operate with physical devices such as Keyboards, Printers, Terminals or with any other type of files supported by the system.

33) Answer: c
Explanation: There are streams that are automatically created when executing a program. They are stdin, stdout and stderr.

34) Answer: b
Explanation: The execution of a C++ program starts from the main() function.

35) Answer: c
Explanation: The important things required in a function is its return type and its name other than that parameter list are optional which a function may or may not have.

36) Answer: Option C

Constructor with no parameters or any number of parameters with default values is called default constructor.
constrctr()
or
constrctr(int a = 1, int b = 2)

37) Answer: Option C

38) Answer: Option D

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39) Answer: Option B

In a class, the private data can be accessed only by the public member function of that class. c++ provides a mechanism in which a non member can have access to the private member of a class. This is achieved by the non_member function "friend" to the class, whose private data can be accessed.

40) Answer: Option C

Dynamic binding binds the data at the run time. Whereas static is at the time of compiling.

41) Answer: Option B

a derived class has all information about a base class and also some extra bit of information. Now a pointer to a derived class will require more space and that is not sufficient in base class. So the a pointer to a derived class cannot point to it. While on the other hand the reverse is true.

42) Answer: Option B

43) Answer: Option D

44) Answer: Option C

45) Answer: Option C

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DEPT. OF CSE / ISE / AI and DS

INTERNAL ASSESMENT TEST-2 DATE: 27/03/2023
Course Name with code: Programming in C++ [21CS382] **MAX MARKS:** 40
NOTE: Answer all questions (40*1Marks).

1. What are mandatory parts in the function declaration?
a) return type, function name b) return type, function name, parameters c) parameters, function named) parameters, variables
2 Which is more effective while calling the functions?
a) call by value b) call by reference c) call by pointer d) call by object
3 What is the scope of the variable declared in the user defined function?
a) whole program b) only inside the {} block c) the main function d) header section
4 How many minimum number of functions should be present in a C++ program for its execution?
a) 0 b) 1 c) 2 d) 3
5 Which of the following is the default return value of functions in C++?
a) int b) char c) float d) void
6 What happens to a function defined inside a class without any complex operations (like looping, a large number of lines, etc)?
a) It becomes a virtual function of the class b) It becomes a default calling function of the class
c) It becomes an inline function of the class d) The program gives an error
7 What is an inline function?
a) A function that is expanded at each call during execution b) A function that is called during compile time
c) A function that is not checked for syntax errors d) A function that is not checked for semantic analysis
8 An inline function is expanded during _____
a) compile-time b) run-time c) never expanded d) end of the program
9 When we define the default values for a function?
a) When a function is defined b) When a function is declared c) When the scope of the function is over d) When a function is called
10 Where should default parameters appear in a function prototype?
a) To the rightmost side of the parameter list b) To the leftmost side of the parameter list
c) Anywhere inside the parameter list d) Middle of the parameter list
11 If an argument from the parameter list of a function is defined constant then _____
a) It can be modified inside the function b) It cannot be modified inside the function c) Error occurs d) Segmentation fault
12 Which of the following feature is used in function overloading and function with default argument?
a) Encapsulation b) Polymorphism c) Abstraction d) Modularity
13 How many sequences of statements present in C++?
a) 4 b) 3 c) 5 d) 6
14 When the inheritance is private, the private methods in base class are _____ in the derived class (in C++).
A. Inaccessible B. Accessible C. Protected D. Public
15 Which design patterns benefit from the multiple inheritances?
A. Adapter and observer pattern B. Code pattern C. Glue pattern D. None of the mentioned
16 What is meant by multiple inheritance?
A. Deriving a base class from derived class B. Deriving a derived class from base class
C. Deriving a derived class from more than one base class D. None of the mentioned
17 What will be the order of execution of base class constructors in the following method of inheritance. class a: public b, public c {...};
A. b(); c(); a(); B. c(); b(); a(); C. a(); b(); c(); D. b(); a(); c();
18 Inheritance allow in C++ Program?
A. Class Re-usability B. Creating a hierarchy of classes C. Extendibility D. All of the above.
19 Can we pass parameters to base class constructor though derived class or derived class constructor?
A. Yes B. No C. May Be D. Can't Say
20 What are the things are inherited from the base class?
A. Constructor and its destructor B. Operator=() members C. Friends D. All of the above
21 Which of the following advantages we lose by using multiple inheritance?
A. Dynamic binding B. Polymorphism C. Both Dynamic binding & Polymorphism D. None of the mentioned
22 In inheritance, order of execution of base class and derived class destructors are:
A. Base to derived B. Derived to base C. Random order D. None of the above
23 What is the difference between protected and private access specifiers in inheritance?

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A. Private member is not inheritable and not accessible in derived class. B. Protected member is inheritable and also accessible in derived class. C. Both are inheritable but private is accessible in the derived class.D. Both are inheritable but protected is not accessible in the derived class.

24 Which value is placed in the base class?

A. Derived values B. Default type values C. Both A & B D. None of the mentioned

25 The friend functions and the member functions of a friend class can directly access the_____ data.

A. Private and protected B. Private and public C. Protected and public D. Private, protected and public

26 class X, class Y and class Z are derived from class BASE. This is _____ inheritance.

A. Multiple B. Multilevel C. Hierarchical D. Single

27 Reusability of the code can be achieved in CPP through _____ .

A. Polymorphism B. Encapsulation C. Inheritance D. Both A and C

28 Which symbol is used to create multiple inheritance?

A. Dot B. Comma C. Dollar D. None of the above

29 _____ inheritance may lead to duplication of inherited members from a "grandparent" base class.

A. Multipath B. Multiple C. Multilevel D. Hierarchical

30 C++ Inheritance relationship is?

A. Association B. Is-A C. Has-A D. None of the above

31 What is the output of this program?

```
#include <iostream>
using namespace std;

void find()
void find()
{
  cout<<"course";
}
int main()
{
  find();
  return 0;
}
```

A. course B. coursecourse C. compile time error D. none of the mentioned

32 Can we pass parameters to base class constructor though derived class or derived class constructor?

A. Yes B. No C. May Be D. Can't Say

33 A variable can be declared as reference by putting _____ in the declaration.

A. # B. $ C. & D. *

34 If a function receives a reference to a variable, can it modify the value of the variable?

A. Yes B. No C. We can not pass reference to a variable. D. Reference can not contain function.

35 Through references we can avoid?

A. wastage of memory B. wastage of CPU time C. Both A and B D. None of the above

36 References can be NULL?

A. References has constant value 0. B. References has constant value . C. Yes. D. No

37 Dereference operator is also called as

A. pointer B. Reference operator C. Offset operator D. Deoffset operator

38 Which of the following is an advantage of reference?

A. Safer B. Easier to use C. Time consuming D. Both A and B

39 Which value can we not assign to reference?

A. Integer B. Floating C. Unsigned D. Null.

40 Which of the following statement is correct?

A. A referenced has to be de-referenced to access a value. B. A referenced does not need to be de-referenced to access a value.
C. A referenced has to be double de-referenced to access a value.
D. Whether a reference should be de-referenced or not depends on the type of the reference.

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Course Name with code: Programming in C++ [21CS382] solutions

1. What are mandatory parts in the function declaration?

a) return type, function name
b) return type, function name, parameters
c) parameters, function name
d) parameters, variables

Answer: **A**
Explanation: In a function, return type and function name are mandatory all else are just used as a choice.

2 Which is more effective while calling the functions?

a) call by value
b) call by reference
c) call by pointer
d) call by object

View Answer
Answer: **B**
Explanation: In the call by reference, it will just passes the reference of the memory addresses of passed values rather than copying the value to new memories which reduces the overall time and memory use.

3 What is the scope of the variable declared in the user defined function?

a) whole program
b) only inside the {} block
c) the main function
d) header section

View Answer
Answer: **B**
Explanation: The variable is valid only in the function block as in other.

4 How many minimum number of functions should be present in a C++ program for its execution?

a) 0
b) 1
c) 2
d) 3

View Answer
Answer: **B**
Explanation: The execution of a C++ program starts from main function hence we

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require atleast 1 function to be present in a C++ program to execute and i.e. the main function.

5 Which of the following is the default return value of functions in C++?

a) int
b) char
c) float
d) void

View Answer
Answer: **A**
Explanation: C++ uses int as the default return values for functions. It also restricts that the return type of the main function must be int.

6 What happens to a function defined inside a class without any complex operations (like looping, a large number of lines, etc)?

a) It becomes a virtual function of the class
b) It becomes a default calling function of the class
c) It becomes an inline function of the class
d) The program gives an error

View Answer
Answer: **C**
Explanation: Any function which is defined inside a class and has no complex operations like loops, a large number of lines then it is made inline.

7 What is an inline function?

a) A function that is expanded at each call during execution
b) A function that is called during compile time
c) A function that is not checked for syntax errors
d) A function that is not checked for semantic analysis

Answer: **A**
Explanation: Inline function is those which are expanded at each call during the execution of the program to reduce the cost of jumping during execution.

8 An inline function is expanded during _____

a) compile-time
b) run-time

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c) never expanded
d) end of the program

View Answer
Answer: **A**
Explanation: An inline function is expanded during the compile-time of a program.

9 When we define the default values for a function?

a) When a function is defined
b) When a function is declared
c) When the scope of the function is over
d) When a function is called

View Answer
Answer: **B**
Explanation: Default values for a function is defined when the function is declared inside a program.

10 Where should default parameters appear in a function prototype?

a) To the rightmost side of the parameter list
b) To the leftmost side of the parameter list
c) Anywhere inside the parameter list
d) Middle of the parameter list

View Answer
Answer: **A**
Explanation: Default parameters are defined to the rightmost side of parameter list in a function to differentiate between the normal and default parameters for example if a function is defined as fun(int x = 5, int y) then if we call fun(10) then 10 should be given to x or y because one can apply both logics like x = 10 already defined and 10 passed is for y but if compiler reads it from left to right it will think it is for x and no parameter is given for y, therefore, the compiler will give error.

11 If an argument from the parameter list of a function is defined constant then _____

a) It can be modified inside the function
b) It cannot be modified inside the function
c) Error occurs
d) Segmentation fault

Answer: **B**
Explanation: A function is not allowed a constant member of the parameter list.

12 Which of the following feature is used in function overloading and function with default argument?

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a) Encapsulation
b) Polymorphism
c) Abstraction
d) Modularity

View Answer
Answer: **B**
Explanation: Both of the above types allows a function overloading which is the basic concept of Polymorphism.

13 How many sequences of statements present in C++?

a) 4
b) 3
c) 5
d) 6

Answer: **C**
Explanation: There are five sequences of statements. They are Preprocessor directives, Comments, Declarations, Function Declarations, Executable statements.

14 When the inheritance is private, the private methods in base class are _____ in the derived class (in C++).

A. Inaccessible
B. Accessible
C. Protected
D. Public

View Answer
Ans : A

Explanation: When the inheritance is private, the private methods in base class are inaccessible in the derived class (in C++).

15 Which design patterns benefit from the multiple inheritances?

A. Adapter and observer pattern
B. Code pattern
C. Glue pattern
D. None of the mentioned

View Answer
Ans : A

Explanation: A template is a formula for creating a generic class

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16 What is meant by multiple inheritance?

A. Deriving a base class from derived class
B. Deriving a derived class from base class
C. Deriving a derived class from more than one base class
D. None of the mentioned

View Answer
Ans : C

Explanation: Multiple inheritance enables a derived class to inherit members from more than one parent.

17 What will be the order of execution of base class constructors in the following method of inheritance.class a: public b, public c {...};

A. b(); c(); a();
B. c(); b(); a();
C. a(); b(); c();
D. b(); a(); c();

View Answer
Ans : A

Explanation: b(); c(); a(); the order of execution of base class constructors in the following method of inheritance.class a: public b, public c {...};

18 Inheritance allow in C++ Program?

A. Class Re-usability
B. Creating a hierarchy of classes
C. Extendibility
D. All of the above

View Answer
Ans : D

Explanation: Advantage of inheritance are like re-usability- You can re-use existing class in a new class that avoid re-writing same code and efforts.We can make an application easily extensible.

19 Can we pass parameters to base class constructor though derived class or derived class constructor?

A. Yes
B. No
C. May Be
D. Can't Say

View Answer
Ans : A

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Explanation: Yes, we pass parameters to base class constructor though derived class or derived class constructor.

20 What are the things are inherited from the base class?

A. Constructor and its destructor
B. Operator=() members
C. Friends
D. All of the above

View Answer

Ans : D

Explanation: These things can provide necessary information for the base class to make a logical decision.

21 Which of the following advantages we lose by using multiple inheritance?

A. Dynamic binding
B. Polymorphism
C. Both Dynamic binding & Polymorphism
D. None of the mentioned

View Answer

Ans : C

Explanation: The benefit of dynamic binding and polymorphism is that they help making the code easier to extend but by multiple inheritance it makes harder to track.

22 In inheritance, order of execution of base class and derived class destructors are:

A. Base to derived
B. Derived to base
C. Random order
D. None of the above

View Answer

Ans : D

Explanation: In inheritance, execution order of constructors are always from base to derived and destructors call order is in reverse i.e. from derived to base. In polymorphic classes, means the class that contain virtual functions, we need to make destructor virtual in base class. Other wise the derived class destructor will not be called

23 What is the difference between protected and private access specifiers in inheritance?

A. Private member is not inheritable and not accessible in derived class.
B. Protected member is inheritable and also accessible in derived class.

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C. Both are inheritable but private is accessible in the derived class.
D. Both are inheritable but protected is not accessible in the derived class.

View Answer
Ans : B

24 Explanation: Protected member is inheritable and also accessible in derived class is the difference between protected and private access specifiers in inheritance.

Which value is placed in the base class?

A. Derived values
B. Default type values
C. Both A & B
D. None of the mentioned

View Answer
Ans : B

Explanation: We can place the default type values in a base class and overriding some of them through derivation.

25 The friend functions and the member functions of a friend class can directly access the_____ data.

A. Private and protected
B. Private and public
C. Protected and public
D. Private, protected and public

View Answer
Ans : A

Explanation: the friend functions and the member functions of a friend class can directly access the Private and protected data

26 class X, class Y and class Z are derived from class BASE. This is _____ inheritance.

A. Multiple
B. Multilevel
C. Hierarchical
D. Single

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View Answer
Ans : C

Explanation: None

27 Reusability of the code can be achieved in CPP through _____ .

A. Polymorphism
B. Encapsulation
C. Inheritance
D. Both A and C

View Answer
Ans : C

Explanation: None

28 Which symbol is used to create multiple inheritance?

A. Dot
B. Comma
C. Dollar
D. None of the above

View Answer
Ans : B

Explanation: For using multiple inheritance, simply specify each base class (just like in single inheritance), separated by a comma.

29 _____ inheritance may lead to duplication of inherited members from a "grandparent" base class.

A. Multipath
B. Multiple
C. Multilevel
D. Hierarchical

View Answer
Ans : A

Explanation: Multipath inheritance may lead to duplication of inherited members from a "grandparent" base class.

30 C++ Inheritance relationship is?

A. Association
B. Is-A
C. Has-A
D. None of the above

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View Answer
Ans : C

Explanation: None

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A. Polymorphism
B. Encapsulation
C. Inheritance
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B. Is-A
C. Has-A
D. None of the above

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View Answer
Ans : B

Explanation: Lets consider a relation ship between classes i.e. Dog IS A Animal, Apple IS A Fruit, Car IS A Vehicle etc. Here, IS A relationship is valid, but, if we say Animal IS A Dog, then it is wrong. So, Animal class should be the base class and Dog class will be the derived class.

31 What is the output of this program?

```
#include <iostream>

using namespace std;

void find()

void find()

{

    cout<<"course";

}

int main()

{

    find();

    return 0;

}
```

A. course
B. coursecourse
C. compile time error
D. none of the mentioned

View Answer
Ans : C

Explanation: We have to use the semicolon to declare the function in line 3. If we did means, the program will execute.

32 Can we pass parameters to base class constructor though derived class or derived class constructor?

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A. Yes
B. No
C. May Be
D. Can't Say

View Answer

Ans : A

Explanation: Yes, we pass parameters to base class constructor though derived class or derived class constructor.

33 A variable can be declared as reference by putting _____ in the declaration.

A. #
B. $
C. &
D. *

View Answer

Ans : C

34 If a function receives a reference to a variable, can it modify the value of the variable?

A. Yes
B. No
C. We can not pass reference to a variable.
D. Reference can not contain function.

View Answer

Ans : A

Explanation: If a function receives a reference to a variable, it can modify the value of the variable.

35 Through references we can avoid?

A. wastage of memory
B. wastage of CPU time
C. Both A and B
D. None of the above

View Answer

Ans : C

Explanation: If we pass it without reference, a new copy of it is created which causes wastage of CPU time and memory. We can use references to avoid this.

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36 References can be NULL?

A. References has constant value 0.
B. References has constant value .
C. Yes.
D. No.

View Answer
Ans : D

Explanation: References can not be NULL.

37 Dereference operator is also called as

A. pointer
B. Reference operator
C. Offset operator
D. Deoffset operator

View Answer
Ans : C

Explanation: Dereference operator is also called as Offset operator

38 Which of the following is an advantage of reference?

A. Safer
B. Easier to use
C. Time consuming
D. Both A and B

View Answer
Ans : D

Explanation: References are safer and easier to use.

39 Which value can we not assign to reference?

A. Integer
B. Floating
C. Unsigned
D. Null

View Answer
Ans : D

Explanation: : If it can be assigned with a null value means, it is a copy of the pointer.

40 Which of the following statement is correct?

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A. A referenced has to be de-referenced to access a value.
B. A referenced does not need to be de-referenced to access a value.
C. A referenced has to be double de-referenced to access a value.
D. Whether a reference should be de-referenced or not depends on the type of the reference.

View Answer

Ans : B

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DEPT. OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: I DATE: 20 /11/2021

Course Name with code: Computer Networks and Security (18CS52) **MAX MARKS**: 40
Class : 5th Sem (A and B) Duration : 90 Min

NOTE: Answer TWO full questions.

1 a) Differentiate between persistent and non persistent connection with diagram. 08M [CO1]
b) Explain scalability of peer to peer architecture with diagram.? 08M [CO1]
c) Define and explain conditional GET with respect to http. 04M[CO1]

OR

2 a) Define Email. How SMTP protocol is used to send data from one user to another. 08M [CO1]
b) What is meant by DNS. List different types and services provided by DNS. 08M [CO1]
c) List different types of Mail Access Protocols and differentiate between POP3 and IMAP. 4M[CO1]

3 a) Explain connection multiplexing and de multiplexing with diagrams. 08M [CO2]
b) Draw FSM for rtd 3.0 and explain it's working. 08M [CO2]
c) Define checksum, Explain with an example how it is useful. 04M[CO2]

OR

4 a) Define reliable data transfer. Differentiate between rtd 1.0 and 2.0. 08M [CO2]
b) Define pipeline protocol. Explain with the help of diagram how pipeline protocol is different from reliable data transfer protocol. 08M [CO2]
c) List and explain transport services available to applications. 04M[CO2]

Staff Name: Dr. Charan K V

Signature: _____ **HOD Signature** _____

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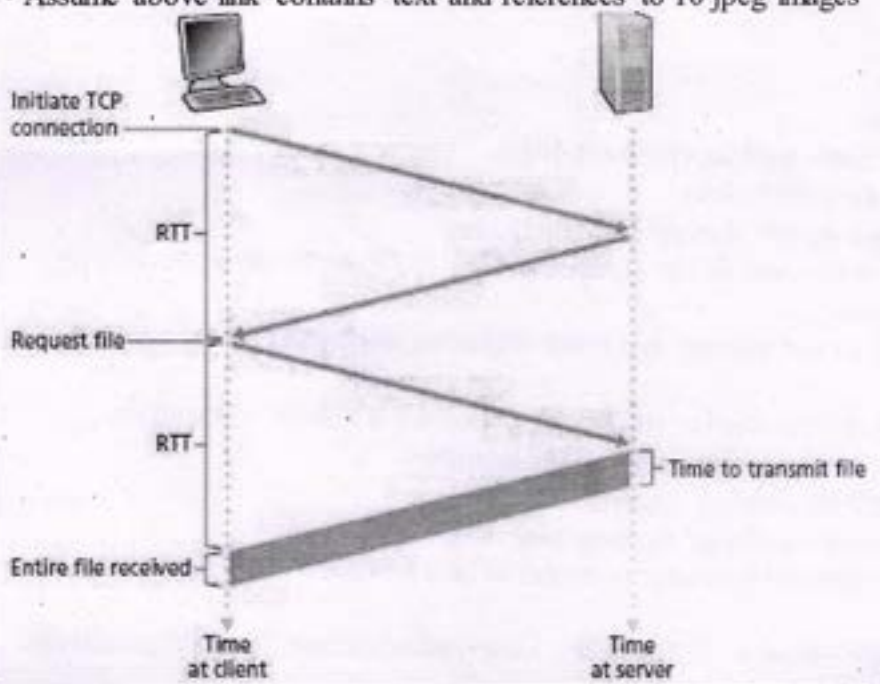
Department of Computer Science And Engineering

2018 Scheme

IA Scheme of Evaluation

B.E. V Semester FIRST Internal Assessment Test NOV 2021

Subject Name:CNS Subject code:18CS52
Faculty In charge: Dr. Charan K V Max Marks: 40

Q. No.	Brief Solution	Allotted Marks
1 a	**HTTP with Non-Persistent Connections** • A non-persistent connection is closed after the server sends the requested-object to the client. • In other words, the connection is used exactly for one request and one response. • For downloading multiple objects, multiple connections must be used. • Suppose user enters URL: "http://www.someSchool.edu/someDepartment/home.index" • Assume above link contains text and references to 10 jpeg images  **HTTP with Persistent Connections** • Problem with Non-Persistent Connections: 1) A new connection must be established and maintained for each requested-object. □ Hence, buffers must be allocated and state info must be kept in both the client and server. □ This results in a significant burden on the server. 2) Each object suffers a delivery delay of two RTTs: i) One RTT to establish the TCP connection and ii) One RTT to request and receive an object. • Solution: Use persistent connections. • With persistent connections, the server leaves the TCP connection open after sending responses.	8

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	• Hence, subsequent requests & responses b/w same client & server can be sent over same connection • The server closes the connection only when the connection is not used for a certain amount of time. • Default mode of HTTP: Persistent connections with pipelining. • Advantages: 1) This method requires only one RTT for all the referenced-objects. 2) The performance is improved by 20%.	
1 b	**Client-Server Architecture** • In this architecture, there is a server and many clients distributed over the network (Figure 1.1a). • The server is always-on while a client can be randomly run. • The server is listening on the network and a client initializes the communication. • Upon the requests from a client, the server provides certain services to the client. • Usually, there is no communication between two clients. • The server has a fixed IP address. • A client contacts the server by sending a packet to the server's IP address. • A server is able to communicate with many clients. • The applications such as FTP, telnet, Web, e-mail etc use the client-server architecture. **P2P Architecture** • There is no dedicated server (Figure 1.1b). • Pairs of hosts are called peers. • The peers communicate directly with each other. • The peers are not owned by the service-provider. Rather, the peers are laptops controlled by users. • Many of today's most popular and traffic-intensive applications are based on P2P architecture. • Examples include file sharing (BitTorrent), Internet telephone (Skype) etc. • Main feature of P2P architectures: self-scalability. • For ex: In a P2P file-sharing system, Each peer generates workload by requesting files. Each peer also adds service-capacity to the system by distributing files to other peers. Advantage: Cost effective '.' Normally, server-infrastructure & server bandwidth are not required. Three challenges of the P2P applications: **1) ISP Friendly** Most residential ISPs have been designed for asymmetrical bandwidth usage. Asymmetrical bandwidth means there is more downstream-traffic than upstream-traffic. But P2P applications shift upstream-traffic from servers to residential ISPs, which stress on the ISPs. **2) Security** Since the highly distribution and openness, P2P applications can be a challenge to security. **3) Incentive**	8

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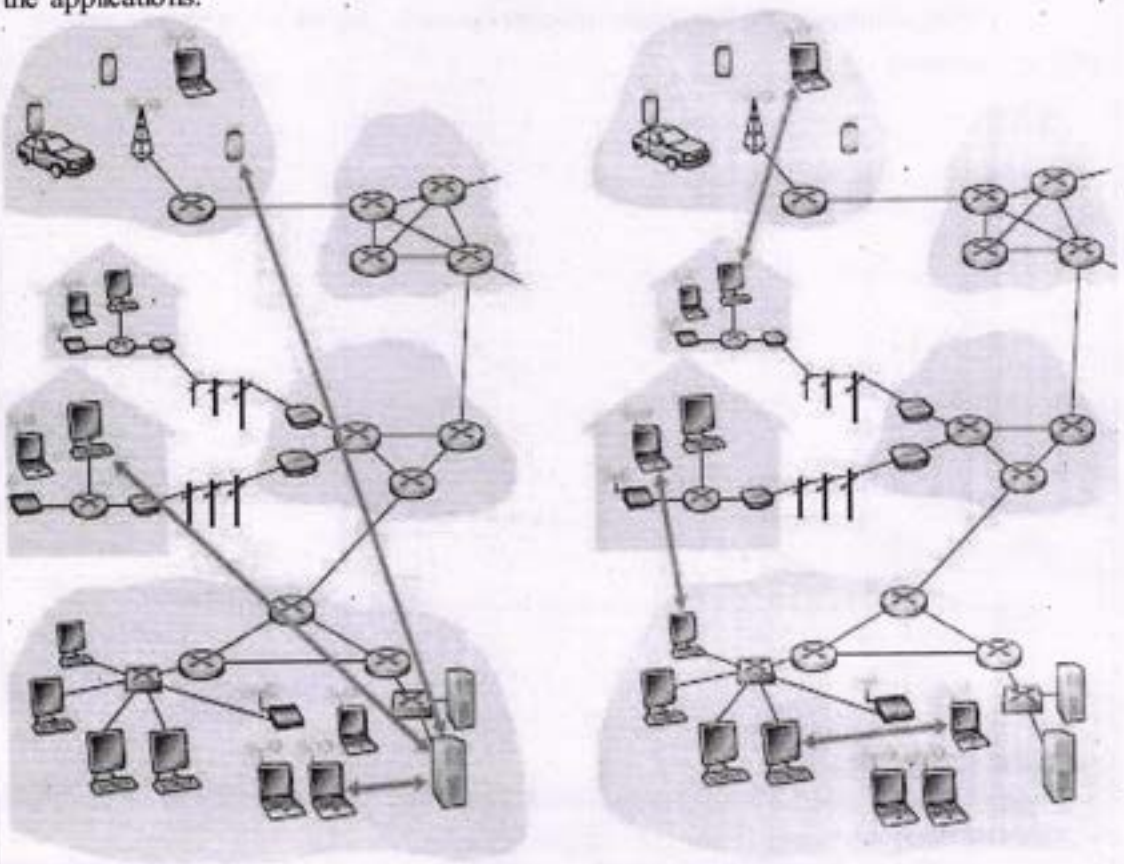
Success of P2P depends on convincing users to volunteer bandwidth & resources to the applications.



Client-server architecture

b. Peer-to-peer architecture

Peer-to-peer architecture is different from client-server architecture.

- In P2P, each node (called peers) acts as a client and server at the same time.
- The peers are not owned by a service-provider.
- The peers not supposed to be always listening on the Internet.
- The peers are dynamic, i.e., some peers will join some peers will leave from time to time.

10

One popular P2P file distribution protocol is BitTorrent

- Consider the following scenarios:

Suppose a server has a large file and 'N' computers want to download the file (Figure 1.15).

1) In client-server architecture, each of the N computers will

→ connect to the server &

→ download a copy of the file to local-host.

2) In P2P architecture, a peer need not necessarily download a copy from the server. Rather, the peer may download from other peers.

Case 2: P2P Architecture

- We have 2 observations:

1) At the beginning of the distribution, only the server has the file.

So, the minimum distribution-time is at least F/us.

2) The peer with the lowest download-rate cannot obtain all F bits of the file in less than F/dmin.

Thus, the minimum distribution-time is at least F/ dmin.

3) The total upload capacity of the system as a whole is utotal = us + u1 + u2 . . . + uN.

The system must deliver F bits to each of the N peers.

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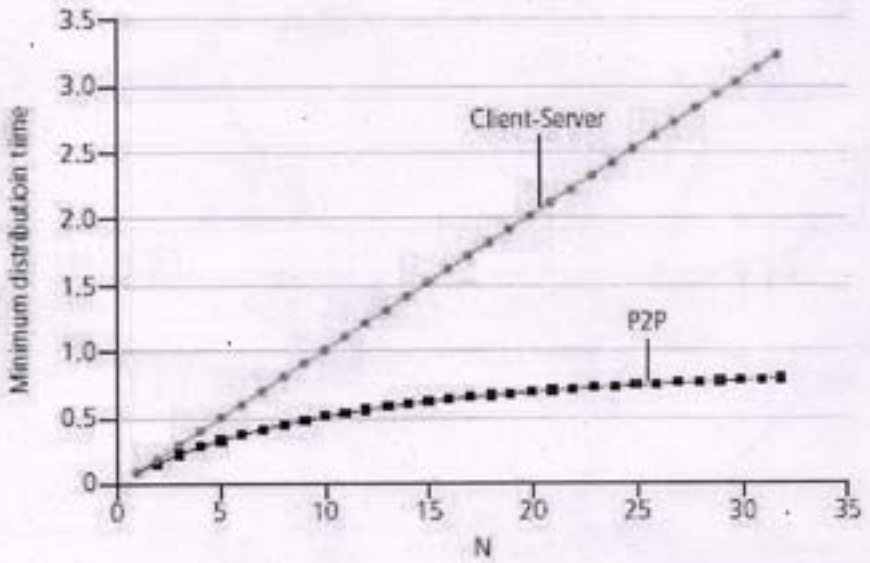
Thus, the minimum distribution-time is at least NF/(us + ul + u2 . . . + uN).

Figure compares the minimum distribution-time for the client-server and P2P architectures.



1 c

1.2.6 The Conditional GET 10

- Conditional GET refers a mechanism that allows a cache to verify that the objects are up to date.
- An HTTP request-message is called conditional GET if
  1) Request-message uses the GET method and
  2) Request-message includes an If-Modified-Since: header-line.
- The following is an example of using conditional GET:

```
GET /fruit/kiwi.fig HTTP1.1
Host: www.exoriguecuisine.com
If-modified-since: Wed, 7 Sep 2011 09:23:24
```

- The response is:

```
HTTP/1.1 304 Not Modified
Date: Sat, 15 Oct 2011 15:39:29
```

2 a

E-mail is an asynchronous communication medium in which people send and read messages. **SMTP (Simple Mail Transfer Protocol)**

- SMTP is an application-layer protocol used for email.
- SMTP uses TCP to transfer mail from the sender's mail-server to the recipient's mail-server.
- SMTP has two sides:
- A client-side, which executes on the sender's mail-server.
- A server-side, which executes on the recipient's mail-server.
- Both the client and server-sides of SMTP run on every mail-server.
- When a mail-server receives mail from other mail-servers, the mail-server acts as a server.

When a mail-server sends mail to other mail-servers, the mail-server acts as a client.

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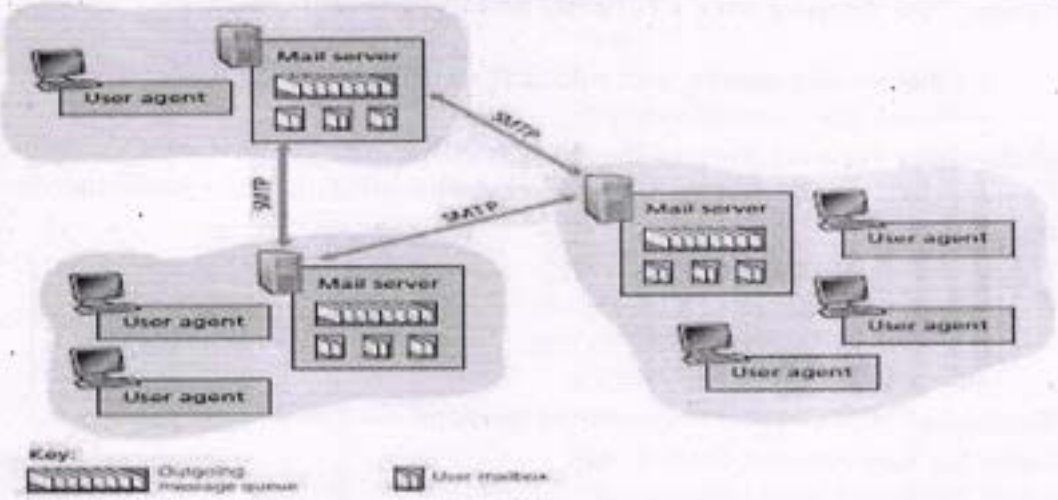

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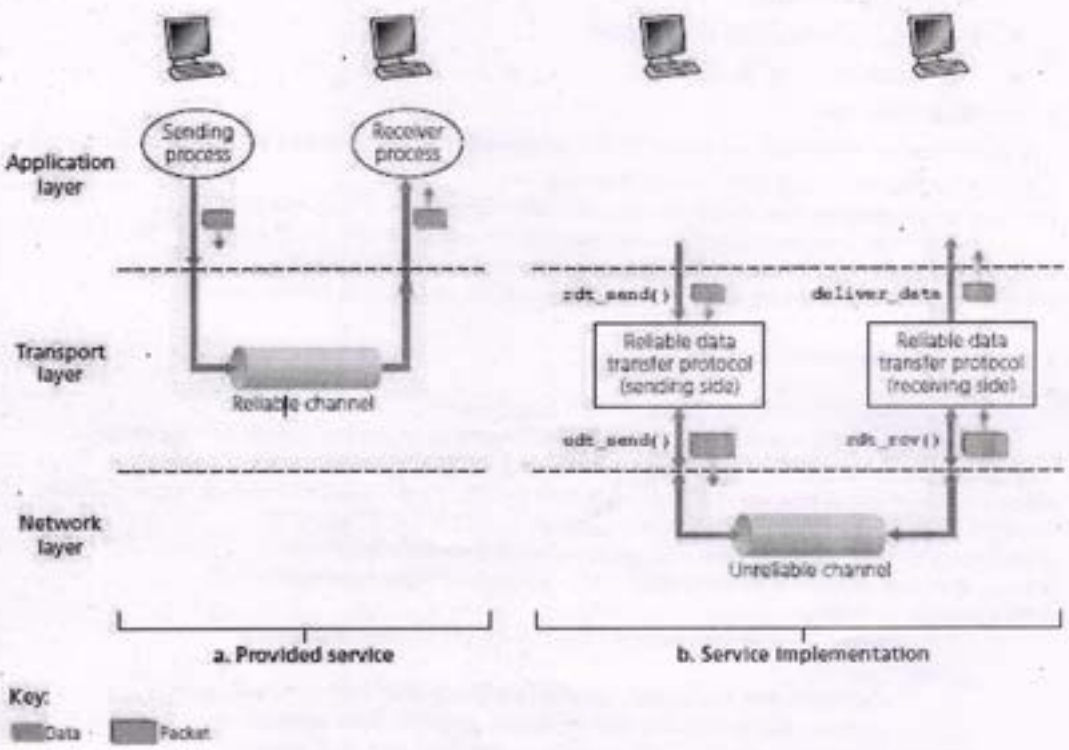
SMTP is the most important protocol of the email system.

• Three characteristics of SMTP (that differs from other applications):

1) Message body uses 7-bit ASCII code only.
2) Normally, no intermediate mail-servers used for sending mail.
3) Mail transmissions across multiple networks through mail relaying.

• Here is how it works:

1) Usually, mail-servers are listening at port 25.
2) The sending server initiates a TCP connection to the receiving mail-server.
3) If the receiver's server is down, the sending server will try later.
4) If connection is established, the client & the server perform application-layer handshaking.
5) Then, the client indicates the e-mail address of the sender and the recipient.
6) Finally, the client sends the message to the server over the same TCP connection.



Reliable data transfer: Service model and service implementation

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Reliable Data Transfer over a Perfectly Reliable Channel: rdt1.0

- Consider data transfer over a perfectly reliable channel.
- We call this protocol as rdt1.0.

Reliable Data Transfer over a Channel with Bit Errors: rdt2.0

- Consider data transfer over an unreliable channel in which bits in a packet may be corrupted.
- We call this protocol as rdt2.0.
- The message dictation protocol uses both
  → positive acknowledgements (ACK) and
  → negative acknowledgements (NAK).
- The receiver uses these control messages to inform the sender about
  → what has been received correctly and
  → what has been received in error and thus requires retransmission.
- Reliable data transfer protocols based on the retransmission are known as ARQ protocols.
- Three additional protocol capabilities are required in ARQ protocols:

1) Error Detection

- A mechanism is needed to allow the receiver to detect when bit-errors have occurred.
- UDP uses the checksum field for error-detection.
- Error-correction techniques allow the receiver to detect and correct packet bit-errors.

2) Receiver Feedback

- Since the sender and receiver are typically executing on different end-systems.
- The only way for the sender to learn about status of the receiver is by the receiver providing
- explicit feedback to the sender.
- For example: ACK & NAK

3) Retransmission

A packet that is received in error at the receiver will be retransmitted by the sender.

2 b

1.5 DNS – The Internet's Directory Service

- DNS is an internet service that translates domain-names into IP addresses.
  For ex: the domain-name "www.google.com" might translate to IP address "198.105.232.4".
- Because domain-names are alphabetic, they are easier to remember for human being.
- But, the Internet is really based on IP addresses (DNS → Domain Name System).

1.5.1 Services Provided by DNS

- The DNS is
  1) A distributed database implemented in a hierarchy of DNS servers.
  2) An application-layer protocol that allows hosts to query the distributed database.
- DNS servers are often UNIX machines running the BIND software.
- The DNS protocol runs over UDP and uses port 53. (BIND → Berkeley Internet Name Domain)
- DNS is used by application-layer protocols such as HTTP, SMTP, and FTP.
- Assume a browser requests the URL www.someschool.edu/index.html.
- Next, the user's host must first obtain the IP address of www.someschool.edu
- This is done as follows:
  1) The same user machine runs the client-side of the DNS application.
  2) The browser
     → extracts the hostname "www.someschool.edu" from the URL and
     → passes the hostname to the client-side of the DNS application.
  3) The client sends a query containing the hostname to a DNS server.
  4) The client eventually receives a reply, which includes the IP address for the hostname.
  5) After receiving the IP address, the browser can initiate a TCP connection to the HTTP server.

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1.5.2.1 A Distributed, Hierarchical Database

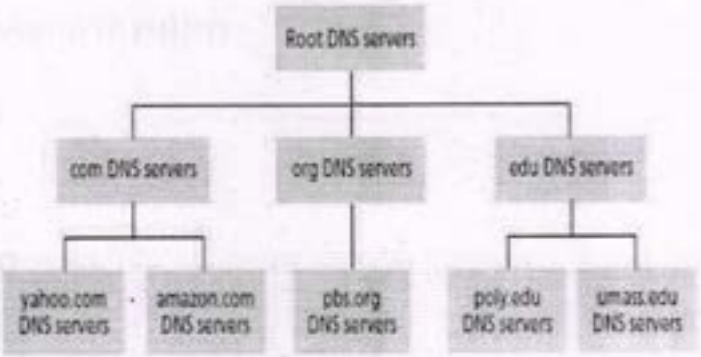

Figure 1.12: Portion of the hierarchy of DNS servers

- Suppose a client wants to determine IP address for hostname "www.amazon.com". (Figure 1.12):
  1) The client first contacts one of the root servers, which returns IP addresses for TLD servers
  2) Then, the client contacts one of these TLD servers.
  - The TLD server returns the IP address of an authoritative-server for "amazon.com".
  3) Finally, the client contacts one of the authoritative-servers for amazon.com.
  - The authoritative-server returns the IP address for the hostname "www.amazon.com".

2 c

1.4.3 Mail Access Protocols

- It is not realistic to run the mail-servers on PC & laptop. This is because
  → mail-servers must be always-on and
  → mail-servers must have fixed IP addresses
- Problem: How a person can access the email using PC or laptop?
- Solution: Use mail access protocols.
- Three mail access protocols:
  1) Post Office Protocol (POP)
  2) Internet Mail Access Protocol (IMAP) and
  3) HTTP.

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1.4.3.1 POP 10

- POP is an extremely simple mail access protocol.
- POP server will listen at port 110.
- Here is how it works:
  - The user-agent at client's computer opens a TCP connection to the main server.
  - POP then progresses through three phases:

1) Authentication

  - The user-agent sends a user name and password to authenticate the user.

2) Transaction

  - The user-agent retrieves messages.
  - Also, the user-agent can
    - → mark messages for deletion
    - → remove deletion marks &
    - → obtain mail statistics.
  - The user-agent issues commands, and the server responds to each command with a reply.
  - There are two responses:
    - i) +OK: used by the server to indicate that the previous command was fine.
    - ii) -ERR: used by the server to indicate that something is wrong.

3) Update

  - After user issues a quit command, the mail-server removes all messages marked for deletion.

- Disadvantage:
  The user cannot manage the mails at remote mail-server. For ex: user cannot delete messages.

1.4.3.2 IMAP

- IMAP is another mail access protocol, which has more features than POP.
- An IMAP server will associate each message with a folder.
- When a message first arrives at server, the message is associated with recipient's INBOX folder
- Then, the recipient can
  - → move the message into a new, user-created folder
  - → read the message
  - → delete the message and
  - → search remote folders for messages matching specific criteria.
- An IMAP server maintains user state-information across IMAP sessions.
- IMAP permits a user-agent to obtain components of messages.
  For example, a user-agent can obtain just the message header of a message.

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3 a

2.2 Multiplexing and Demultiplexing

- A process can have one or more sockets.
- The sockets are used to pass data from the network to the process and vice versa.

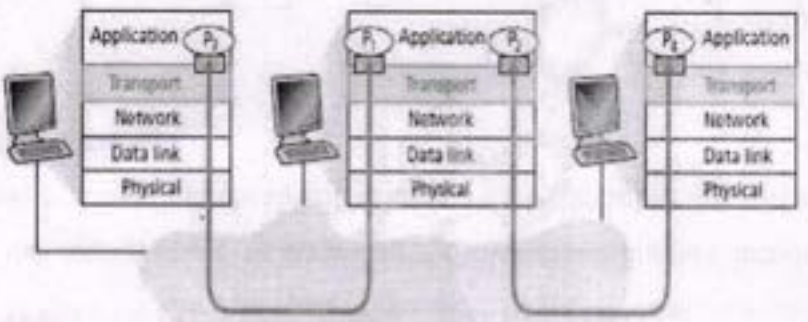
1) Multiplexing

- At the sender, the transport-layer
  - → gathers data-chunks at the source-host from different sockets
  - → encapsulates data-chunk with header to create segments and
  - → passes the segments to the network-layer.
- The job of combining the data-chunks from different sockets to create a segment is called multiplexing.

2) Demultiplexing

- At the receiver, the transport-layer
  - → examines the fields in the segments to identify the receiving-socket and
  - → directs the segment to the receiving-socket.
- The job of delivering the data in a segment to the correct socket is called demultiplexing.

- In Figure 2.1,
  - In the middle host, the transport-layer must demultiplex segments arriving from the network-layer to either process P1 or P2.
  - The arriving segment's data is directed to the corresponding process's socket.



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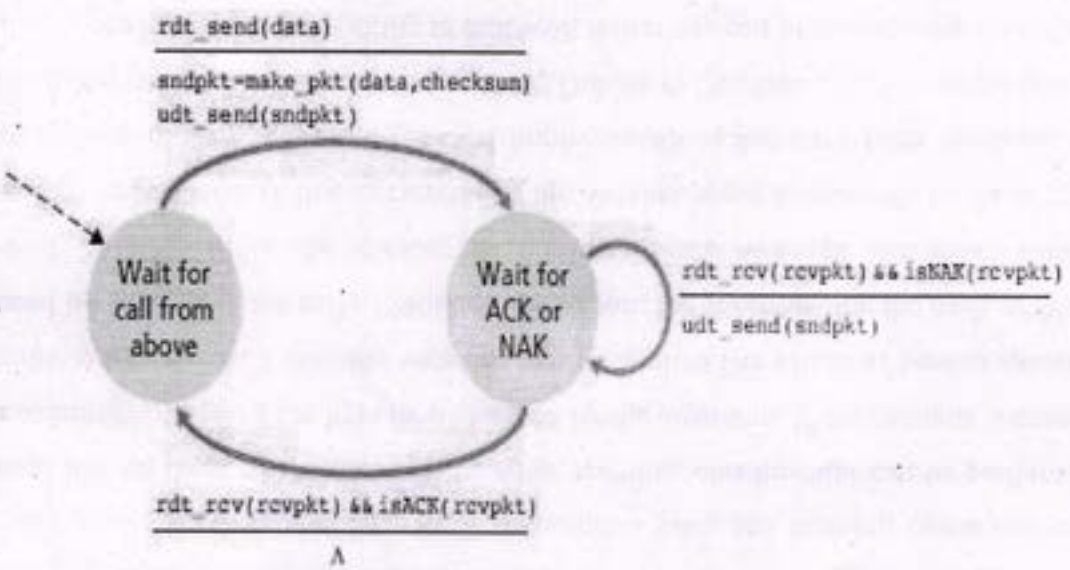

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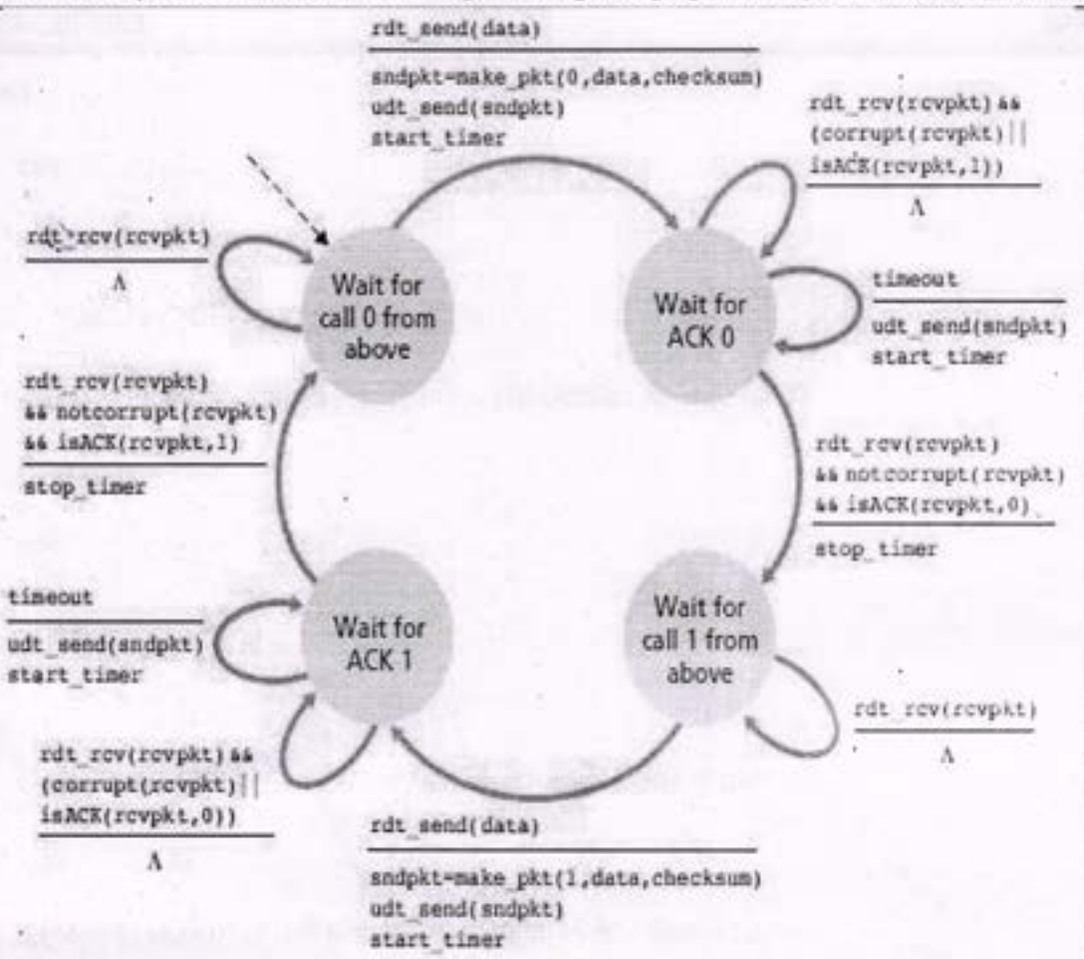

Reliable Data Transfer over a Lossy Channel with Bit Errors: rdt3.0

• Consider data transfer over an unreliable channel in which packet lose may occur. We call this protocol as rdt3.0.

• Two problems must be solved by the rdt3.0:
1) How to detect packet loss?
2) What to do when packet loss occurs?

• Solution:
The sender
→ sends one packet & starts a timer and
→ waits for ACK from the receiver (okay to go ahead).

If the timer expires before ACK arrives, the sender retransmits the packet and restarts the timer.The sender must wait at least as long as
1) A round-trip delay between the sender and receiver plus
2) Amount of time needed to process a packet at the receiver.

• Implementing a time-based retransmission mechanism requires a countdown timer.

• The timer must interrupt the sender after a given amount of time has expired.

Figure shows the sender FSM for rdt3.0, a protocol that reliably transfers data over a channel that can corrupt or lose packets;

• Because sequence-numbers alternate b/w 0 & 1, protocol rdt3.0 is known as alternating-bit protocol.

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3 c

2.3.2 UDP Checksum

- The checksum is used for error-detection.
- The checksum is used to determine whether bits within the segment have been altered.
- How to calculate checksum on the sender:
  1) All the 16-bit words in the segment are added to get a sum.
  2) Then, the 1's complement of the sum is obtained to get a result.
  3) Finally, the result is added to the checksum-field inside the segment.
- How to check for error on the receiver:
  1) All the 16-bit words in the segment (including the checksum) are added to get a sum.
     i) For no errors: In the sum, all the bits are 1. (Ex: 1111111)
     ii) For any error: In the sum, at least one of the bits is a 0. (Ex: 1011111)

Example:

- On the sender:
  - Suppose that we have the following three 16-bit words:

    0110011001100000
    0101010101010101 → three 16 bits words
    1000111100001100

  - The sum of first two 16-bit words is:

    0110011001100000
    0101010101010101
    1011101110110101

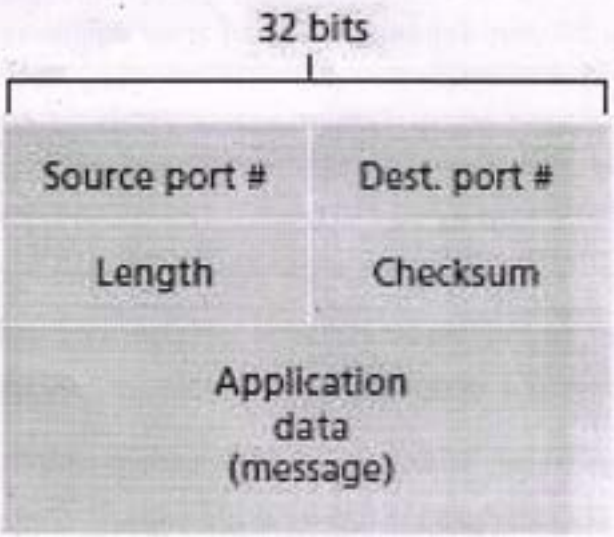
  - Adding the third word to the above sum gives:

    1011101110110101 → sum of 1st two 16 bit words
    1000111100001100 → third 16 bit word
    0100101011000010 → sum of all three 16 bit words

  - Taking 1's complement for the final sum:

    0100101011000010 → sum of all three 16 bit words
    1011010100111101 → 1's complement for the final sum

4



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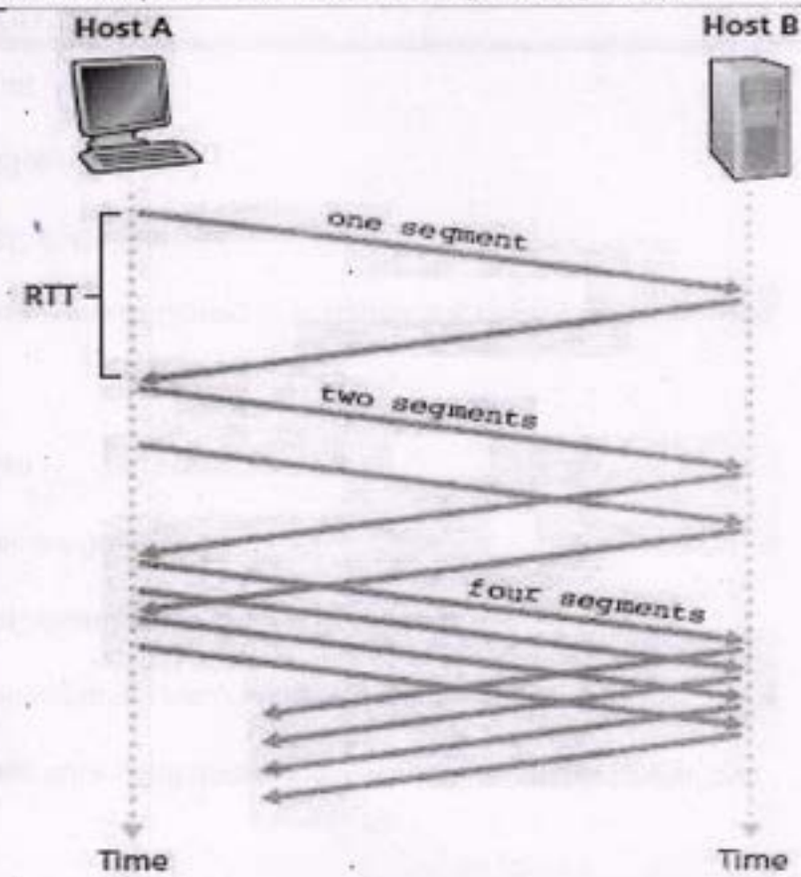

8

Distributed Hash Table

- We can use P2P architecture to form a distributed database.
- We consider a simple database, which contains (key, value) pairs.
- Each peer will only hold a small subset of the data.
- Any peer can query the distributed database with a particular key.
- Then, the database will

→ locate the peers that have the corresponding (key, value) pairs and
→ return the key-value to the querying peer.

- Any peer will also be allowed to insert new key-value pairs into the database.
- Such a distributed database is referred to as a distributed hash table (DHT).
- To construct the database, we need to use some hash-functions.
- The input of a hash-function can be a large number.

But the output of the hash-function is of fixed-size bit-string.

- The outline of building a DHT is as follows:

1) Assign an identifier to each peer, where the identifier is an n-bit string.
So, we can view the identifier as an integer at the range from 0 to 2n-1.
2) For a data pair (key, value), the hash value of the key is computed.
Then the data is stored in the peer whose identifier is closest to the key.
3) To insert or retrieve data, first we need to find the appropriate peer.
Problem: It is not realistic to let the peer to store all of the other peer's identifiers.
Solution: Use a circular arrangement.

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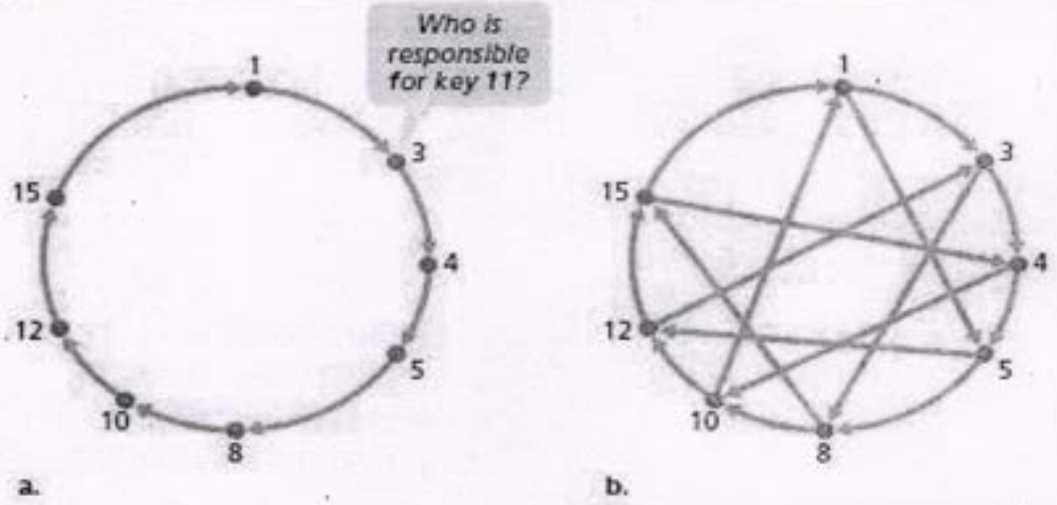


Circular Arrangement

• In this example, the identifiers are range [0, 15] (4-bit strings) and there are eight peers.

• Each peer is only aware of its immediate successor and predecessor • So, each peer just needs to track two neighbors.

• When a peer asks for a key, the peer sends the message clockwise around the circle.

• For example:

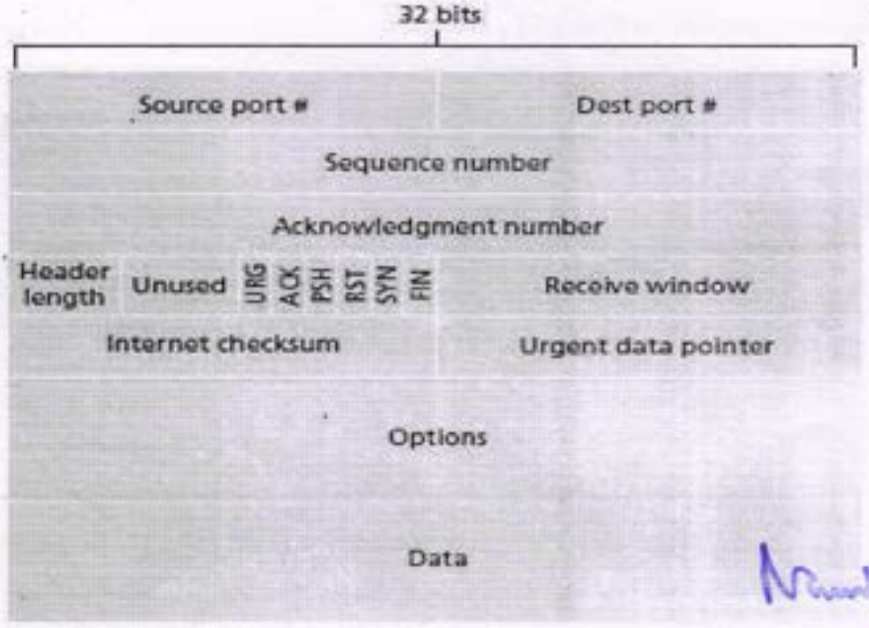
- The peer 4 sends a message saying "Who is responsible for key 11?"
- The message will forward through peers 5, 8, 10 and reach peer 12.
- The peer 12 determines that it is the closest peer to key 11.
- At this point, peer 12 sends a message back to the querying peer 4.

• But when the circle is too large, a message may go through a large number of peers to get answer.

• Problem: There is trade off between

i) Number of neighbors each peer has to track and

ii) Number of message to be sent to resolve a single query.



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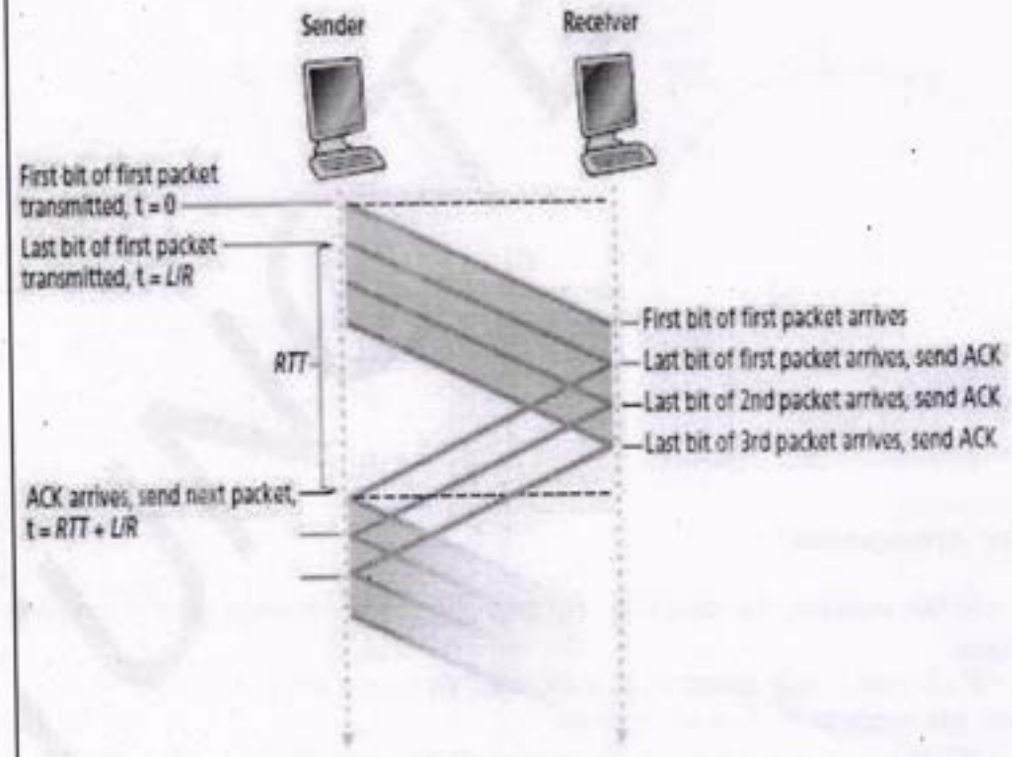

b. Pipelined operation

Figure 2.16: Stop-and-wait and pipelined sending

8

4 c

2.1.2 Overview of the Transport Layer in the Internet

- When designing a network-application, we must choose either TCP or UDP as transport protocol.

1) UDP (User Datagram Protocol)

- UDP provides a connectionless service to the invoking application.
- The UDP provides following 2 services:
  - i) Process-to-process data delivery and
  - ii) Error checking.
- UDP is an unreliable service i.e. it doesn't guarantee data will arrive to destination-process.

2) TCP (Transmission Control Protocol)

- TCP provides a connection-oriented service to the invoking application.
- The TCP provides following 3 services:
  - 1) Reliable data transfer i.e. guarantees data will arrive to destination-process correctly.
  - 2) Congestion control and
  - 3) Error checking.

4

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A7 eN

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DEPT. OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: I DATE: 10 /11/2022

Course Name with code: Computer Networks and Security (18CS52) **MAX MARKS**: 40

Class : 5th Sem Duration : 90 Min

NOTE: Answer TWO full questions.

1 a) Differentiate between persistent and non persistent connection with diagram. 10M [CO1]
b) Explain scalability of peer to peer architecture with diagram.? 10M [CO1]

OR

2 a) Define Email. How SMTP protocol is used to send data from one user to another 10M[CO1]
b)What is meant by DNS. List different types and services provided by DNS. 10M [CO1]

3 a) Explain HTTP request and response message format. 10M [CO1]
b) Write a note on FTP and Discuss about FTP command and replies. 10M [CO1]

OR

4 a) Define and explain conditional GET with respect to http. 10M [CO1]
b)What are the different transport services available to application?explain. 10M[CO1]

Signature of faculty

[Prof. Shanmukaswamy C V]
Head , Dept. Of CSE

Verified

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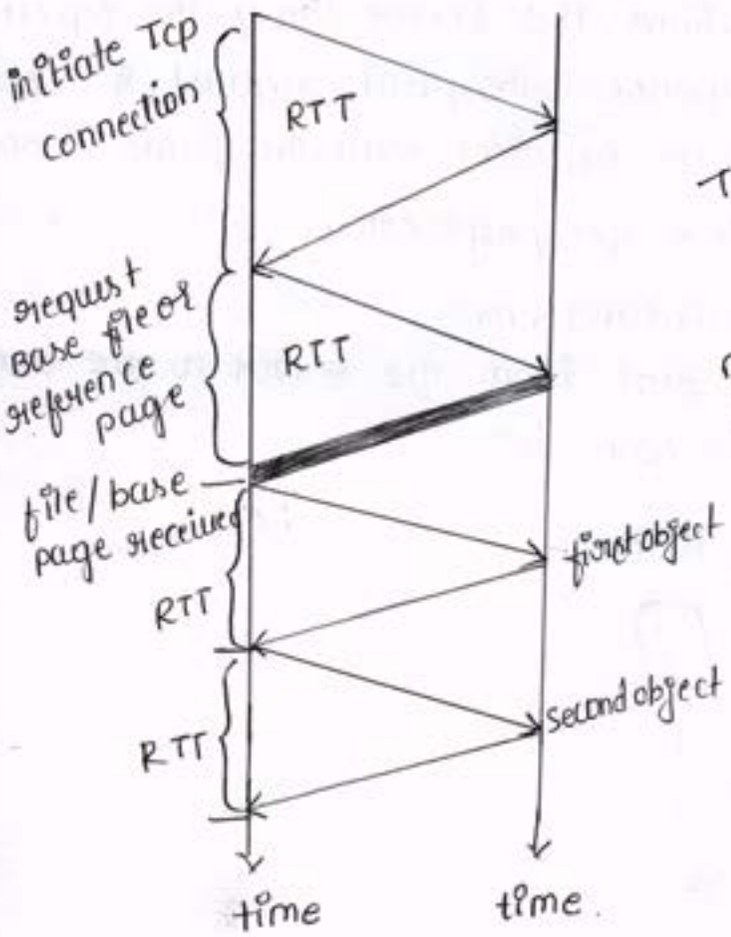
1)

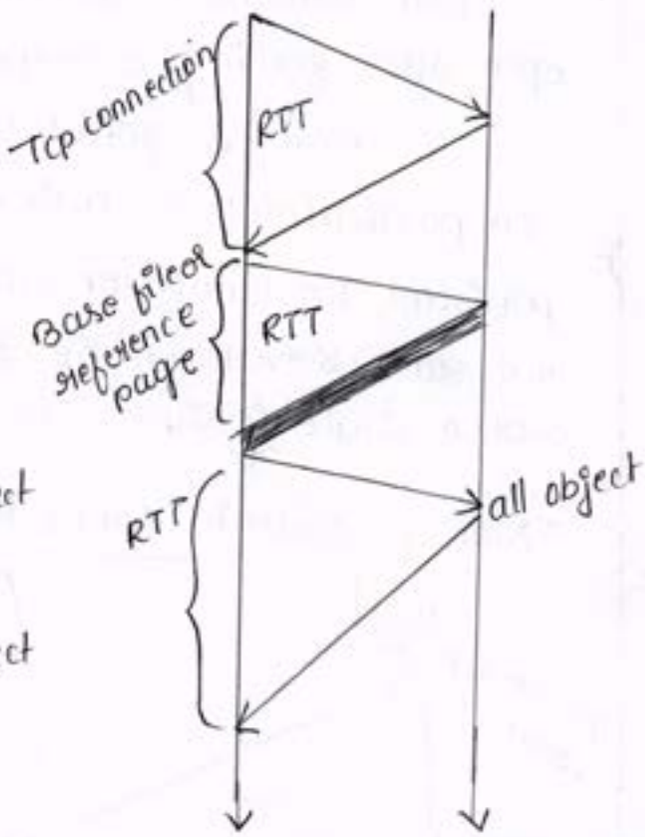
a] Differentiate between persistent and non-persistent connection with diagram [10M] 5M

→ persistent connection :-

1. Non-pipelined
2. pipelined



Non-pipelined



pipelined

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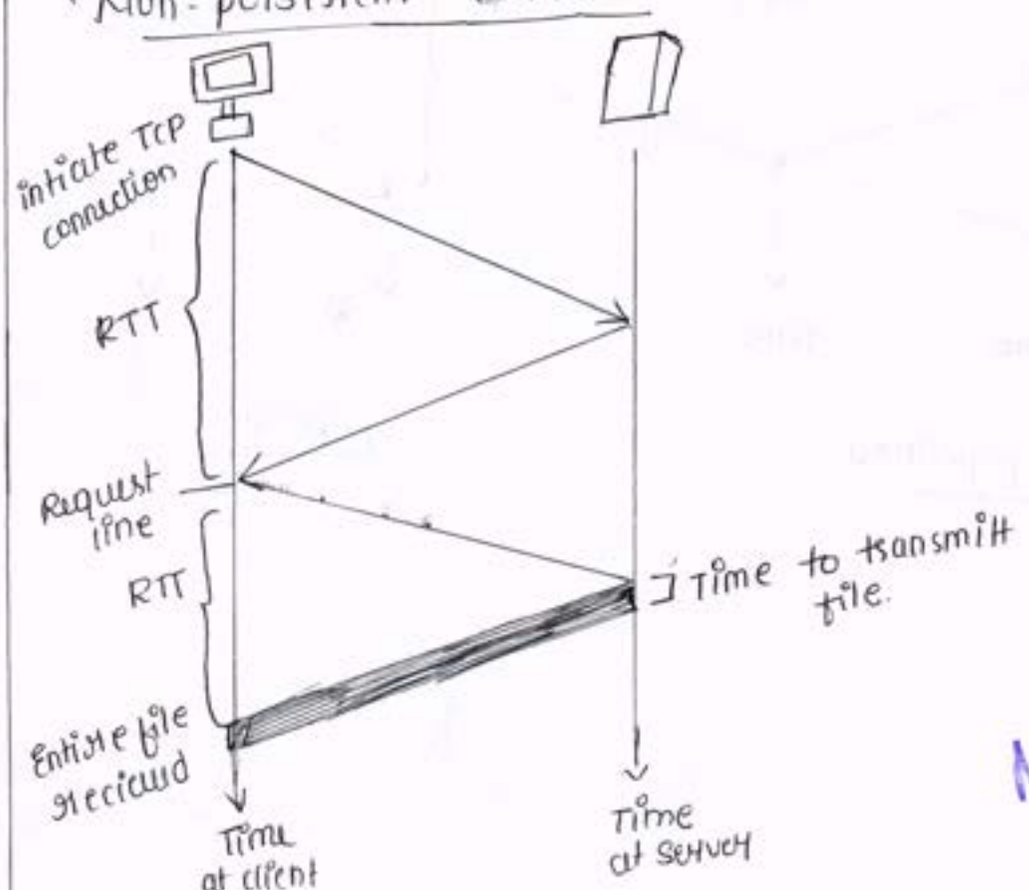
* A brand-new connection must be established & maintained for each request object. For each of these connections, TCP buffers must be allocated and TCP variables must be kept in both the client & server. This can place a significant burden on the web server, which may be serving request from hundreds of different clients simultaneously.

* Each object suffers a delivery delay of two RTTs – one RTT to establish the TCP connection and one RTT to request & receive an object

With persistant connections, the server leaves the TCP connection open after sending a response subsequent request & response b/w the client & server can be sent over the same connection. In particular, an entire web page can be sent over a single persistent TCP connection. moreover, multiple web pages residing on the same server can be sent from the server to the same client over a single persistent TCP connection

5M

Non-persistent Connection :-



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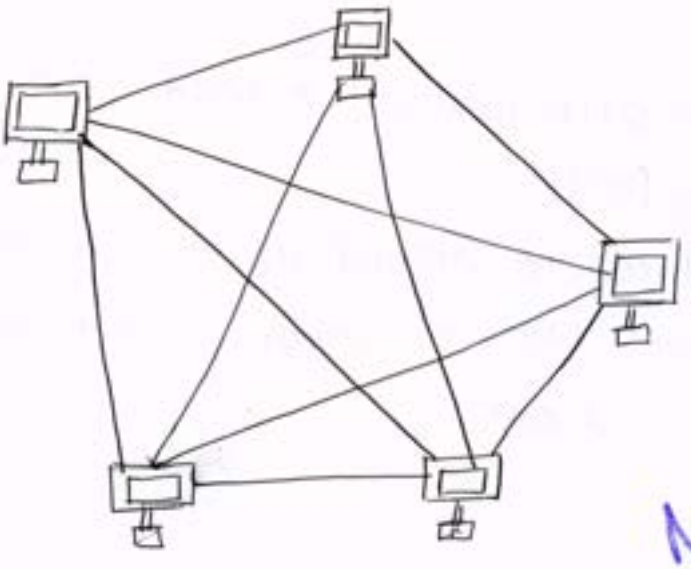
* Round-trip time (RTT) is the time it takes for a small packet to travel from client to server & then back to the client
* the RTT includes packet-propagation delays, packet queuing delay in intermediate routers & switches, & packet processing delays
* when a user clicks on a hyperlink, the browser initiate a TCP connection b/w the browsers & the web server, this involves a "three-way handshake" - the client sends a small TCP segment to the server the server acknowledges & responds with a small TCP segment, & finally the client acknowladges back to the server
* the first two parts of the three way handshake take one RTT
* After completing the first two parts of the handshake, the client sends the HTTP request message combined with the third part of the three-way handshake into TCP connection.
* once the request message arrives at the server, the server sends the HTML file into the TCP connection. This HTTP request/response eats up another RTT thus, roughly, the total response time is two RTTs plus the transmission time at the server of the HTML file.

b] Explain Scalability of pure to pure architecture with diagram? [10M]

→



P2P architecture.

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* There is no dedicated server
* In a p2p architecture, there is minimal dependence on dedicated servers in data centres.
* The application employs direct communication between pairs of intermittently connected hosts called peers.
* The peers are not owned by the service provider, but are instead desktops and laptops controlled by users, with most of the peers residing in homes, universities, and offices
* Many of todays' most popular & traffic-intensive applications are based on p2p architectures these applications include file sharing (eg. Bit Torrent) Internet Telephony (eg. Skype) & IPTV (eg., Kankan & PPstream)

Features :-

* Self-Scalability :-
  for Example, in a p2p file-sharing application, although each peer generates workload - by requesting files, each peer also adds services capacity to the system by distributing files to other peers
* cost effective :-
  p2p architecture are also cost effective, since they normally don't require significant server infrastructure & server bandwidth

2]

a] Define Email. How SMTP protocol is used to send data from one user to another. [10M]

→ Electronic mail can be defined as the message distributed by electronic means from one computer user to one or more recipients via a network.

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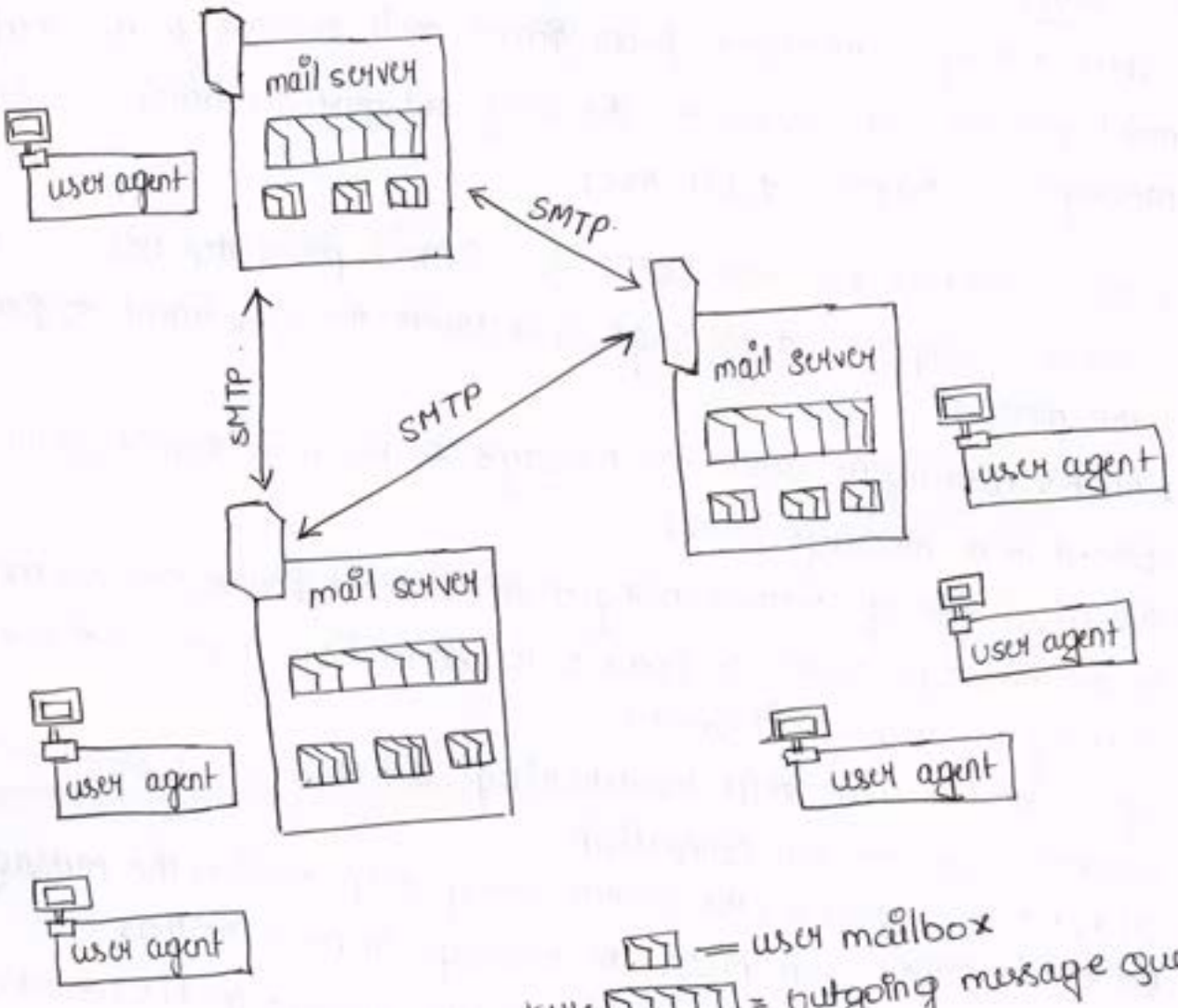
* E-mail has three major components : user agent, mail servers & simple Mail transfer protocol (SMTP)



: user agent : allow user to read, reply to, forward, save & compose message

* mail servers :- mail server from the core of the Email infrastructure. Each recipients has a mailbox located in one of the mail servers. A typical message start its journey in the sender's user agent, travels to the sender's mail server, & travels to the recipient's mail server, where it is deposited in the recipient's mailbox

* SMTP :- SMTP is the principal application-layer protocol for internet Electronic mail. It uses the reliable data transfer service of Tcp to transfer mail from the sender's mail server to the recipient's mail server. As with most application-layer protocol

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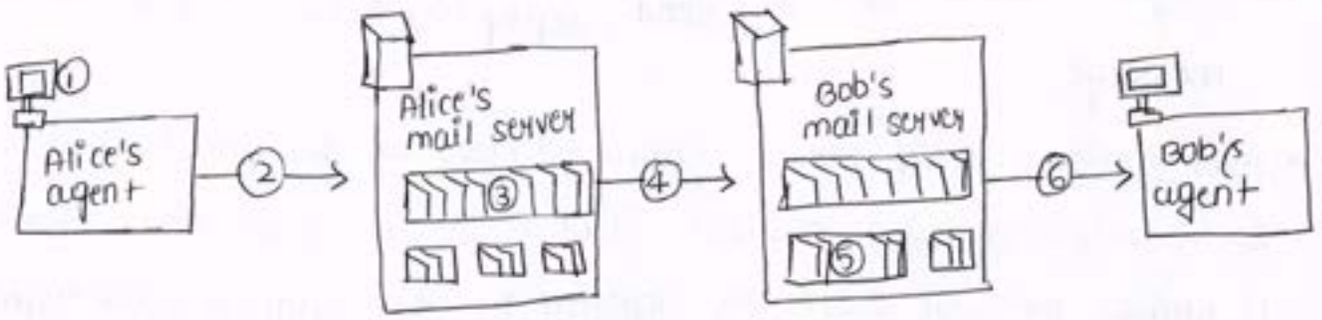
SMTP has two sides: a client side, which executes on the sender's mail server, & a server side, which executes on the recipient's mail server

SMTP

SMTP transfers messages from sender mail servers to the recipients mail servers. It restricts the body (not just the headers) of all mail messages to simple 7-bit ASCII

1. Alice invokes her user agent for e-mail. provides Bob's e-mail address, composes a message, & instructs the user agent to send the message
2. Alice's user agent sends the message to her mail server, where it is placed in a message queue
3. The client side of SMTP, running on Alice's mail server, sees the message in the message queue. It opens a TCP connection to an SMTP server, running on Bob's mail server
4. After some initial SMTP handshaking, the SMTP client sends Alice's message into the TCP connection.
5. At bob's mail server, the server side of SMTP receives the message. Bob's mail server then places the message in Bob's mailbox
6. Bob invokes his user agent to read the message at his convenience



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2)
b) What is meant by DNS. list different types & services provided by DNS. [10M]

→ Domain Name System (DNS) is a hierarchial naming system built on a distributed database for computers

* All the hosts connected to network is identified by IP address. But it is difficult for human beings to remember these IP address to access a particular host. Hence hosts are identified by hostnames

Ex: google.com

* But the routers require IP address to forward the planet
∴ In order to map hostname with the IP address DNS is used

The service provided by the DNS

1] Host aliasing
2] Mail server aliasing
3] Load distribution

1] Host aliasing :- A host with a complicated hostname can have one or more alias names for example, a hostname such as relay1.west-coast.enterprise.com could have, say, two aliases such as enterprise.com & www.enterprise.com. In this case, the hostname relay1.westcoast.enterprise.com is said to be a canonical hostname.

* Alias hostname, when present, are typically more mnemonic than canonical hostname

2] Mail server aliasing :- for obivious reasons, it is highly desirable that e-mail address be mnemonic.

for example, if Bob has an account with Hotmail, Bob's e-mail address might be as simple as bob@hotmail.com. However, the hostname of the Hotmail mail server is more complicated & much less mnemonic than simply hotmail.com

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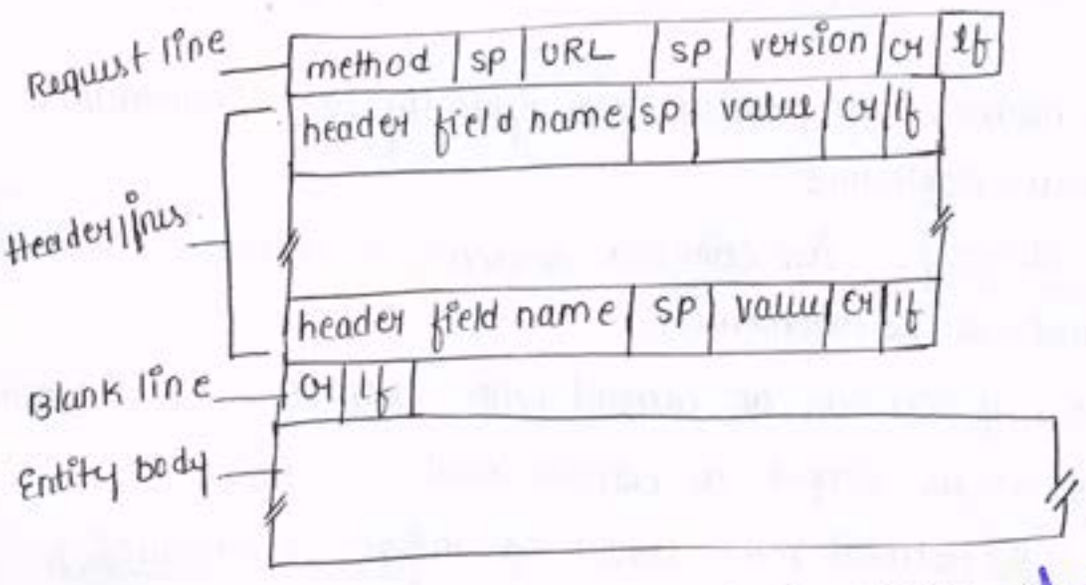
* DNS can be invoked by a mail application to obtain the canonical hostname for a supplied alias hostname as well as the IP address of the host

3] Load distribution:- DNS is also used to perform load distribution among replicated servers - Such as replicated web servers. Busy sites, such as cnn.com, are replicated over multiple servers, with each server running on a different end system & each having different IP address. For replicated web servers, a set of IP addresses is thus associated with one canonical hostname

* The DNS database contains this set of IP address. When clients make a DNS query for a name mapped to a set of addresses, the server responds with the entire set of IP address, but rotates the ordering of the addresses within each reply.
* Because a client typically sends its HTTP request message to the IP address that is listed first in the set, DNS rotation distributes the traffic among the replicated servers.

5] a] Explain HTTP request and response message format. [10 M]

HTTP request message:



Where SP - space, CR - carriage return & LF - line feed

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method :

there are five HTTP methods

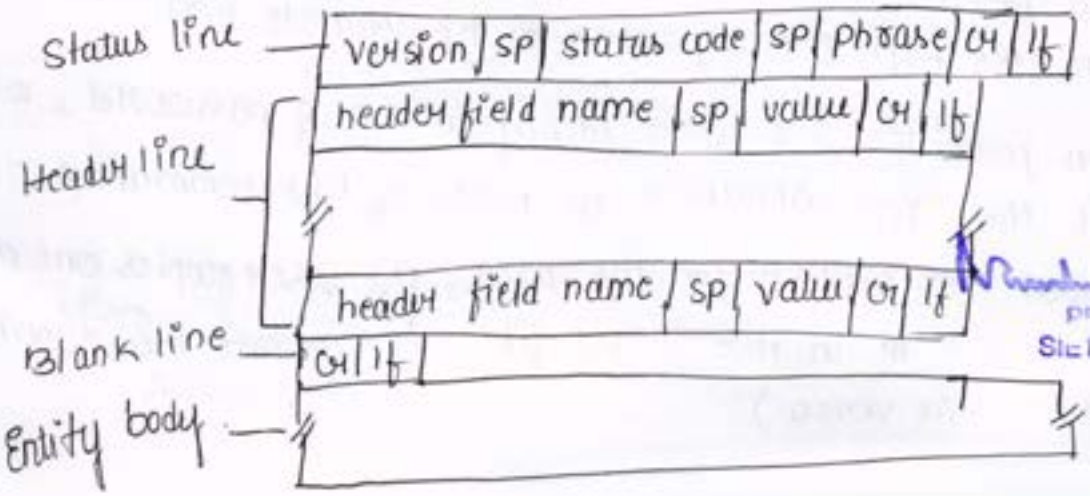
* GET: the GET method is used when the browser requests an object, with the requested object identified in the URL field.
* POST: with a POST message, the user is still requesting a web page from the server, but specific content of the web page depend on what the user entered into the form field if the value of the method field is POST, then the Entity body contains what the user entered into the form field
* PUT: The PUT method is also used by application that need to upload object to web servers.
* HEAD: used to retrive header information. It is used for debugging purpose
* DELETE: The DELETE method allows a user, or an application, to delete an object on a web server

URL: specifies URL of the requested object

version: This field represent HTTP version, usually HTTP/1.1

Header line: Host: www.someschool.edu
connection: close
user-agent: Mozilla/5.0
Accept-language: fr

HTTP Response message.



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* The status line has three fields: the protocol version field, a status code, & a corresponding status message

* The status code & associated phrase indicate the result of the request. Some common status codes & associated phrases include

* 200 OK Request succeeded & the information is returned in the response.

* 301 moved permently: Requested object has been permentely moved; the new URL is specified in location: header of the response message. The client software will automatically retrieve the new URL

* 400 Bad Request: This is a generic Error code indicating that the request could not be understood by the server

* 505 HTTP version Not supported: The requested HTTP protocol version is not supported by the server

* 404 Not Found: The requested document does not exist on this server

3 b] Write a not on FTP & Discuss about FTP commond & replies [10M]

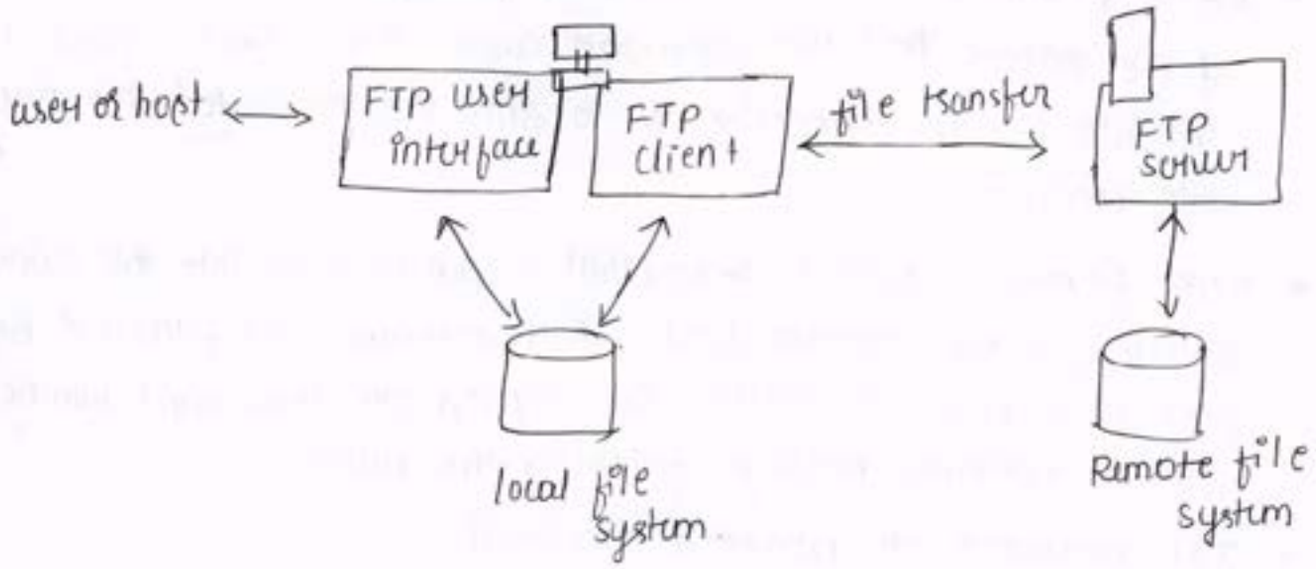
* FTP is used for transferring file from one host to another host

* In order for the user to access the remote account, the user must provide user identification & a password. After providing this authorization information, the user can transfer files from the local file system to the remote file system & vice versa

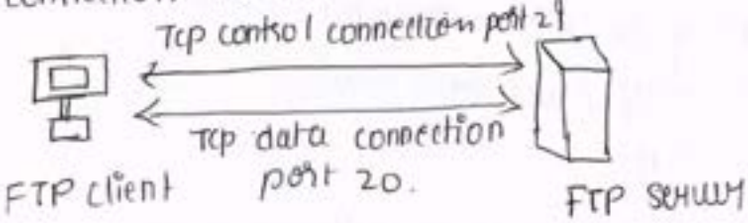
* The user first provides the hostname of the remote host, causing the FTP client process in the local host to Establish a TCP connection with the FTP server process in the remote host

* The user than provides the user identification & password, which are sent over the TCP connection as part of FTP commands

* once the server has authorized the user, the user copies one or more files stored in the local file system into the remote file system (or vice versa)



* FTP uses Two parallel Tcp connection to transfer a file, a control connection & a data connection
* The control connection is used for sending control information between the hosts information such as user identification, password, commands to change remote directory, & commands to "put" & "get" files
* the data connection is used to actually send a file



* when a user starts an FTP session with a remote host, the client side of FTP (user) first initiates a control Tcp connection with the server side on server port number 21.

FTP commands and Replies

* USER username: used to send the user identification to the server
* PASS password: used to send the user password to the server
* LIST: used to ask the server to send back a list of all the files in the current remote directory the list of files is sent over a data connection rather than the control Tcp connection.

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* RETR filename : used to retrieve a file form the current directory of the remote host this command causes the remote host to initiate a data connection & to send the requested file over the data connection

* STOR filename : used to store (that is, put) a file into the current directory of the remote host . Each command is followed by a reply sent from server to client . The replies are three-digit numbers, with an optional message following the number

* 331 username ok, password required
* 125 data connection already open ; transfer starting
* 425 can't open data connection
* 452 Error writing file

4] a] Define and Explain conditional GET with respect to http. [10M]

→ * Although caching can reduce user-perceived response times, it introduces a new problem the copy of an object residing in the cache may be stale. In other words, the object housed in the web server may have been modified since the copy was cached at the client

* HTTP has a mechanism that allows a cache to verify that its object are up to date this mechanism is called the conditional GET

* An HTTP request message is a so-called conditional GET message (1) the request message uses the GET method & (2) the request message includes an if-modified-since: header line

Ex:-

First , on the behalf of a requesting browser , a proxy cache sends a request message to a web server

```
GET /fruit/kiwi.gif HTTP/1.1
Host: www.exoticuecuisine.com
```

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Second, the web server sends a response message with the requested object to the cache:

HTTP/1.1 200 OK
Date: Sat, 8 Oct 2011 15:39:29
Server: Apache/1.3.0 (Unix)
Last-modified: Wed, 7 Sep 2011 09:23:24
Content-Type: image/gif

The cache forwards the object to the requesting browsers but also caches the object locally importantly, the cache also stores the last-modified date along the within the object

Third, one week later, another browser requests the same object via the cache, & the object is still in the cache. Since this object may have been modified at the web server in the past week, the cache performs an up-to-date check by issuing a conditional GET, specifically, the cache sends

GET /fruit/kiwi.gif HTTP/1.1
Host: www.exoticquecuisine.com
If-modified-since: Wed, 7 Sep 2011 09:23:24

This conditional GET is telling the server to send the object only if the object has been modified since the specified date.

Suppose the object has not been modified since 7 Sep 2011 09:23:24

Then, fourth, the server sends a response message to the cache

HTTP/1.1 304 Not Modified
Date: Sat, 15 Oct 2011 15:39:29
Server: Apache/1.3.0 (Unix)
(Empty entity body)

We see that in response to the conditional GET, the web server still sends a response message

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H]

b] What are the different transport service available to application? Explain [10M]

1) Reliable data Transfer :-

* packets can get lost within a computer network. for example, a packet can overflow a buffer in a router, or can be discarded by a host or router after having some of its bits corrupted
* For many applications - such as electronic mail, file transfer, remote host acess, web documents transfers & financial application data loss can have devastating consequences
* Thus, to support these applications, something has to be done to guarantee that the data sent by one end of the application is delivered correctly and completely to the other end of the application
* If a protocol provides such a guaranteed data delivery service, it is said to provide reliable data transfer. one important service that a transport-layer protocol can potntially provide to an application is process-to-process reliable data transfer.
* when a transport protocol provides this service, the sending process can just pass its data into the socket & know with complete confidence that the data will arrive without errors at the receiving process.

Throughput :-

* Transport-layer protocol could provide guaranteed available throughput at some specified rate
* with such a service, the application could request a guaranteed throughput of r bits/sec, & the transport protocol would then ensure that the available throughput is always at least r bits/sec. such a guaranteed throughput service would appeal to many applications

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* Application that have throughput requirements are said to be bandwidth-sensitive application. many current multimedia application are bandwidth sensitive

* Elastic application can make use of as much, or as little, throughput as happens to be available. Electronic mail, file transfer & web transfers are all Elastic applications

3) Timing :-

* A transport-layer protocol can also provide timing guarantees

* Interactive real-time applications, such as Internet telephony, virtual Environments, teleconferencing & multiplayer games require tight timing constraints on data delivery in order to be effective

4) Security :-

* Transport protocol can provide an applications with one or more security service.
for example, in the sending host, a transport protocol can Encrypt all data transmitted by the sending process, & in the receiving host, the transport-layer protocol can decrypt the data before delivering the data to the receiving process

* A transport protocol can provide security services like confidentiality, data integrity End point authentication

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odd

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INTERNAL ASSESMENT TEST: I — **DATE:**12/11/2022
SUB :AUTOMATA THEORY AND COMPUTABILITY**(18CS54)** — **MAX MARKS** 40
SEM : V — **TIME** : 90 min

NOTE: Answer the TWO full questions Q1 or Q2 and Q3 or Q4

1.	a. Set of all the strings{0,1} of length 2 construct a DFA that accepts it.	6M[CO1]
	b.Length of W is greater than (or) equal to 2 obtain a DFA for it by taking {a,b} .	7M[CO1]
	c. |W|mod2=0 for {a,b} obtain a DFA for it.	7M[CO1]
	OR	
2.	a.Every a is immediately followed by b construct a DFA for it.	7M [CO1]
	b.W contains no more than 1b, obtain a DFA for it.	7M[CO1]
	c. No consecutive characters are the same by taking {a,b} obtain a DFA for it.	6M[CO1]
3	a. Construct DFA to accept set of all strings which are divisible by 3(decimal numbers).	10M[CO1]
	b. Construct DFA to accept set of all strings which are divisible by 5(binary numbers numbers).	10M[CO2]
	OR	
4	a. Construct DFA to accept set of all strings which are divisible by 4(decimal numbers).	10M[CO1]
	b. Construct DFA to accept set of all strings which are divisible by 7(decimal numbers).	10M[CO1]

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INTERNAL ASSESMENT TEST: I — **DATE:**12/11/2022
SUB :AUTOMATA THEORY AND COMPUTABILITY**(18CS54)** — **MAX MARKS** 40
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	OR	
2.	a.Every a is immediately followed by b construct a DFA for it.	7M [CO1]
	b.W contains no more than 1b, obtain a DFA for it.	7M[CO1]
	c.No consecutive characters are the same by taking {a,b} obtain a DFA for it.	6M[CO1]
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	b. Construct DFA to accept set of all strings which are divisible by 5(binary numbers numbers).	10M[CO2]
	OR	
4	a. Construct DFA to accept set of all strings which are divisible by 4(decimal numbers).	10M[CO1]
	b. Construct DFA to accept set of all strings which are divisible by 7(decimal numbers).	10M[CO1]

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Automata Theory & Computability

1st Internals

Scheme & Solution

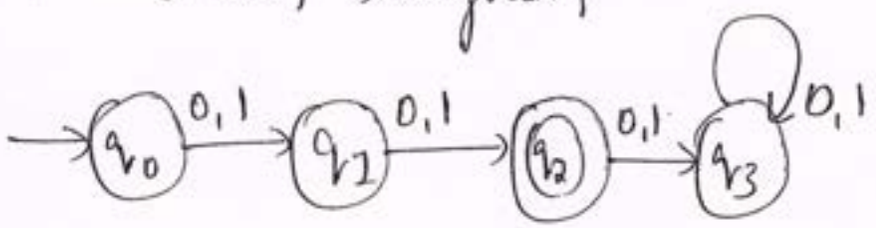
Sem: 5th Sem

1 a

Given $|w| = 2$

$L = \{00, 01, 10, 11\}$ 2M

Transition Diagram



4M

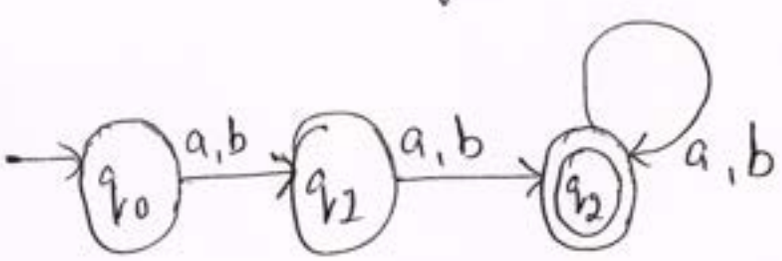
1) b

Given

$|w| \geq 2$

$L = \{aa, ab, ba, bb, aaa, aab, aba, \text{---}\}$ 2M

Transition Diagram



5M

$F \rightarrow \{q_2\}$

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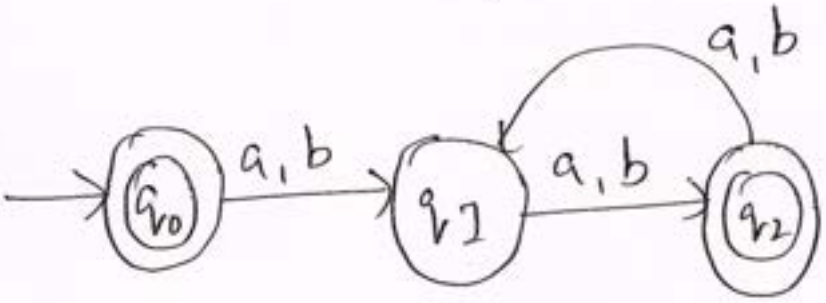
c

given

$|w| \bmod 2 = 0$

$L = \{\epsilon, aa, ab, ba, bb, aaaa, aaab, aabb, \ldots\}$ 2M

Transition Diagram

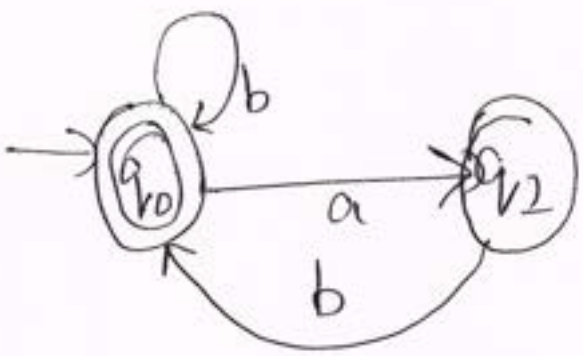


5M

$F \rightarrow \{q_0, q_2\}$

2) a

$L \rightarrow \{\epsilon, ab, b, abab, bab, bbab, abb, \ldots\}$ 2M



5M

$F \rightarrow \{q_0\}$

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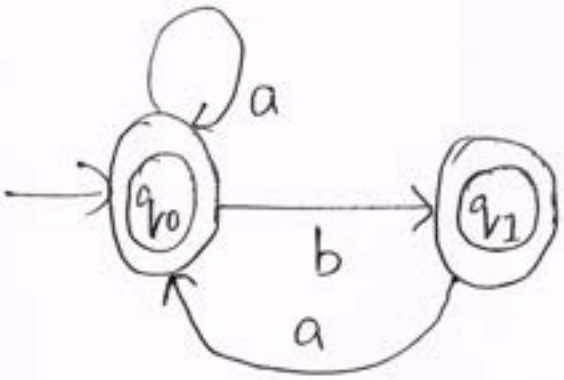
b

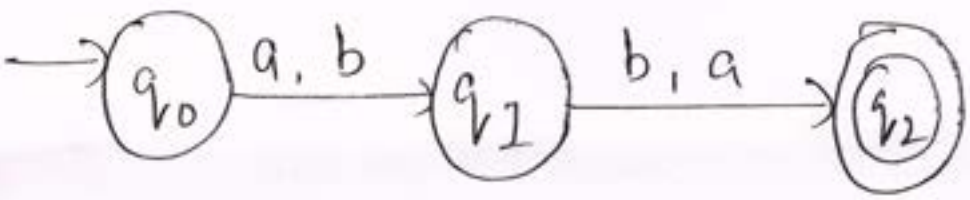
$L \rightarrow \{\epsilon, a, b, ab, ba, aab, aba, baa, \ldots\}$ 2M



4M

$F \rightarrow \{q_0, q_2\}$ 1M

c



6M

3) a

Given

Strings divisible by 3

$\delta(q_i, d) \rightarrow q_j$ 2M

$J = (r * i + d) \bmod K$

$r = 10$

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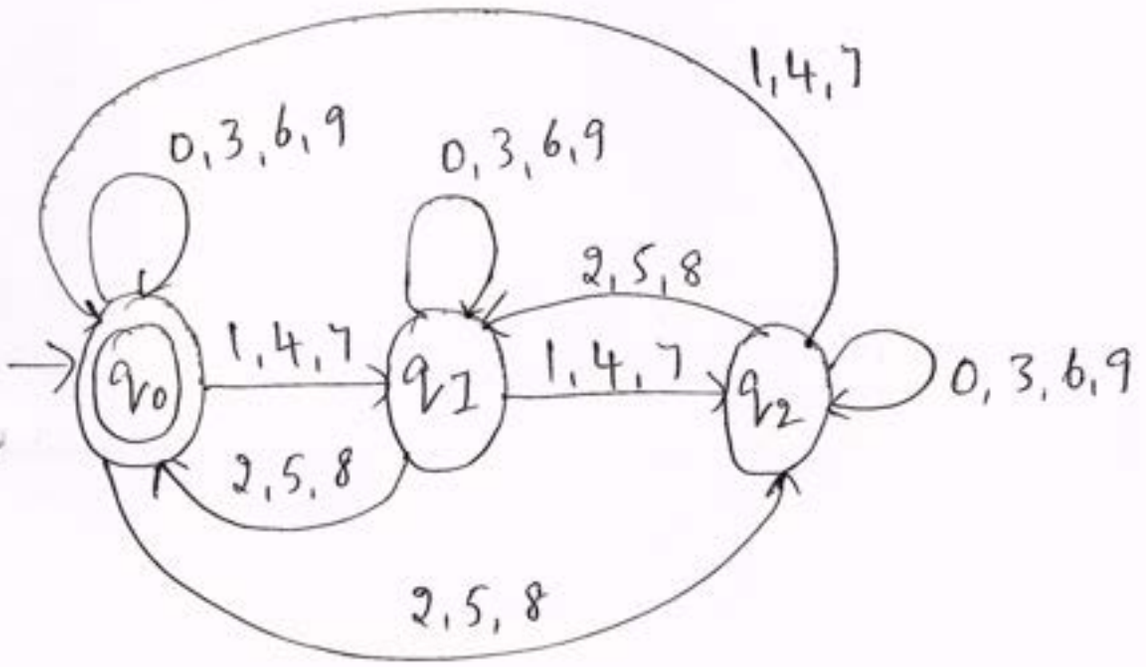
$\Sigma = 0, 1, 2$

$d = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9$

$K = 3$



4M

δ	0	1	2
q_0	q_0	q_1	q_2
q_1	q_1	q_2	q_0
q_2	q_2	q_0	q_1

3M

$F \rightarrow \{q_0\}$

1M

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3) b

$\delta(q_i, d) \rightarrow \{q_J\}$

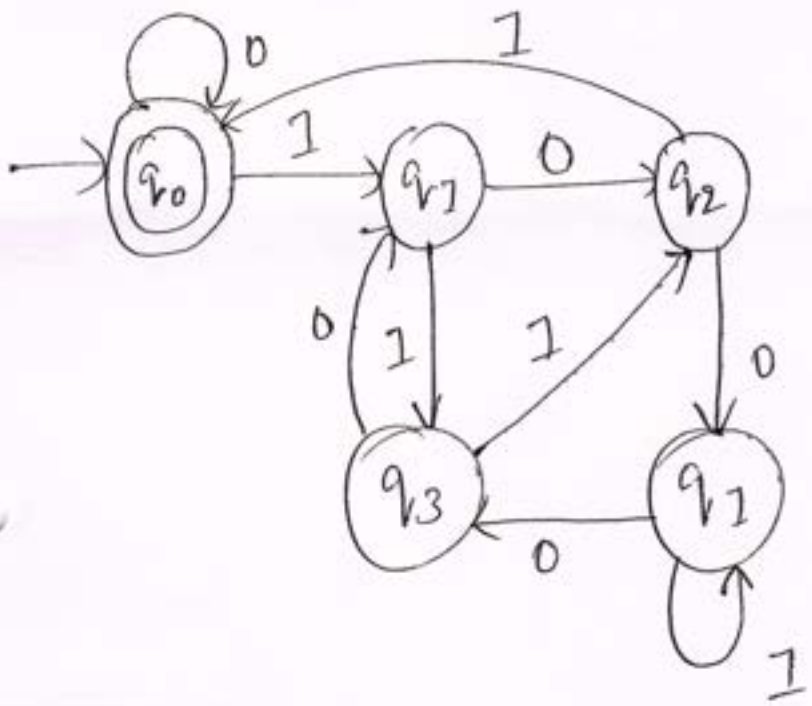
$J = (r * i + d) \bmod K$

$r = 2$

$i = 0, 1, 2, 3, 4$ 4M

$d = 0, 1$

$K = 5$



4M

δ	0	1
q_0	q_0	q_1
q_1	q_2	q_3
q_2	q_4	q_0
q_3	q_1	q_2
q_4	q_3	q_4

$F \rightarrow \{q_0\}$ 2M

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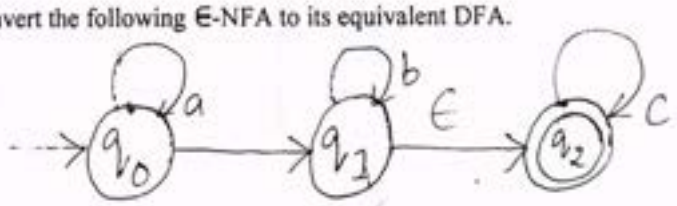
INTERNAL ASSESMENT TEST: II | **DATE**:17/12/2022
SUB : AUTOMATA THEORY AND COMPUTABILITY (**18CS54**) | **MAX MARKS** 40
SEM : V | **TIME** : 90 min

NOTE: Answer the TWO full questions **Q1 or Q2 and Q3 or Q4**

1. a. Convert the following ϵ-NFA to its equivalent DFA. **8M[CO1]**

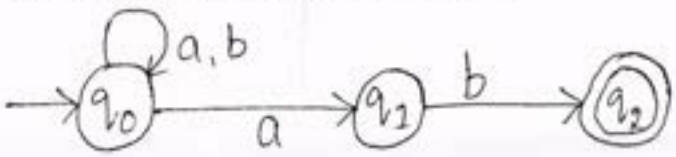


1.b. Using build keyword algorithm construct FSM for cat,cab,bat. **4M[CO2]**

c.Obtain a regular expression for the following:

a. String consisting of either one a or one b.
b. Set of strings of a's and b's ending with either a or bb.
c. Set of strings of a's and b's whose length is 2.
d. Set of strings of a's and b's having odd length. **8M[CO1]**

2. a. Convert the following NFA to its equivalent DFA. **10M[CO2]**



b. Find the minimized DFA for the following. **10M[CO1]**

δ_D	a	b
→*q_1	q_2	q_4
q_2	q_3	q_5
*q_3	q_2	q_6

→

δ_D	a	b
q_4	q_5	q_1
q_5	q_6	q_2
q_6	q_5	q_3

3. a. The language ends with a pattern 'aaaa', obtain the CFG for the same. **8M[CO3]**

b. The language contains a substring 'abb', obtain the CFG for the same. **8M[CO3]**

c. The language does not ends with 'ba', obtain the CFG for the same. **4M[CO3]**

4. a. Eliminate useless symbol from the grammar given below. **10M[C03]**

$S \rightarrow aA \mid bB$
$A \rightarrow aA \mid a$
$B \rightarrow bB$
$D \rightarrow ab \mid Ea$
$E \rightarrow aC \mid d$ [C -> Capital]

b. Eliminate the Unit productions from the grammar given below. **10M[C03]**

$S \rightarrow XY$
$X \rightarrow A$
$A \rightarrow B \mid a$
$B \rightarrow b$
$Y \rightarrow T$
$T \rightarrow Y \mid c$ [c -> Small]

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Automata Theory & Computability

2nd Internals

Sem: V th Sem

Scheme & Solution

1) a

eclosure(0) = 0

eclosure(1) = 1

eclosure(2) = 2, 3, 4, 6, 9

eclosure(3) = 3, 4, 6

eclosure(4) = 4

eclosure(5) = 3, 4, 5, 6, 8, 9

eclosure(6) = 6

eclosure(7) = 7, 8, 9

eclosure(8) = 3, 4, 6, 8, 9

eclosure(9) = 9

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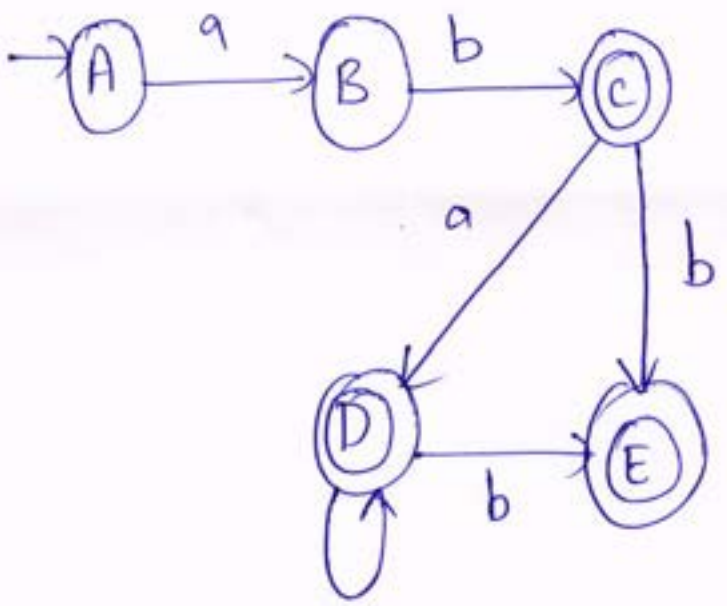
Transition table

	δ	a	b
→	A	B	ϕ
	B	ϕ	C
*	C	D	E
*	D	D	E
*	E	ϕ	ϕ



a

b Build Keyword algorithm

$K \rightarrow \{cat, cab, bat\}$

$\Sigma \rightarrow \{a, b, c, t\}$

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c

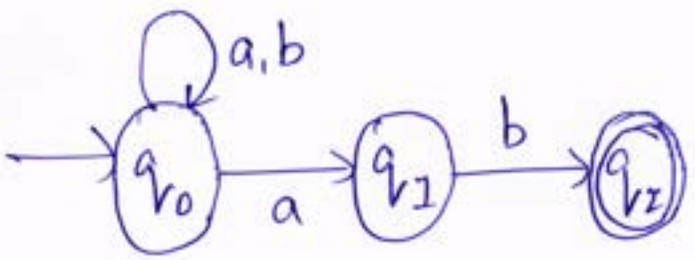
a RE → (a+b)

b RE → $(a+b)^*$ (a+bb)

c RE → ((a+b)(a+b))

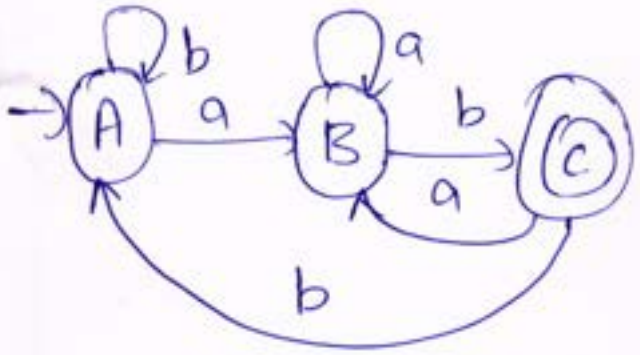
d RE → $((a+b)(a+b))^*$ (a+b)

2) a



δ_N	a	b
q_0	$\{q_0, q_1\}$	q_0
q_1	ϕ	q_2
* q_2	ϕ	ϕ

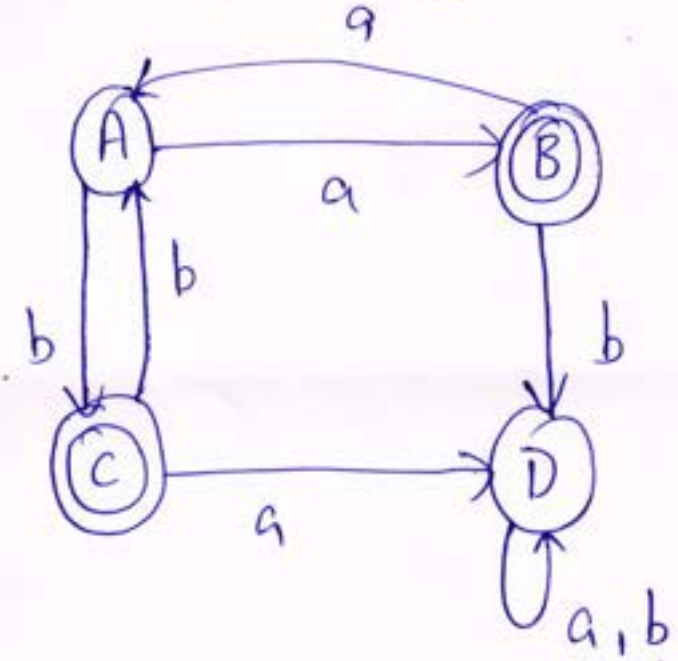
δ_0	a	b
q_0	$\{q_0, q_1\}$	q_0
$\{q_0, q_1\}$	$\{q_0, q_1\}$	$\{q_0, q_2\}$
* $\{q_0, q_1\}$	$\{q_0, q_1\}$	q_0



b

[A] [K-A]

[2,4] [1,3,5,6]



4 a

$S \rightarrow aA \mid bB$

$A \rightarrow aA \mid a$

$B \rightarrow bB$

$D \rightarrow ab \mid Ea$

$E \rightarrow ac \mid d$

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Ops	Nps	Rules
a, b, d	a, b, d	A → a D → ab E → d
a, b, d, A, D, E	a, b, d, A, D, E	S → aA A → aA | a D → ab | Ea E → d
a, b, d, S, A, D, E	a, b, d, S, A, D, E	E → d S → aA A → aA | a D → ab | Ea
	a, b, d, S, A, D, E	E → d

Unreachable Algorithm

Ops	Nps	Rules
S	S	S → aA
S, A, a	S, A, a	S → aA A → aA | a
	S, A, a	

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b. $S \rightarrow XY$

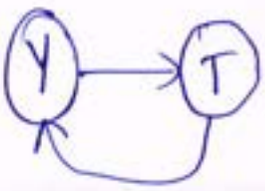
$X \rightarrow A$

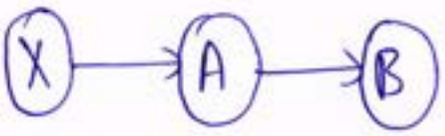
$A \rightarrow B \mid a$

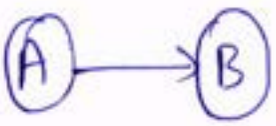
$B \rightarrow b$

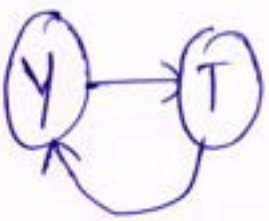
$Y \rightarrow T$

$T \rightarrow Y \mid c$









$S \rightarrow XY$

$X \rightarrow a \mid b$

$A \rightarrow b \mid a$

$B \rightarrow b$

$Y \rightarrow c$

$T \rightarrow c$

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: I

SUB :Unix Programming(18CS56) **MAX MARKS : 40**

SEM : V Sem **DATE& TIME : 21/11/21&90 min**

NOTE : Answer any **TWO** full questions.

1. a) With a neat diagram, explain the architecture of UNIX **7M[CO1]**
   b) List and briefly explain the features of Unix. **7M[CO1]**
   c) What are internal and external commands in Unix? Explain two of them each with example. **6M[CO1]**

OR

2. a) Describe organization of man documentation and a typical man page with example command. **7M[CO1]**
   b) Define Command? Explain briefly general command format with example?. **7M[CO1]**
   c) Explain the structure of /etc/passwd and /etc/shadow **6M[CO1]**

3. a) Explain the following commands- a) passwd b) echo c) wc d) ls e) who. **7M[CO1]**
   b) With the help of the diagram, explain the parent-child relationship **7M[CO2]**
   c) Briefly explain file permissions with example. **6M[CO2]**

OR

4. a) Explain briefly ls command with ls –l options. **7M[CO2]**
   b) Briefly explain basic file types. **7M[CO2]**
   c) Differentiate between absolute pathname and relative pathname. **6M[CO2]**

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Staff Name : Mr Basavesha D

Signature:

HOD Signature

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Unix Programming (18CS56)

Internal Assessment Test-1

Scheme & Solution

1. a) Neat Diagram of architecture of unix. → 2M.

Explanation of → 5M

* Kernel
* Shell & GUI's
* Files & process
* System calls

7M

b) Listing features of unix → 1M.
Explanation of each feature → 6M
} 7M

1) Multiuser System.
2) Multitasking system.
3) The unix Toolkit
4) Building-block approach
5) Pattern matching
6) Documentation.

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1. c) Internal commands are the frequently used commands & are built-in to the shell.

External commands are stored as a separate program. A command with an independent existence in the form of separate file is called an External command → 2M

Explanation of above in detail with example → 5M } 7M

2. a) organization of man documentation → 2M
A typical man page with example command → 5M } 7M.

MAN. which inclusions.

NAME, SYNOPSIS, Description, options, Exit Status, Return values, Errors, versions, Files.

$man [option] ... [command name]...

$man printf.

b) Command is an instruction given by a user telling a computer to do something such as running single & group of linked programs → 2M

General command format Diagram → 2M.

Explanation with Example → 3M.

Ex: ls, id, grep.

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c) file permission with example.

1) Read Permission
2) Write Permission
3) Execute Permission

} 6M.

4 a) ls command description → 1M
options list → 1M
explanation → 5M
} 7M.

1) Content Permissions.
2) number of links
3) owner of the content
4) group owner — " —
5) size of the content in bytes
6) last modified data
7) file & dir. name

b) basic file types in unix
listing → 1M
→ 6M
} 7M.

1) Regular
2) directory
3) Symbolic link
4) FIFO
5) block device
6) char device
} file.

c) 4 difference b/w ⇒ 4M
Absolute & Relative Path
Example for each ⇒ 2M
6M.

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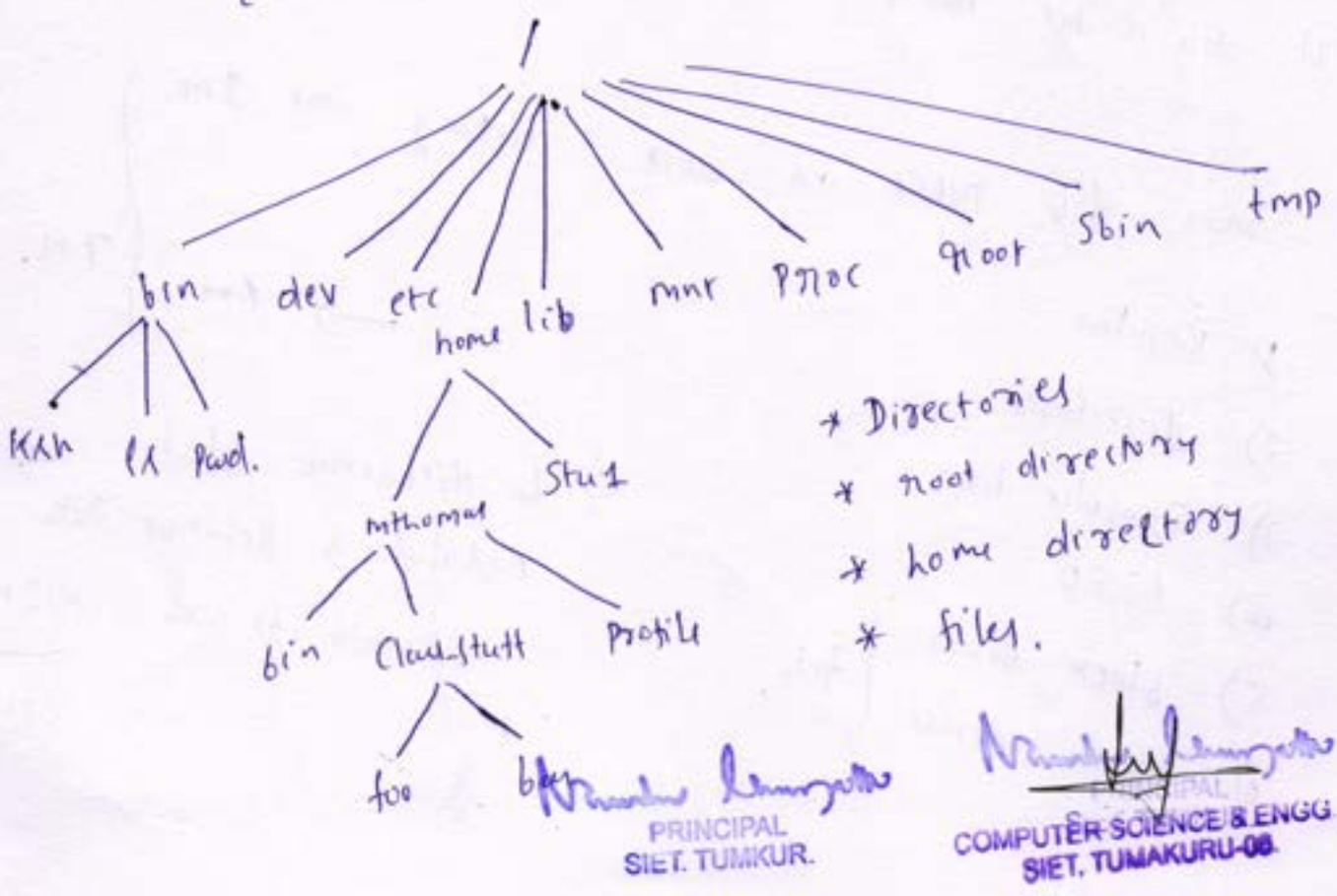
c) Structure of /etc/passwd → 3M
Structure of /etc/shadow → 3M
} 6M.

/etc/passwd file stores essential info. during login.
All fields are separated by a colon (:) symbol.

3.a) The commands Explanation along with Example

a) passwd → 2
b) echo → 1
c) wc → 2
d) ls → 1
e) who → 1
} 7M.

b) Diagram of Parent-child relationship → 2M.
Explanation in detail → 5M
} 7M.



* Directories
* root directory
* home directory
* files.

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INTERNAL ASSESMENT TEST: I
SUB : Big Data Analytics (18CS82) **USN:** | | | | | | | | | | |
SEM : VII "A" & "B" SEC

Date: 25/10/2022
MAX MARKS : 40
TIME : 90 min

NOTE: Answer TWO full questions

1.	a. Explain briefly bigdata, scalability and parallel processing?	10M[CO-1]
	b. Explain briefly data architecture, data sources and quality?	10M[CO-1]
	OR	
2.	a. Explain pre-processing, storing and data storage and analysis briefly?	10M[CO-1]
	b. Briefly explain big data analytics applications and case studies?	10M[CO-1]
3.	a. Explain briefly hadoop distributed file system?	10M[CO-2]
	b. Explain briefly hadoop map reduce framework?	10M[CO-2]
	OR	
4.	a. Briefly explain the essential hadoop tools	10M[CO-2]
	b. Briefly explain hadoop YARN applications?	10M[CO-2]

****

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   b. Briefly explain hadoop YARN applications? 10M[CO-2]

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Assesment test NO:- 1

1] Big Data Analytics – Scheme of Evaluation

a] Explain briefly bigdata, scalability and parallel processing?

→ Big data needs processing of large data volume and therefore needs intensive computations [5M]

→ processing complex applications with large data sets (tetrabytes or petabyte) need hundreds of computing nodes.

→ scalability enables increase or decrease in the capacity of data storage, processing & analysis. [5M]

Explaination-5M

1] b] Explain briefly data architecture, datasource and quality?

* Data source

→ A data source is the location where data that is being used originates from called data source.

Types of data source

1) structured data, semi-structured or unstructured

* Data quality

→ high quality means data which enables all the required operations analysis decisions, planning and knowledge discovery five R's follows.

> Relevancy > range > reliability > recency > robustness.

factors Affecting data quality

> data noise > missing value

> outlier > Duplicate value. [5M]

Data Architecture

Layer 5 Data consumption	Export data sets to cloud web etc	Datausages BPS BIs knowledge discovery	Analytics realtime schedule.
Layer 4 Data processing.	processing technology map reduce hive, pig, spark.	processing in realtime scheduled	synchronous asynchronous processing
Layer 3 Data storage	considerations types formats compairision	hadoop distribute file system spark mesos or S3	NOSQL data store hbase mongo. DB cassandra
Layer 2 Data ingestion Data acquisition	ingestion using extract load transform	data semantics append aggregate compact	pre. processing [5M]

2] explain pre-proong, storing & data storage and analysis Briefly.

a] * Data pre-processing

> Data-pre processing is an important step at the ingestion layer pre-processing is a most before data mining and analytics

> pre-procesg is also most before running a machine learning (ML) Algorithm pre-processing needs are. -5M

* * Big data storage

> NoSql data bases are considred as semi-structured data Bigdata store uses NoSql NoSql stands for NoSql or not only Sql.

* Big data Analytics

-> Data Analytics can be form data Analysis that clusters segments, ranks & predicts future possibilities. -5M

2] b] Briefly explain Big data analytics applns & case studies.

Applns

1) Big data in marketing and sals
2) Big data Analytics in detection / marketing frauds. -5M

Case studies -5M

3] a] explain briefly hadoop distributed file system?

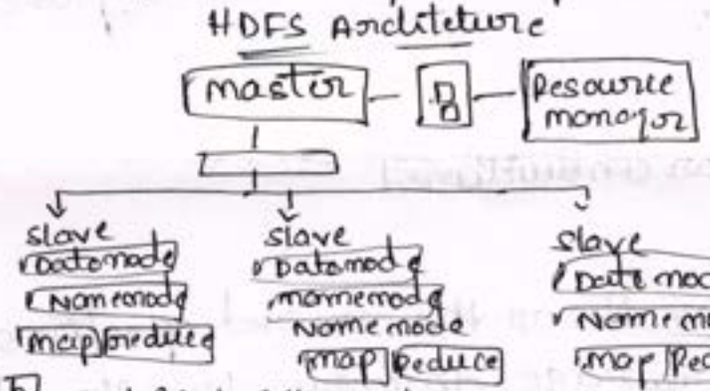

Diagram -5M

Explanation -5M

3] b] explain briefly hadoop map reduce frome work.

Mapper means:- software for doing the assigned ask after recognizing the data blocks imported using keys. -5M

Reducer means:- software reducing the mapped data by using the aggregation -5M

4] a] Briefly explain the essential hadoop tools.

1) zoo keeper- coordination service 2) Avro data serilization and transfer utility -5M
3) Oozie 4) Sqoop 5) Flume 6) Ambari 7) Chukwa-A 8) HBase-A 9) Zookeeper-A
10) Hive-A data ware hoose system 11) pig-A 12) Mahout-A.

Explanation -5M

4] b] Briefly explain hadoop YARN applications?

-> YARN is a resource management platform It manages the computer resources.

-> YARN seperates the resource mangement and processing components. -5M

Explanation -5M

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INTERNAL ASSESMENT TEST: II
SUB : Big Data Analytics (18CS82) **USN:** | | | | | | | | | | |
SEM : VII "A"

Date: 01/12/2022
MAX MARKS : 40
TIME : 90 min

NOTE: Answer TWO full questions

1.	a. Explain briefly NoSQL data store?	10M[CO-3]
	b. Explain briefly NoSQL data architecture patterns?	10M[CO-3]
	OR	
2.	a. Explain briefly with a neat diagram CAP theorem?	10M[CO-3]
	b. Briefly explain NoSQL to manage Big Data?	10M[CO-3]
3.	a. Explain briefly Shared-Nothing Architecture for Big Data tasks?	10M[CO-3]
	b. Explain briefly MongoDB abd Cassandra Databases?	10M[CO-3]
	OR	
4.	a. Briefly explain MapReduce map tasks, reduce tasks and mapreduce execution?	10M[CO-4]
	b. Briefly explain steps involved in MapReduce processing with a neat diagram?	10M[CO-4]

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SEM : VII "A"

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   b. Briefly explain steps involved in MapReduce processing with a neat diagram? 10M[CO-4]

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Q1:- Explain briefly NOSQL data Store? BDA-IA-2 Scheme of Evaluation

SOP:- Transaction on SQL DB Exhibit ACID properties. ACID Stand for automicity, Consisting, isolation and durability.

Automaticity:- all operation in transaction must complex and if interupted, than must be undone. [rolled back].

Consistency:- transaction must maintain the intergrity constraint follow the consistency principle.

Isolation:- two transaction of DB must be isolation from Each other and done Separately.

Durability:- means transaction must persist once completed.

NOSQL:- A new category of data Store in nosql [means not only SQL] data Stores. 5M

- NOSQL is an all together new approach of thinking about DB such of Schema, flexibility Simple, relationship, dynamic Schemid, auto Sharding, replication flexibility in approach.
- NOSQL data Store are considered as Semi Structured data.

Characteristics:- NOSQL is close to non relational dataStore System with flexible data model.

- NOSQL not necessary has a fixed Schema such as table:-
  - Do not use the concept of joins, data written at one node can be replicated to multiple nodes.
  - Data Store is thus fault tolerent, their can be partitioned into unshared Shards.

Features:- - relax one
- more of ACID properties.
- Characterized by two out of 3 properties.
- Can be characterized by BASE properties. 5M

Q2(16). Explain briefly NOSQL data architecture patterns?

SOP:- Key value Store:- Simple way to implement
- Characteristic are high performance, Scalability, flexibility.
- Stores accessed use a primary key for accessing the values.
- Concept is Similar to high table where universe key point to a particular item. 5M

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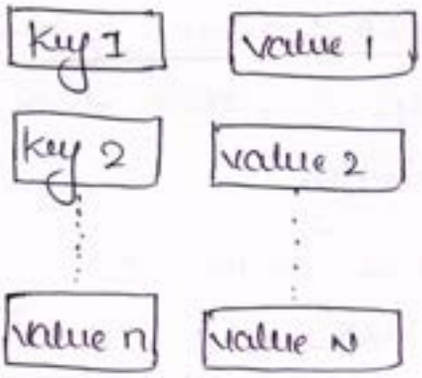


Key	value
ashish	"Categories: Student; Branch: Semutes; USN; BTch;

Advantages:- - Eventually consistent
- Value can be any data type
- Every just reverse value & return the value as a single item.
- Returned values on queries can be used to convert into list, table, columns, data, phone field and column.
  i) Scalability
  ii) Reliability
  iii) Portability
  iv) Low operation cost

Key value store provide client to read and write values using a key.
i) Gets(key) - value associated with key.
ii) put(key, value) - associate the value with the key and update a value if this key is already present.
iii) Multi get (key1, key2.) return list of values associate with list of keys.
iv) delete remove a key & its values from the data store.

Typical use of key value store are:-
  i) Image store
  ii) document or file store
  iii) Lookup table
  iv) Query cache.

5M

Q13) Briefly explain NOSQL to manage Big data?

SOP:- NOSQL:- Limits the support for joins queries, support suppose matrix like columns- family.
- Characteristic of Easy Creation and high processing speed, Scalability and storing/storability of much higher magnitude of data
- NOSQL Sacrifices the support of ACID properties and instead support CAP and BASE properties.
- NOSQL data processing Scale horizontally as well vertically.

5M

NOSQL adds for Bigdata:- BD needs Scalable storage of terabyte and petabyte, dropping of support for DB joins & storing data in differently on several distributed servers together as cluster.

5M

-Solution such as Couch DB, DynamoDB, mango DB (or) Cassandra follows CAP theorem.

2a) Characteristic:-
- high and Easy Scalability
- Support to Replication
- distributable
- usage of NOSQL servers
- usage of open source tools
- Support to Schemaless data model
- Support to integrated caching
- NO flexibility.

5M

Explanation - 5M

3a) Explain briefly shared-Nothing architecture for Bigdata tasks?

SOL:- it is a cluster architecture, node does not share data with any other node.
- Bigdata store consists of an architecture
- Independence:- Each node with no memory sharing. How powered Computational efficiency.
- Self healing:- a link failure causes creation of another line.
- Each node functioning as a shard.
- NO network connection.

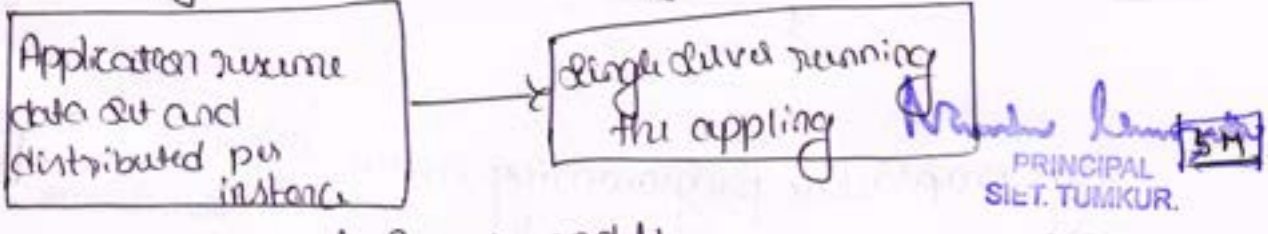
5M

Choosing the distribution models:-

Advantage:- ability to handle large size data.
- processing of many read and write operation simultaneously in application models for distribution.

1. Single server models:- Simplest distribution option for NOSQL database to access to is single distribution (SSD) of an application.
- graph DB process the relationship between nodes at a server.

2. Shard very large databases:- Showing sharding of very large dataset into divides on each running the application on flow i, j, k and l different servers clusters.
- DB_i, DB_j, DB_k & DB_l are 4 shards.
- datastores may add an auto sharding iterative



5M

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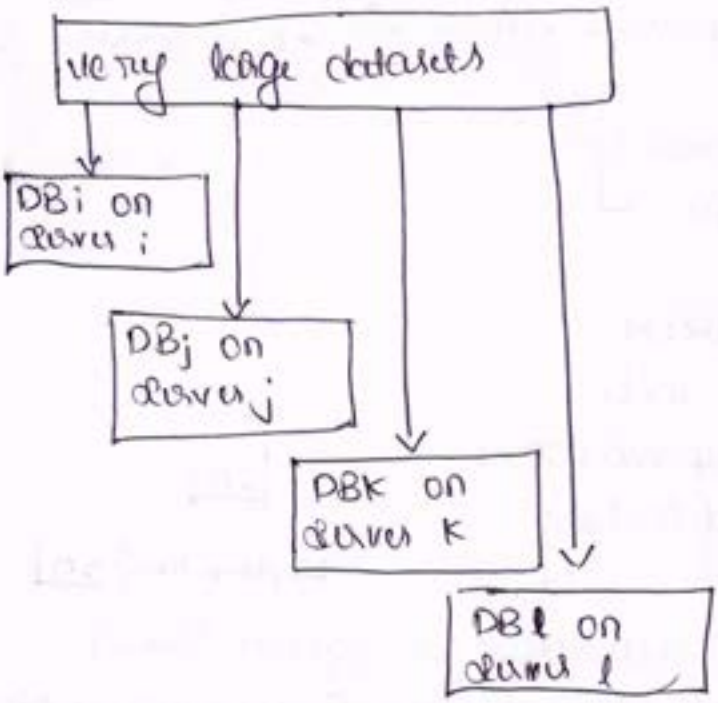
a) Single server models.

P.T.O



bdd loading - very large databases.

5M

(b) Briefly explain MapReduce map tasks, reduce tasks and mapreduce Execution.

Sol:- Bigdata processing Employee the mapreduce programming model. a job means a map reds programs Each job consists of smaller unit tasks.

- framework using which we can write application in huge amount of data in parallel on large cluster of commodity hardware in reliable manner.
- Each job consists of several smaller units called mapreduce tasks.

5M

- the model defines important task namely map and reduce
- map takes input datasets as pieces of data and map them on various nodes for parallel processing

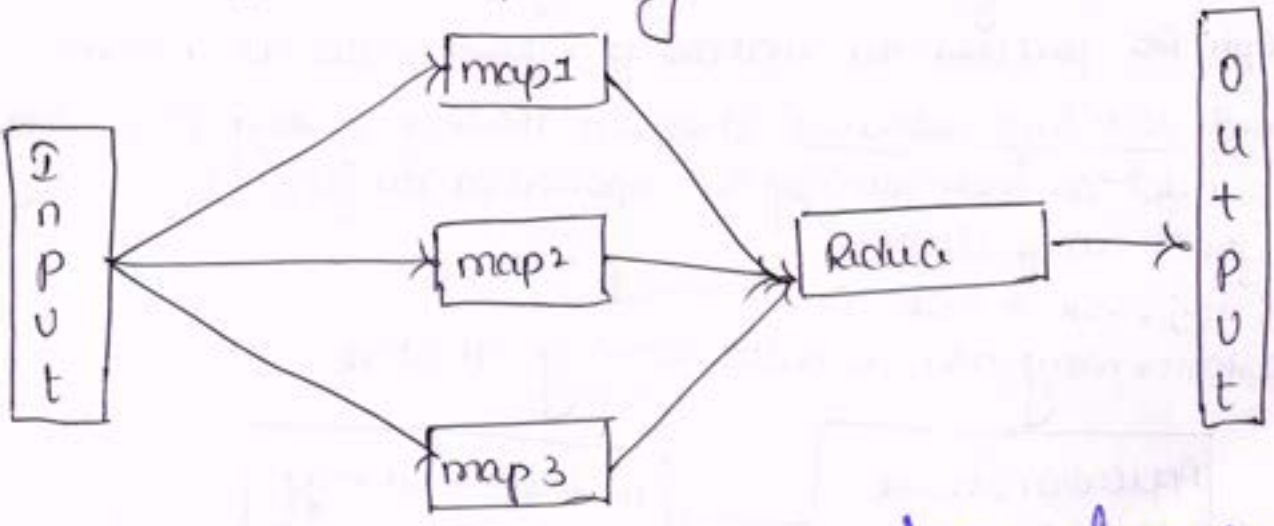


fig: mapReduce programming model.

5M

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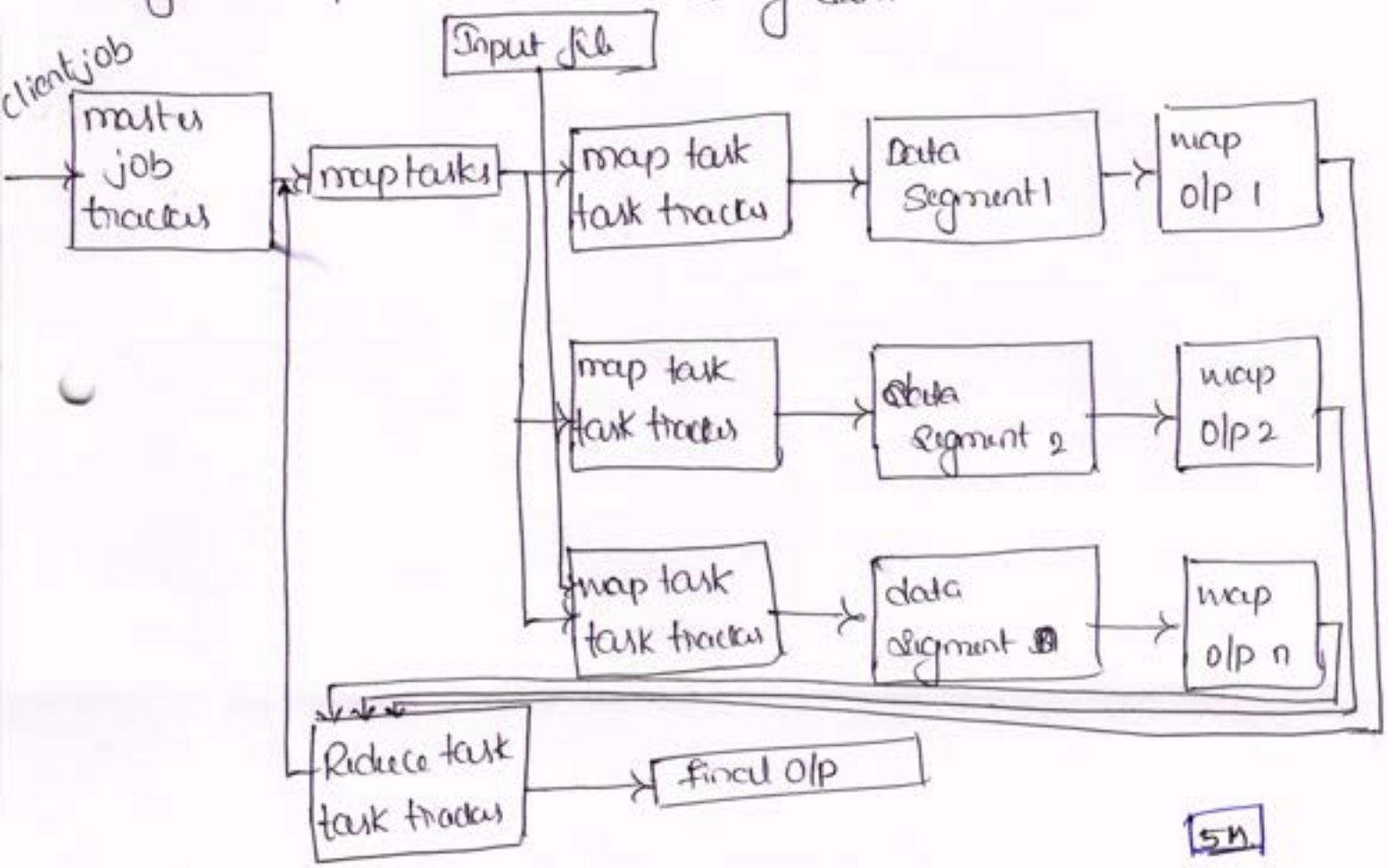
- model dying two tasks namely map and reduce map tasks input data sets as pieces of dataset & pieces of data and map them on variety nodes for parallel processing
- Reduce task which task the op from the map as a i/p & combine through data pieces into a main set of data



5M

Map tasks:-

map (key 1, value 1) → list (key 2, value 2)

Map Reduce Execution:-

General Split:- dying logical representation of data & presentation split data for processing at individual map

- Reduce map process when a client submitting a job and the scheduling action by the job tracker, task tracker.

RR:- communicate with input split and convert the split into the records which are in form of by value

Shuffle and sorting process:- all pairs in the same group key (K_2) collect and group together, group function key.

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- Reduce processes output zero or another set of key value pairs to final output file.

∴ Hence this is the explination of mapreduce tasks, reduce tasks, map tasks, mapreduce Execution with a neat diagram. [5M]

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: II

SUB :User Interface Design(18CS734) **MAX MARKS : 40**

SEM : VII Sem **DATE& TIME : 01/11/22&90 min**

NOTE : Answer any **TWO** full questions.

1. a) Explain briefly guidelines for designing conceptual models. **7M[CO2]**
   b) List and explain important human characteristics in design. **7M[CO2]**
   c) Briefly explain about Human Interaction Speed. **6M[CO2]**

OR

2. a) Explain the techniques for determining the user requirements using Direct and Indirect methods. **10M[CO2]**
   b) Which are the factors which distract the user from screen and what are the the factors that screen user want . **10M[CO2]**

3. a) List and explain briefly formatting of menus. **7M[CO1]**
   b) List and explain different functions and contents of menus. **7M[CO1]**
   c) List and explain different types of menus w.r.t structure of menus. **6M[CO1]**

OR

4. a) Explain Briefly the following graphical menus: i) Pull-Down Menu ii) Cascading Menu. **10M[CO1]**
   b) Explain briefly selecting menu choices. **10M[CO1]**

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   b) Which are the factors which distract the user from screen and what are the the factors that screen user want . **10M[CO2]**

3. a) List and explain briefly formatting of menus. **7M[CO1]**
   b) List and explain different functions and contents of menus. **7M[CO1]**
   c) List and explain different types of menus w.r.t structure of menus. **6M[CO1]**

OR

4. a) Explain Briefly the following graphical menus: i) Pull-Down Menu ii) Cascading Menu. **10M[CO1]**
   b) Explain briefly selecting menu choices. **10M[CO1]**

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Signature:_____ **HOD Signature**_____

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: II

Scheme of Evaluation

SUB :User Interface Design(18CS734) **MAX MARKS : 40**

SEM : VIII Sem **DATE : 01/11/2022**

1.a) Guidelines for designing conceptual models (any 7) **(1*7=7M)**

- **Reflect the user's mental model not the designer's:** A user will have different expectations and levels of knowledge than the designer. So, the mental models of the user and designer will be different. The user is concerned with the task to be performed, the business objectives that must be fulfilled.
- **Draw physical analogies or present metaphors:** Replicate what is familiar and well known. Duplicate actions that are already well learned. A metaphor, to be effective, must be widely applicable within an interface.
- Comply with expectancies, habits, routines, and stereotypes: Use familiar associations, avoiding the new and unfamiliar. With color, for example, accepted meanings for red, yellow, and green are already well established. Use words and symbols in their customary ways.
- **Provide action-response compatibility:** All system responses should be compatible with the actions that elicit them. Names of commands, for example, should reflect the actions that will occur.
- **Make invisible parts and process of a system visible:** New users of a system often make erroneous or incomplete assumptions about what is invisible and develop a faulty mental model. As more experience is gained, their mental models evolve to become more accurate and complete. Making invisible parts of a system visible will speed up the process of developing correct mental models.
- **Provide proper and correct feedback**: Be generous in providing feedback. Keep a person informed of what is happening, and what has happened, at all times, including: o Provide visible results of actions. o Display actions in progress. o Provide a continuous indication of status. o Present as much context information as possible. o Provide clear, constructive, and correct error messages.
- **Avoid anything unnecessary or irrelevant:** Never display irrelevant information on the screen. People may try to interpret it and integrate it into their mental models, thereby creating a false one.
- **Provide design consistency:** Design consistency reduces the number of concepts to be learned. Inconsistency requires the mastery of multiple models. If an occasional inconsistency cannot be avoided, explain it to the user.
- **Provide documentation and a help system that will reinforce the conceptual model:** Do not rely on the people to uncover consistencies and metaphors themselves. The help system should offer advice aimed at improving mental models.
- **Promote the development of both novice and expert mental models :** Novices and experts are likely to bring to bear different mental models when using a system.

1. b)Listing+ explanation of important human characteristics in design(any 6) **(1+6=7M)**

1.Perception •

Perception is our awareness and understanding of the elements and objects of our environment through the physical sensation of our various senses, including sight, sound, smell, and so forth. Perception is influenced, in part, by experience.

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2.Memory •

Memory is viewed as consisting of two components, long-term and short-term (or working) memory.

- Short-term, or working, memory receives information from either the senses or long-term memory, but usually cannot receive both at once, the senses being processed separately. Within short-term memory a limited amount of information processing takes place. Information stored within it is variously thought to last from 10 to 30 seconds, with the lower number being the most reasonable speculation. Knowledge, experience, and familiarity govern the size and complexity of the information that can be remembered.
- Long-term memory contains the knowledge we possess. Information received in short-term memory is transferred to it and encoded within it, a process we call learning.

3.Visual Acuity •

The capacity of the eye to resolve details is called visual acuity. It is the phenomenon that results in an object becoming more distinct as we turn our eyes toward it and rapidly losing distinctness as we turn our eyes away—that is, as the visual angle from the point of fixation increases.

4.Foveal and Peripheral Vision •

Foveal vision is used to focus directly on something; peripheral vision senses anything in the area surrounding the location we are looking at, but what is there cannot be clearly resolved because of the limitations in visual acuity just described.

- Foveal and peripheral vision maintain, at the same time, a cooperative and a competitive relationship. Peripheral vision can aid a visual search, but can also be distracting.

5.Information Processing •

The information that our senses collect that is deemed important enough to do something about then has to be processed in some meaningful way.

- There are two levels of information processing going on within us. One level, the highest level, is identified with consciousness and working memory. It is limited, slow, and sequential, and is used for reading and understanding.

6.Mental Models •

A mental model is simply an internal representation of a person's current understanding of something. Usually a person cannot describe this mental mode and most often is unaware it even exists.

7.Movement Control •

Particularly important in screen design is Fitts' Law (1954). This law states that: • The time to acquire a target is a function of the distance to and size of the target.

8.Learning •

Learning, as has been said, is the process of encoding in long-term memory information

- A design developed to minimize human learning time can greatly accelerate human performance. People prefer to stick with what they know, and they prefer to jump in and get started that is contained in short-term memory.

9.Skill •

The goal of human performance is to perform skillfully. To do so requires linking inputs and responses into a sequence of action. The essence of skill is performance of actions or movements in the correct time sequence with adequate precision.

10.Individual Differences •

In reality, there is no average user. A complicating but very advantageous human characteristic is that we all differ—in looks, feelings, motor abilities, intellectual abilities, learning abilities and speed, and so on.

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c) explanation about Human Interaction Speed (6*1=6M)

- The speed at which people can perform using various communication methods has been studied by a number of researchers. The following, are summarized as table below

Reading	
Prose text:	250–300 words per minute.
Proofreading text on paper:	200 words per minute.
Proofreading text on a monitor:	180 words per minute.
Listening:	150–160 words per minute.
Speaking to a computer:	105 words per minute.
After recognition corrections:	25 words per minute.
Keying	
Typewriter	
Fast typist:	150 words per minute and higher.
Average typist:	60–70 words per minute.
Computer	
Transcription:	33 words per minute.
Composition:	19 words per minute.
Two finger typists	
Memorized text:	37 words per minute.
Copying text:	27 words per minute.
Hand printing	
Memorized text:	31 words per minute.
Copying text:	22 words per minute.

2 a) Techniques for determining the user requirements using Direct and Indirect methods. (5+5=10M).

Here are some recommended direct methods for getting input from users(any 5)

1. Individual Face-to-Face Interview
2. Telephone Interview or Survey
3. Traditional Focus Group
4. Facilitated Team Workshop
5. Observational Field Study
6. Requirements Prototyping
7. User-Interface Prototyping
8. Usability Laboratory Testing
9. Card Sorting for Web Sites

INDIRECT METHODS • An indirect method of requirements determination is one that places an intermediary between the developer and the user. This intermediary may be electronic or another person(any 5).

1. MIS Intermediary
2. Paper Survey or Questionnaire
3. Electronic Survey or Questionnaire
4. Iterative survey
5. Electronic Focus Group
6. Marketing and Sales
7. E-Mail or Bulletin Board
8. User Group
9. Competitor Analyses
10. Other Media Analysis

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b)factors distract user from screen(any 5) (5+5=10M)

- Unclear captions and badly worded questions. These cause hesitation, and rereading, in order to determine what is needed or must be provided. They may also be interpreted incorrectly, causing errors.
- Improper type and graphic emphasis. Important elements are hidden. Emphasis is drawn away from what is important to that which is not important.
- Misleading headings. These also create confusion and inhibit one's ability to see existing relationships.
- Information requests perceived to be irrelevant or unnecessary. The value of what one is doing is questioned, as is the value of the system.
- Information requests that require one to backtrack and rethink a previous answer, or look ahead to determine possible context. Inefficiency results, and mistakes increase.
- Cluttered, cramped layout. Poor layout creates a bad initial impact and leads to more errors. It may easily cause system rejection.
- Poor quality of presentation, legibility, appearance, and arrangement. Again, this degrades performance, slowing the user down and causing more errors.
- Visual inconsistency in screen detail presentation and with the operating system.
- Lack of restraint in the use of design features and elements.
- Overuse of three-dimensional presentations.
- Overuse of too many bright colors.
- Poorly designed icons.
- Bad typography
- Metaphors that are either overbearing or too cute, or too literal thereby restricting design options.

What Screen Users Want (Any 5)

- An orderly, clean, clutter-free appearance.
- An obvious indication of what is being shown and what should be done with it.
- Expected information located where it should be.
- A clear indication of what relates to what, including options, headings, captions, data, and so forth.
- Plain, simple English.
- A simple way of finding out what is in a system and how to get it out.
- A clear indication of when an action can make a permanent change in the data or system.

3 a)Listing+Formatting of menus (any 6)(1+6=7M)

1.Consistency

- Provide consistency with the user's expectations.

Display

- If continual or frequent references to menu options are necessary, permanently display the menu in an area of the screen that will not obscure other screen data.

2.Presentation

- Ensure that a menu and its choices are obvious to the user by presenting them with a unique and consistent structure, location, and/or display technique.

3.Organization

- Provide a general or main menu.
- Display: — All relevant alternatives. — Only relevant alternatives.
- Delete or gray-out inactive choices.

4.Complexity

- Provide both simple and complex menus.
- Simple: a minimal set of actions and menus.
- Complex: a complete set of actions and menus.

5.Item Arrangement

- Align alternatives or choices into single columns whenever possible. — Orient for top-to-bottom reading. — Left-justify descriptions

. • If a horizontal orientation of descriptions must be maintained: — Organize for left-to-right reading.

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6.Ordering

- Order lists of choices by their natural order, or
- For lists associated with numbers, use numeric order.

7.Groupings

- Create groupings of items that are logical, distinctive, meaningful, and mutually exclusive.

8.Line Separators

- Separate vertically arrayed groupings with subtle solid lines.
- Separate vertically arrayed subgroupings with subtle dotted or dashed lines.

b)Functions of menus(any 3) + Contents of menus **(3+4=7M)**

Functions of menus

1. Navigation to a New Menu
2. Execute an Action or Procedure
3. Displaying Information
4. Data or Parameter Input

Contents of menus

1. Menu Context
2. Menu Title
3. Choice Descriptions
4. Completion Instructions

c) Different menus listing +structure of menus (1*6=6M)

1.Single Menus

- In this simplest form of menu, a single screen or window is presented to seek the user's input or request an action to be performed

2.Sequential Linear Menus

- Sequential linear menus are presented on a series of screens possessing only one path.
- The menu screens are presented in a preset order, and, generally, their objective is for specifying parameters or for entering data.

Simultaneous Menus

- Instead of being presented on separate screens, all menu options are available simultaneously.

3.Hierarchical Menus

- A hierarchical structure results in an increasing refinement of choice as menus are stepped through, for example, om options, to suboptions, from categories to subcategories, from pages to sections to subsections, and so on

4.Connected Menus

- Connected menus are networks of menus all interconnected in some manner. Movement through a structure of menus is not restricted to a hierarchical tree, but is permitted between most or all menus in the network.

5.Event-Trapping Menus

- Event Trapping menus provide an ever-present background of control.

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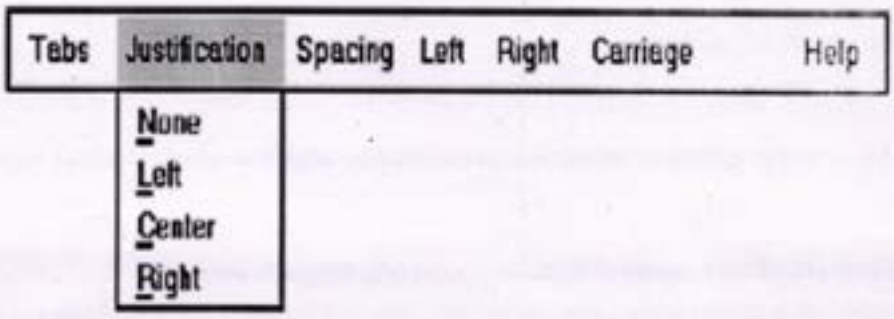
4 a. Pull down menu (5M)+ Cascading menu (5M)

- The advantages of pull-down menus are:
  - The menu bar cues a reminder of their existence.
  - They may be located relatively consistently on the screen.
  - No window space is consumed when they are not used.
  - They are easy to browse through.
  - Their vertical orientation is most efficient for scanning.
  - Their vertical orientation is most efficient for grouping.
  - Their vertical orientation permits more choices to be displayed.
  - They allow for display of both keyboard equivalents and accelerators.

- The disadvantages of pull-down menus are:
  - They require searching and selecting from another menu before seeing options.
  - They require looking away from main working area to read.
  - The require moving the pointer out of working area to select (unless using keyboard equivalents).
  - The items are smaller than full-size buttons, slowing selection time.
  - The may obscure the screen working area.



Cascading Menus

- Proper usage:
  — To reduce the number of choices presented together for selection (reduce menu breadth).
  — When a menu specifies many alternatives and the alternatives can be grouped in meaningful related sets on a lower-level menu.
  — When a choice leads to a short, fixed list of single-choice properties.
  — When there are several fixed sets of related options.
  — To simplify a menu.
  — Avoid using for frequent, repetitive commands.
- The advantages of cascading menus are that:
  - The top-level menus are simplified because some choices are hidden.
  - More first-letter mnemonics are available because menus possess fewer alternatives.
  - High-level command browsing is easier because subtopics are hidden.
- The disadvantages of cascading menus are:
  - Access to submenu items requires more steps.
  - Access to submenu items requires a change in pointer movement

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b) Selecting menu choices (2*5=10M)

1.Initial Cursor Positioning

If one option has a significantly higher probability of selection, position the cursor at that option.

• If repeating the previously selected option has the highest probability of occurrence, position the cursor at this option.

• If no option has a significantly higher probability of selection, position the cursor at the first option.

2.Choice Selection

• Pointers: — Select the choice by directly pointing at it with a mechanical device such as a mouse or trackball pointer, or light pen, or pointing with one's finger.

3.Defaults

• Provide a default whenever possible.

• Display as bold text.

4.Unavailable Choices

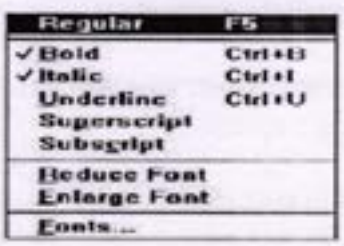
• Unavailable choices should be dimmed or —grayed out.

• Do not add or remove items from a menu unless the user takes explicit action to add or remove them through the application.

5.Toggled Menu Items • Purpose: — Use to designate two opposite commands that are accessed frequently. — Use when the menu item displayed will clearly indicate that the opposite condition currently exists

Mark Toggles or Settings

- **Purpose:**
  — Use to designate that an item or feature is active or inactive over a relatively long period of time.
  — Use to provide a reminder that an item or feature is active or inactive.
- **Guidelines:**
  — Position the indicator directly to the left of the option.
  — For situations where several nonexclusive choices may be selected, consider including one alternative that deselects all the items and reverts the state to the "normal" condition.



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2022-23

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: I

SUB :User Interface Design(18CS734) **MAX MARKS : 40**

SEM : VII Sem 'A' Sec . **DATE& TIME : 27/10/22&90 min**

NOTE : Answer any **TWO** full questions.

1. a)	Explain the Importance and Benefits of good user Interface Design	7M[CO1]
b)	Explain in detail the characteristics of GUI.	7M[CO1]
c)	List and explain any 5 graphical system advantages and disadvantages.	6M[CO1]
	OR	
2. a)	Write differences between GUI and Webpage Design.	10M[CO1
b)	Discuss the general principles of User Interface Design.	10M[CO1
3. a)	Explain briefly obstacles and pitfalls in the development path.	7M[CO1]
b)	List and explain the five commandments in designing for people.	7M[CO1]
c)	Explain the concept of Direct Manipulation for graphical systems.	6M[CO1]
	OR	
4. a)	Define usability? Explain common usability problem and objective measures of usability.	10M[CO1
b)	List out differences between a) Printed pages vs Web pages b) Intranet vs Internet	10M[CO1

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Staff Name : Mr Basavesha D

Signature: 25/10/22 **HOD Signature**

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User Interface Design

Scheme & Solution I.A. Test-1

1 a) Importance of good UID ——→ 3M
Benefits of good UID ——→ 4M } 7M

List out why we need good UID & benefits like improve readability i.e 25 percent less time & 25 percent less errors.

① improve readability i.e 25 percent less time & 25 percent less errors.
② reduce decision-making time.
③ reduce training cost
④ Org. customer benefit
⑤ Employee satisfaction.
⑥ Economic benefits.

b) characteristics of GUI } 7M

Listing (1M) + Explanation of each (6M)

1) Sophisticated visual presentation
2) Pick & click interaction
3) Restricted set of Interface options
4) Visualization
5) object orientation
6) Concurrent performance of Functions.

c) 5 advantages of GUI ($2\frac{1}{2}$ M) + disadvantages of GUI ($2\frac{1}{2}$) ⇒ 5M

Adv:- ① Symbols recognized faster than text
② Faster learning
③ Faster use & problem solving
④ Easier remembering
⑤ more natural.

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disadv :-

1. Greater design complexity
2. Learning still necessary
3. Inconsistencies in techniques & terminology.
4. Not always familiar.
5. Production limitations.

2. a) Difference b/w GUI & WebPage Design. → 10M

10 Diff. list w.r.t. characteristics

1. Devices
2. user focus
3. Data
4. Information
5. user tasks
6. presentation
7. Navigation
8. Interaction
9. Response time
10. System capability etc

b) General Principles of U.I.D → 10M.

10 principles listing + explanation

1) Aesthetically pleasing
2) clarity
3) compatibility
4) comprehensibility

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(5) configurability
(6) consistency
(7) control
(8) Directness
(9) Efficiency
(10) Familiarity etc

3. a) obstacles in development Path + Pitfalls — 11 — } 3+4 } 7M.

Gould (1988) general observation about design. →
6 observations

Common Pitfalls → 6 pitfalls
No early analysis, No usability testing
No design element prototypes
No common design team vision of interface
Poor communication.

b) 5 commandment listing (1M) + Explanation (6M) ⇒ 7M.
(1) Gain a complete understanding of users & their tasks.
(2) Solicit early & ongoing user involvement
(3) Perform rapid prototyping & testing.
(4) Modify & iterate the design as much as necessary.
(5) Integrate the design of all the system components.

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c) Concept of Direct manipulation defn + 4 Characteristics

1M + 5M ⟹ 6M

"The term used to describe this style of interaction for graphical systems"

1) The system is portrayed as an extension of real world
2) Continuous visibility of objects & actions
3) Actions are rapid & incremental with visible disp. results
4) Incremental actions are easily reversible.

4 a) usability definition + common usability problems + objective measures of usability (2 + 4 + 4) ⇒ 10M.

It used to describe the effectiveness of human performance. easily & effectively.

10 common usability problems (Any 8) ⇒ 4M

objective measures ⟹ 4M

1) How effective is the interface?
2) How learnable is the interface?
3) How flexible is the interface?

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b) List out differences

a) Printed Pages vs web pages → 5M.
b) Intranet vs Internet → 5M
} 10M.

a) 1) Page size
2) Page rendering
3) Page layout
4) Page resolution
5) Page Navigation
6) Interactivity
7) Page Independence (Any 5)

b) 1) Users
2) Tasks
3) Type of Information
4) Amount of —11—
5) Hardware & software
6) Design Philosophy (Any 5).

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VII Sem 'B' – 1st IA

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INTERNAL ASSESMENT TEST: I **DATE: 05/11/22**
COURSE: AI&ML (18CS71) TIME: 90 min **MAX MARKS: 40**
SEM: VII

NOTE: Answer the TWO **full** questions **Q1 or Q2 and Q3 or Q4**

1. a. Define AI? Explain the technique in AI & Application. **[10M]** CO1
   b. Explain Tic-Tac-Toe algorithm with an example. **[10M]** CO1

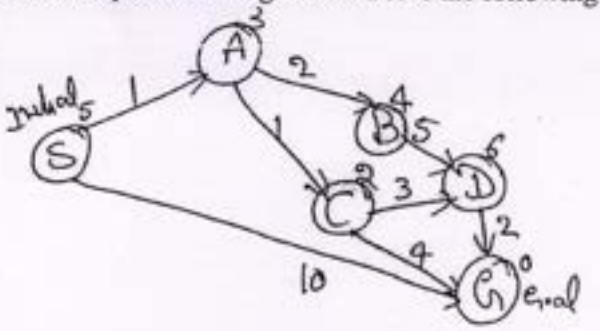
or

2. a. Define state-space search algorithm. Write an algorithm & explain the water jug problem as a state space. **[10M]** CO1
   b. What is production system? Explain mission area & carnivals problem. **[10M]**

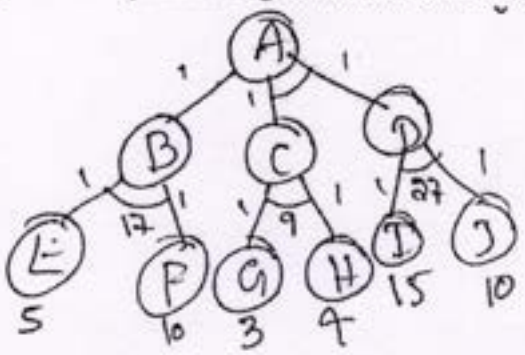
3. a. What is heuristic search technique? Explain generate and test algorithm with example. **[10M]**
   b. Explain Breadth-First-Search & Depth-First-Search. Write down the advantages and disadvantages of both **[10M]**

or

4. a. What is A* search algorithm? Explain with algorithm. Solve the following problem. **[10M]**



   b. What is AO* search algorithm? Explain the algorithm and solve the following graph. **[10M]**



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Signature:.....

HOD Signature.....

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Internal Assesment Test :- I

[10M]

① a. Define AI ? Explain the technique in AI & Application.

→ AI is a branch of Computer Science that pursues creating the Computers or machines as intelligent as human beings. [3M]

* AI Technique :- [4M]

→ The knowledge Captures generates / generalizations that share properties and grouped together, rather than being allowed Seperate Representation.

→ It Can be Understood by People who must Provide it - even though for many programs bulk of the data comes automatically from Reading.

→ In many AI domains, how the People Understand the Same people must Supply the knowledge to a Program.

→ It can be easily modified to Correct errors & Reflect changes in Real Conditions.

→ It can be Widely Used even if it is incomplete or incorrect.

→ It Can be Used to help OverCome its Own Sheer bulk by helping to narrow the Range of possibilities that must be Usually Considered.

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* Application of AI → (3M)

- → Problem Solving
- → Search Strategies
- → Control Strategies
- → Speech Recognition
- → Natural Language Understanding
- → Computer Version
- → Expert System.
- → Entertainment
- → Healthcare.
- → Gaming
- → finance
- → Data Security
- → Social media.
- → Robotics.
- → Agriculture
- → E-Commerce
- → Education.

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① ⑥ Explain Tic-Tac-Toe algorithm with an example [10M]

→ Step 1 :- Consider 3X3 matrix [3 Rows & 3 columns] elements are 1 to 9 [1, 2, 3, 4, 5, 6, 7, 8, 9]

→ Step 2 :- to play algorithm Select 2 players i.e 1 is machines & Seconderies Human being.

→ Step 3 :- to plot matrix always should Remember one Row & one column elements must be 15.

→ Step 4 :- machine Value is '0' & Human Value must be 'X' & always machine Should be Select the first Vector in matrix then human can select.

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Ex:- [5M]

8	3	4	⇒15
1	5	9	⇒15
6	7	2	⇒15
⇓15	⇓15	⇓15	15

X	X	O
O	O	O
X		

Machine

move (1) :- 5

move (3) :- 5, 4

move (5) :- 5+4 = 9.

15 - 9 = 6 => already taken by Human.

machine can't win from human.

8 + 6 = 14

15 - 14 = 1

{5, 4, 1} [machine not allowed to win the game So, it choose 1 element]

move (7) :- 5, 4, 1.

5 + 1 = 6

15 - 6 = 9

Machine will not win after taking vector element in 9 in move (7) [5, 4, 1, 9].

Human

move (2) :- 8

move (4) :- 8, 6

move (6) :- 8, 6, 3

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→ After move (7) machine win the game, why the human will not win because he won't check the Opposite Oppone Value which & all he Selected. But machine check everything.

---

(9) (a) Define State-Space Search algorithm. Write an algorithm & explain the water jug problem as a State Space. [10M]

→ A State-Space Represents a problem in terms of states & operators that change states. [3M]

* a State Space Consists of.

→ a set of states

→ Set of Rules

* Water Jug Problem —[4M]

We Use 2 just called four & three, four holds a maximum of 4 gallons of water & 3 a maximum of 3 gallons of water.

→ the State Space is a set of Prearranged Pairs giving the number of gallons of water in the pair of just at any time. i.e. (four, three) where,

four = 0, 1, 2, 3 or 4

three = 0, 1, 2, or 3.

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Here, let x denotes the 4-gallons jug.
y denotes the 3 gallons jug.

→ the start - state is (0, 0) & goal state is (2, n) where 'n' may be any but it is limited to three holding from 0 to 3 gallons of water or empty. three & four shows the name & numerical number shows the amount of water in jugs for solving the water jug problem.

S. NO	Initial State	Condition	final State	Description of action taken
1	(x, y)	if (x < 4)	(4, y)	fill the 4 gallon jug completely.
2	(x, y)	if (y < 3)	(x, 3)	fill the 3 gallon jug completely
3	(x, y)	if (x > 0)	(x-d, y)	pour some part from the 4 gallon jug.
4	(x, y)	if (y > 0)	(x, y-d)	pour some part from the 3 gallon jug
5	(x, y)	if (x > 0)	(0, y)	Empty the 4 gallon jug.
6	(x, y)	if (y > 0)	(x, 0)	Empty the 3 gallon jug.
7	(x, y)	if (x+y) < 7	(x, y-(4-x))	Pour some water from the 3 gallon jug to fill the 4 gallon jug.
8	(x, y)	if (x+y) < 7	(x-(3-y), y)	Pour some water from the 4 gallon jug to fill the 3 gallon jug.
9	(x, y)	if (x+y) < 4	(x+y, 0)	Pour some water from the 3 gallon jug to fill the 4 gallon jug
10	(x, y)	if (x+y) < 3	(0, x+y)	Pour some water from the 4 gallon jug to fill the 3 gallon jug.

[3M]

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Sl. No	4 gallon jug	3 gallon jug	Rule followed
1	0 gallon	0 gallon	initial State
2	0 gallon	3 gallon	Rule no 2
3	3 gallon	0 gallon	Rule no 9
4	3 gallon	3 gallon	Rule no 2
5	4 gallon	2 gallon	Rule no 7
6	0 gallon	2 gallon	Rule no 5
7	2 gallon	0 gallon	Rule no 9

on Reaching the 7th attempt we reach a State which is our goal State.

2 (b) What is Production System? Explain missionaries & cannibals Problem. [10M]

→ Production System Provide appropriate Structures for performing & describing Search Process.

→ A production System has 4 basic components as enumerated. [3M]

→ A Set of Rules each Consisting of a left Side that determines the applicability of the Rule & a right Side that describes the operation to be performed if the Rule is applied.

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* Mission & Carnivals Problem →[7 M]

→ 3m & 3c → River (boat)
(carnivals eat)

mission Source MMMCCC —B→ → at a time only 2m or 2cer crossover the River & while come back boat Should Contain 1m or 1 C. it Should not be Comes Empty.

→ MMMCCC Destination.

left end Right end.

0 → initial Step mmmccc & B

1 → two carnivals cross over mmmc —CCB→ BCC

2 → one carnivals come back MMMCCB ←BC— C.

3 → Two Carnivals Cross over MMM —BCC→ BCCC.

4 → one Carnivals come back. MMMCB ←BC— CC.

5 → two missionaries cross over MC —mmB→ CCmmB.

6 → A missionary & carnival come back ←BmC— mc.

7 → two missionaries cross over CC —Bmm→ MMMCB

8 → One Carnivals come back CCCB ←CB→ MMM

9 → Two carnivals cross over C —BCC→ MMMCCB

10 → One carnival comeback CCB ←CB— MMMC.

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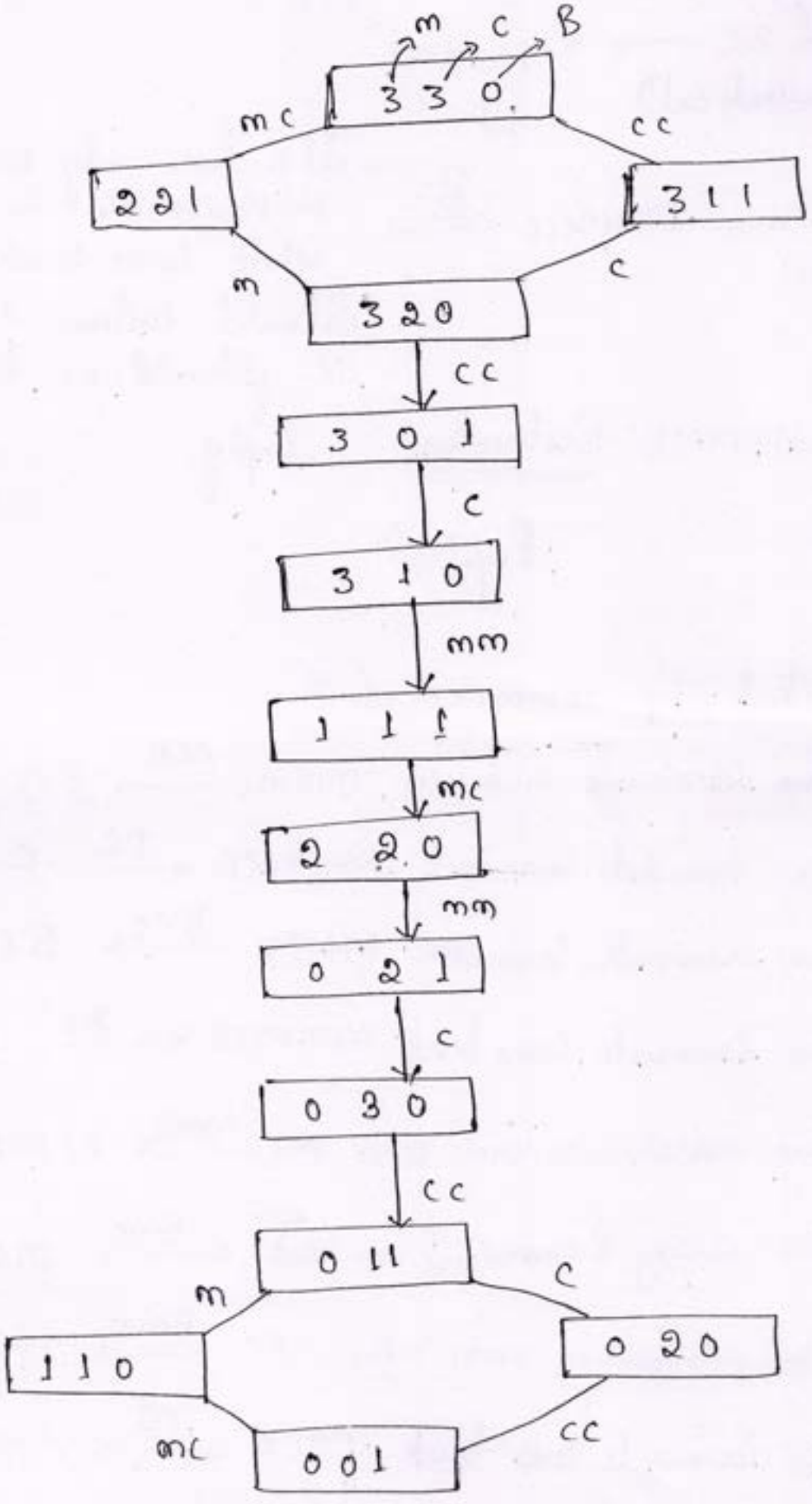
11 → Two Cannibals two over - CCB → BMMMCCC
Destination



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(3) (a) What is heuristic Search technique ? Explain generate and test algorithm with example. [10M]

——→ Heuristic Search is class of method which is used in order to Search a Solution Space for an optimal Solution for a Problem. →[2M]

* Generate and test Algorithm →[2M]

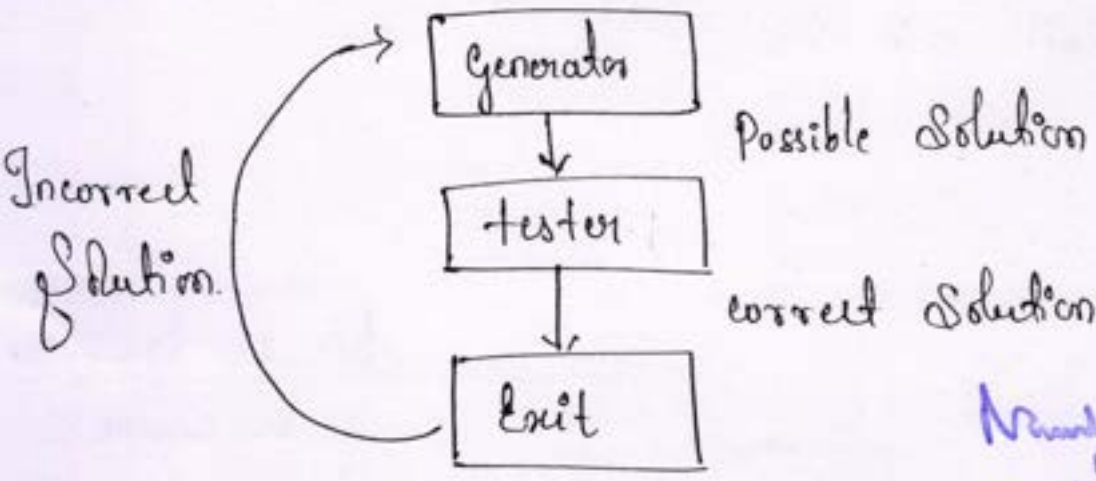
Generate and test Search algorithm is a very simple algorithm that guarantees to find a Solution if done Systematically & there Exists a Solutions.

Algorithm:

(1) Generate a Possible Solution.

(2) Test to See if this is the expected Solution.

(3) if the Solution has been found, Quit else go to Step 1.



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* two approaches are followed while generating Solution.

→ Generate Complete Solution

→ Generate Random Solution.

* Example [6M]

A Salesman has a list of cities each of which he must visit exactly once. There are direct roads between each pair of cities on the list. Find the Route the Salesman should follow for the Shortest Possible Round trip that both start & finishes at any one of the cities.

→ Traveler need to visit 'n' cities.

→ to know the distance b/w each pair of cities.

→ want to know the Shortest Route that visit all the cities once.

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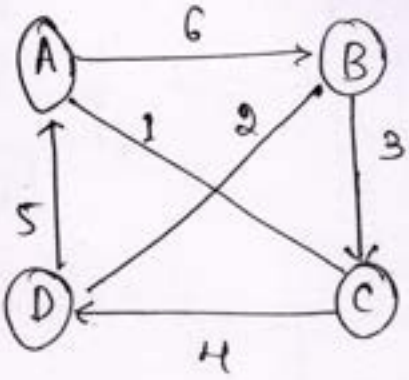


Search for path length of path.

1 ⟶ ABCDA ⟶ 6+3+4+5 = 18

2 ⟶ ABDCA ⟶ 6+2+4+1 = 13

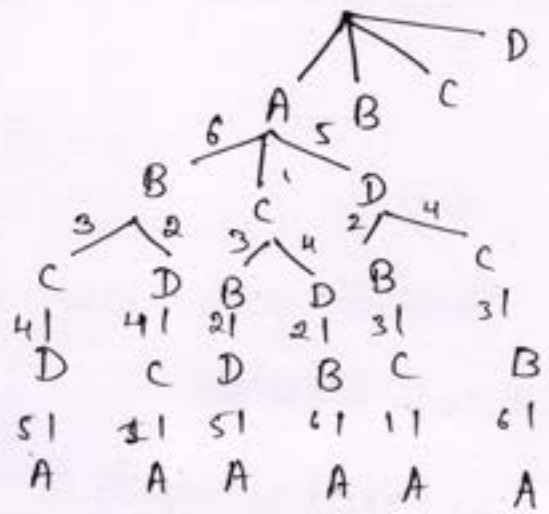
3 ⟶ ACBDA ⟶ 1+3+2+5 = 11

4 ⟶ ADBCA ⟶ 5+2+3+1 = 11

5 ⟶ ACDBA ⟶ 1+4+2+6 = 13

6 ⟶ ADCBA ⟶ 5+4+3+6 = 18.

∴ the shortest path ⇒ ACBDA & length of the path = 11



ACBDA = 11

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(3) (b) Explain Breadth-first-Search & depth-first-Search. Write down the advantages & disadvantages of both. [10m]

→ * Breadth-first-Search —[3m]

→ Create a Variable Called NODE_LIST & Set it to the initial State

→ until a good State is formed or NODE_LIST is empty

→ Remove the first element from NODE_LIST & call it E. If NODE_LIST was empty, quit.

→ for each way that each Rule can match the State described in E do.

* apply the Rule to generate a new State.

* if the new State is a goal State, quit & Return this State.

* otherwise, add the new State to the end of NODE_LIST.

* advantages: — [2m]

→ Used to find the Shortest path btw States.

→ Always find optimal Solution

→ there is nothing like Useless path in BFS, Since it Searches level by level.

→ finds the closest goal State in less time.

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* disadvantages

→ all of the connected Vertices must be stored in memory, Consumes more memory.

* Algorithm of Depth-first-Search —(3M)

→ if the initial state is a goal state, quit & Return Success.

→ otherwise, do the following until Success or failure is Signaled.

→ Generate Successor E of initial State. If there are no more Successors Signal failure.

→ if Successor is Returned, Signal Success, otherwise continue in this loop.

* advantages —(2M)

→ Consumes less memory

→ finds the longer distance element in less time.

→ * disadvantages

→ may not find optimal Solution to the Problem.

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H. (a) What is A^* Search algorithm? Explain with an algorithm. Solve the following Problem. [10M]

→ A^* Search algorithm :- Shortest path through the Search Space. [2M]

→ Select Successor node.

$f(n) = g(n) + h(n)$

Where,

$f(n)$ → estimated total path to Reach goal

$g(n)$ → cost to reach the node & from the start Stage.

$h(n)$ → heuristic Value.

* Algorithm :- [5M]

Step 1 :- place the starting node in Open list

Step 2 :- Check if the open-list is empty or not, if the list is empty Return failure & Stops

Step 3 :- Select node from the open-list which has the Small Value of evaluation function (gth) if node n is goal node then Return Successor & stop

Step 4 :- Expand node n & generate all of its Successor & put n in the closed list.

→ for each Successor 'n'. Check whether 'n' is ahead in the open or closed list.

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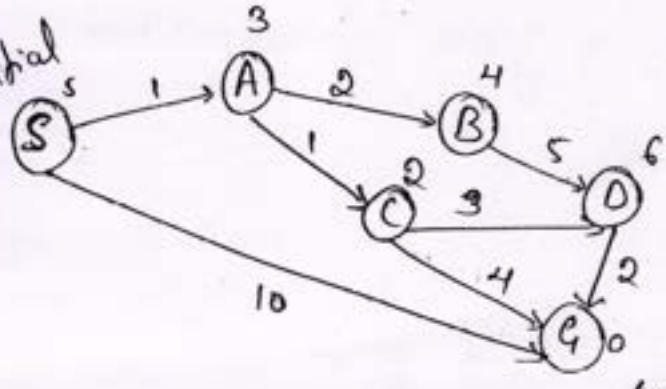
(b) Explain A* & AO* algorithm with example. 10M [CO1]

→ if not then Compute evaluation fun^n for 'n' & place into Open-list.

Step 5 :- if node n is already in Open & close then it should be attached to the back pointer which Reflect the lowest g(n) value.

Step 6 :- Return to Step 2.

Ex:- Initial



→[3M]

→ S → A ⇒ f(n) = g(n) + h(n)

= 1 + 3 = 4.

→ S → G ⇒ f(n) = g(n) + h(n) = 10 + 0 = ~~10~~ 10.

→ S → A → B ⇒ 1 + 2 + 4 = 7.

→ S → A → C ⇒ 1 + 1 + 2 = 4

→ S → A → C ⇒ D = 5 + 6 = 11

→ S → A → C → G = 1 + 1 + 4 = 6.

S → A → C ⇒ G = 6

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(b) What is AO* Search algorithm? Explain the algorithm & Solve the following graph. [10M]

→ it is useful for representing the Solution of Problem that can be Solved by decomposing them into Set of Smaller problem all of which must be Solved →[4M]

→ Every node has AND & OR

→ OR node Represents a choice b/w Possible to decomposition

→ AND node Represents a given decomposition

* problem definition –[4M]

Given [G, S, T] where

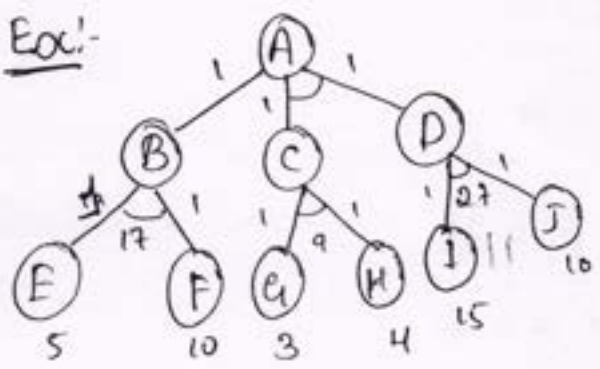
G = implicitly Specified AND/OR graph

S = Start node of AND/OR graph

T = Set of terminal node

h(n) = heuristic function Estimating the cost of Solving the Subproblem at n.

Ex:-



→[2M]

$f(n) = A(B+E+F) = (5+1)+(10+1)$

$= 17.$

$1+17 = 18$

$f(n) = (A+(C+G+H)+(D+I+J)$

$= (3+1)+(4+1)+(15+1+10$

$= 9+27$

$= 36$

$= A(1+36+1)$

$= 38$

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INTERNAL ASSESMENT TEST: IDATE: 22/11/22
COURSE: Cryptography(18CS744)
SEM: VII

MAX MARKS:40
TIME: 90 min

NOTE: Answer the TWO **full** questions **Q1 or Q2 and Q3 or Q4**

1) a.By using Caesar cipher convert PT: HELLO to CT using key has 5 **7M[CO1]**
b. Using playfair cipher convert BALLON to CT taking key has MONARCHY. **7M[CO1]**
c. Using Euclids technique find gcd(1025,35) **6M[CO1]**

OR

2) a. With an RSA algorithm find the value of C, where P=3, Q=7, E=5, M=4. **10M[CO1]**
b. By using Vigenere cipher technique convert a PT: GIVE MONEY to CT taking key has LOCK. **10M[CO1]**

3) a. Using Diffie Hellmann key exchange find the value of K where q=11, Private key of user A is 8, Private key of user B is 4. **7M[CO2]**
b. With an RSA algorithm find the value of C, where P=7, Q=7, E=5, M=4. **7M[CO2]**
c. Using rail fence convert PT: MEET ME AFTER THE PARTY to CT ,depth has 2. **6M[CO2]**

OR

4) a. Using row transposition convert PT: attack postponed until two am, k=4312567 **10M[CO2]**
b.Using double transposition convert PT : attack postponed until two am, k=SIET **10M[CO2]**

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Cryptography

I^st Internals

Sem: 7^th Sem Scheme & Solution

1) a

$C \rightarrow (p+K) \bmod 26$

$C \rightarrow (8+5) \bmod 26$

$13 \bmod 26$

13

$C \rightarrow (12+5) \bmod 26$

$17 \bmod 26$

17

$C \rightarrow (15+5) \bmod 26$

$20 \bmod 26$

20

$C \rightarrow (p+K) \bmod 26$

$C \rightarrow (5+5) \bmod 26$

$10 \bmod 26$

10

$C \rightarrow (12+5) \bmod 26$

$17 \bmod 26$

17

H E L L O
↓ ↓ ↓ ↓ ↓
M I Q Q T

7M

1) b

Key → MONARCHY

P.T → BALLON

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M	O	N	A	R
C	H	Y	B	D
E	F	G	I/J	K
L	P	Q	S	T
U	V	W	X	Z

- Plain Text → Cipher Text

  BA|LX|LO|NZ

  IB|SU|MP|RW

7M

2) 6

$p = 3,\ Q = 7,\ e = 5,\ M = 4$

- $n = p * q$

$n = 21$

$\phi(n) = (p-1)(q-1)$

$\phi(n) = (2)(6)$

$\phi(n) = 12$

$d = 5^{-1} \bmod 12$

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$d = 5$

$C = M^e \bmod n$

$C = 4^5 \bmod 21$

$C = 1024 \bmod 21$

$C = 16$

$M = C^d \bmod n$

$M = 16^5 \bmod 21$

$M = 1048576 \bmod 21$

$M = 4$

6M

2)b)

P.T → GIVE MONEY

Key → LOCK LOCKL

P's value →	6	8	21	4	12	14	13	4	24
	11	14	02	10	11	14	02	10	11
	17	22	23	14	23	28	15	14	35

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CT → R W X O X C P O J

C's → 17 22 23 14 23 28 15 14 35

value

K's → 11 14 02 10 11 14 02 10 11

Value

G I V E M O N E Y

3) a $q = 11$

Private Key of user A is 8

Private Key of user B is 4

Power	1	2	3	4	5	6	7	8	9	10
1	1	1	1	1	1	1	1	1	1	1
2	2	4	8	5	10	9	7	3	6	1
3										

$\alpha = 2, \quad 2 < 11$

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(ii) $\alpha_A < q$

$8 < 11$

$X_B < q$

$4 < 11$

$Y_A = \alpha^{X_A} \bmod q$

$Y_A = 2^8 \bmod 11$

$Y_A = 256 \bmod 11$

$\boxed{Y_A = 3}$

$Y_B = \alpha^{X_B} \bmod q$

$Y_B = 2^4 \bmod 11$

$Y_B = 16 \bmod 11$

$\boxed{Y_B = 5}$

7M

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$K \rightarrow (Y_B)^{X_A} \bmod q$

$(5)^8 \bmod 11$

$K = 4$

$K \rightarrow (Y_A)^{X_B} \bmod q$

$(3)^4 \bmod 11$

$K = 4$

---

b) $P = 7, Q = 7, e = 5, M = 4$

$n = p * q$

$n = 49$

$\phi(n) = (p-1)(q-1)$

$= (6)(6)$

$\phi(n) = 36$

$1 < 5 < 12$

$e = 5$

$d = e^{-1} \bmod \phi(n)$

$= 5^{-1} \bmod 36$

$= 145$

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$d = 29$

$C = M^e \bmod n$

$C = 4^5 \bmod 49$

$C = 1029 \bmod 49$

$C = 44$

$M = C^d \bmod n$

$= 44^{29} \bmod 49$ 7M

3) c MEET ME AFTER THE PARTY depth → 2

M E M A T R H P R Y
E T E F E T E A T

6M

C.T → MEMATRHPRYETEFETEAT

4) a K = 4 3 1 2 5 6 7

a t t a c k p
o s t p o n e
d u n t i l t
w o a m z y z

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10M

CT → ttnaaaptmtsuoaodwcoixknlypetz

4) b

PT :- attack postponed until two am

Key :- SIET
3214

3	2	1	4
a	t	t	a
c	k	p	o
s	t	p	o
n	e	d	u
n	t	i	l
t	w	o	a
m	x	y	z

C.T → tppdioytktetwxacsnntmaoolaz

3	2	1	4
t	p	p	d
i	o	y	t
k	t	e	t
w	x	a	c
s	n	n	t
m	a	o	o
u	l	a	z

C.T → pyeanoapotxnal
tikwsmudttctoz

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10M

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INTERNAL ASSESMENT TEST: IDATE: 02/12/22
COURSE: Cryptography(18CS744)
VII

MARKS:40SEM:
TIME: 90 min

NOTE: Answer the TWO **full** questions **Q1 or Q2 and Q3 or Q4**

1) a.Explain the steps in DES with neat diagram. **10M[CO1]**
b. Explain Feistel structure in brief. **10M[CO1]**

OR

2) a. Explain RSA algorithm with an example. **10M[CO1]**
b. Explain Diffie Hellmann key exchange with an example. **10M[C03]**

a. Explain X.509 certificate format with neat diagram. **10M[CO3]**
b. Explain CA hierarchy in brief. **10M[CO3]**

OR

4) a. Explain X.509 version 3 and its main categories under certificate extensions. **10M[CO2]**
b. Explain Elgamal cryptography in brief. **10M[CO2]**

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INTERNAL ASSESMENT TEST: IDATE: 02/12/22
COURSE: Cryptography(18CS744)
SEM: VII

MARKS:40
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NOTE: Answer the TWO **full** questions **Q1 or Q2 and Q3 or Q4**

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c. Explain Elgamal cryptography in brief. **10M[CO2]**

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Cryptography Sem- VII

2nd Internals

Sem: 7th sem Scheme & Solution

1) a Characteristics of public Key cryptosystems
↳ 5M

Ingredients of public Key cryptosystems
↳ 5M

b listing the requirements – 3M

Brief Explanation of public Key cryptography
↳ 7M

2) a Brief explanation of public Key Cryptography
↳ 10M

Any 5 X2

b RSA

(1) P, q select two prime numbers
↳ 1M

(2) Compute n such that $n = P \times q$ – 1M

(3) Compute $\phi(n)$ such that 1M

$\phi(n) = (p-1)(q-1)$

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(4) find e such that

(a) $1 < e < \phi(n)$

(b) $\gcd(e, \phi(n)) = 1$ – 2M

(5) find d such that

$d = e^{-1} \bmod n$ – 2M

(6) $C = M^e \bmod n$ – 1M

(7) $M = C^d \bmod n$ – 1M

3) a

(1) Select a prime number q 1M

(2) Select α such that α should be a primitive root of q, $\alpha < q$ 1M

(3) Assume α_A where $\alpha_A < q$ 1M

(4) $Y_A = \alpha^{X_A} \bmod q$ $\boxed{X_A < q}$ 4M

(5) Assume X_B where $X_B < q$

$Y_B = \alpha^{X_B} \bmod q$ 3M

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3) b

Block cipher - definition - 1M

Stream cipher - difinition - 1m

Block cipher - advantage - 1m

Stream cipher - advantage - 1m

Block cipher - diagram - 1m

Stream cipher - diagram - 1m

Any two differences - 2M

4) a

Listing parameters - 2M

Brief explanation of any 4 parameters - 2X4 - 8M

4) b

DES [Data Encryption Standard] algorithm - 4M

Diagram - 4M

Working flow of DES - 2M

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: II DATE: 02/11/2022

Course Name with code: Project Management (18MN752) **MAX MARKS:** 40

Class : 7th Semester

NOTE: Answer TWO full questions.

1) a)Explain the basic steps in project planning .what do you understand by term **"Work break down structure** "explain. 10 M [CO2]

b) What is the purpose of project schedule? Explain the steps to develop project schedule..10 M [CO2]

OR

2a) How GANTT charts are used in scheduling the project. Explain with suitable example. 10 M [CO2]

b) What are steps involved in staffing management plant. Explain. 10M [CO2]

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3 a) what do you understand by term **"Project Kick off"?** Explain steps involved in project management quality planning. 10 M [CO3]

b) What are steps involved in Budgeting the project. Explain. 10 M [CO3]

OR

4 . Write a short notes on: 5 * 4 = 20M[CO3]

(1) Risk management plan
(2) Risk Identification & Risk Analysis
(3) Risk Response planning
(4) Project quality planning

****

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Project Management (18MN752)

Internal Assesment Test : II

1

a) Explain the basic steps in project planning. what do you understand by term "Work break down structure" explain. 10M [CO2]

Basic steps in project planning

1. Create and Analyze business case :- The business case is the reason why organization needs to carry out the project.
2. Identify and Meet Stakeholders for Approval :- Identifying project stakeholders means listing anyone who will be affected by project, so includes the public and government regulatory agencies.
3. Define project Scope :- The scope of project is an outline of what it is and isn't setting out to achieve.
4. Set Goals and Objectives :- The goals and objectives for project will build on the initial objectives outlined in the business plan.
5. Determine Deliverables :- Delivarables are the concrete results that project produces. One of the most important project planning steps is to decide on what these deliverables will and who is reponsiblefor both producing and receiving them.
6. Create Project Schedule and Milstone :- Project schedule is vary important doument that outlines when different tasks of projects are due to begin and end, along with major measurement milestones.
7. Assignment of Tasks :- Within team everyone should know what their role and who is responsible for different elements of the project
8. Carry Out Risk assessment :- Having a functional Risk management plan means performing a storong assement at the planning stage of the project.

Work Breakdown Stowdure (WBS)

*. The WBS is a Graphical display of the project

*. WBS is a hierarchial listing of the sub-components of a project

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Purpose of WBS :- The purpose WBS is to devide the total project into small pieces, sometimes called work packages.

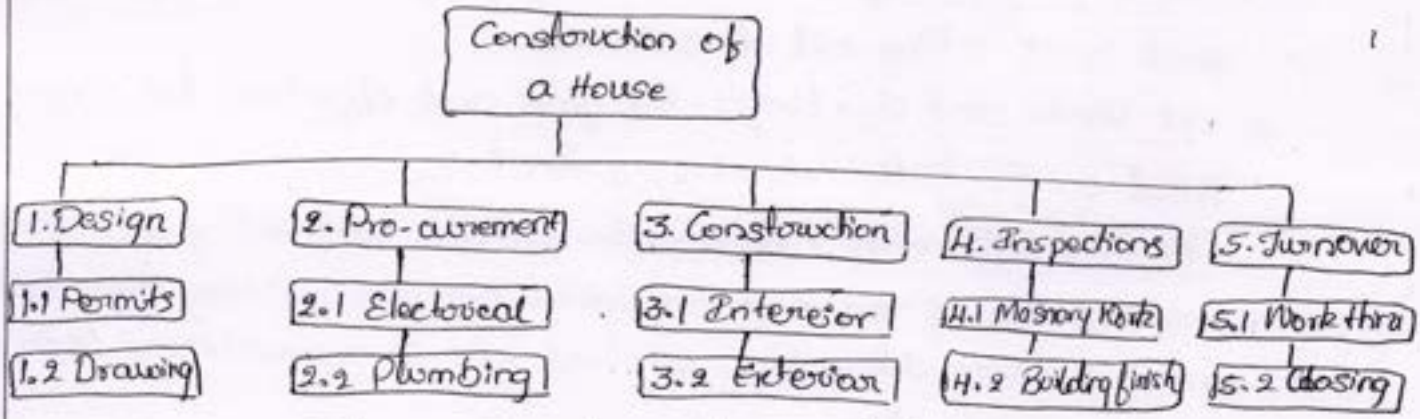
WBS Components

* Tasks
* Dependences
*. Start date
* Duration
* Resources
*. Milestones
*. Delivarables

WBS levels :- Typically 6

* Total project
* Sub project
+ Combination of tasks
* Task
* Sub - Task
+ Individual actions

Example :- Phase Based work breakdown structure



Phase Based work Breakdown structure.

b) What is purpose of project schedule? Explain the steps to develop project schedule. → 10 [CO2]

Purpose of project schedule

The primary purpose of the project schedule is to guide the team to the end.

The schedule is measuring stick for assessing the project performance, evaluating progress, and getting to project closure soon as suitable.

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7 Steps to create a project schdule,

1. Define project goals :- Write down key milestones or deliverables that will make this project schedule successful in the end.
2. Identify all stakeholders :- Make list of every person that needs to interact with the project that needs to interact with the project team, even if their role is a simple sign-off.
3. Determine final deadline :- Decide when need to be completely finished with the project. Be sure to give enough time to account for conflicts or changes that might come up later during schedule management.
4. List each step or task :- Take those milestones and deliverables defined in the first step and break them down into smaller task and subtasks to be sure all bases are covered.
5. Assign a team member responsible for each task :- Decide who will taken on each task and subtask, and be toransparent with deadlines, Remember that colleagues likely have other project going on the same time. Be mindful of their workload so they don't feel overloaded.
6. Work backward to set due dates for each task :- Figure out how long each task will take to complete, knowing that delay are inevitable. Sequencing is important to consider as well since certain tasks will need to be finished before another can start.
7. Organize your project schedule in one tool, and share it with your team
You've successfully built your project plan and now it's important to organize it in a way that everyone involved can see and work from it. Finding a tool that can help you do both will be critical to your success.

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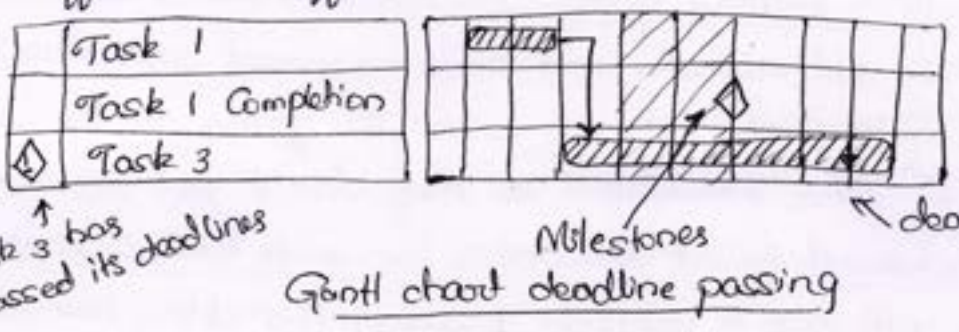
2

a) How GANTT charts are used scheduling the project. Explain with suitable example. 10 M [CO2]

Step 1:- Review Scope Baseline :- Gather the team and review the approved scope baseline, which consists of three components 1) The scope statement, 2) the Work break down structure (WBS) and 3) The wbs dictionary. The project team member should confirm that the scope baseline address 100% of the project scope.

Step 2:- Create Activities :- Using a technique called Decomposition, the project team breaks down each WBS work package into activities. Jut like when creating the WBS work packages, the team needs to sets rule for creating schedule activities. The final schedule needs to be the one that effective and efficient.



Gantt chart deadline passing

Step 3:- Sequence Activities :- Every activity is related to one another activity Every activity, except the first and last, has a relationship with a predecessor and a successor.

Step 4 :- Estimate Resources :- Before the durations can be estimated, resources must be identified and estimated. Resources include labour material and equipment.

Step 5 :- Estimate Durations :- Duration is the time between the start and end of activity. Review the resources, relationship and sequencing, then estimate the duration of each activity.

Gantt chart Constraints

	Task Name	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M
1	Brochures																			
2	Writing																			
3.	Design																			
4	Review																			
5	Corrections																			
6	Printing																			

* The same estimate technique used for estimating resources can be used to estimate durations, but make sure you identify constraints which are limitations or restrictions on an activity.

Step 6 - Develop Schedule :- Create the Gantt chart by loading all information into project management software tool. Review schedule and ensure that all schedule risk have been addressed. Check that response plans and schedule contingencies have been included.

2
b) What are steps involved in staffing management plant. Explain.

Steps involved in the staffing process are :- → 10M [CO2]

1. Manpower planning
2. Selection
3. Recruitment
4. Placement
5. Training
6. Development
7. Promotion
8. Transfer
9. Appraisal
10. Determination of Remuneration

1. Manpower Planning :- Manpower planning can be regarded as the quantitative and qualitative measurement of labour force required in an enterprise, Therefore, in an overall sense, the planning process involves the synergy in creating and evaluating the manpower inventory.

2. Recruitment :- Recruitment is a process of searching for prospective employees and stimulating them to apply for jobs in the organization. It stands for finding the source from where potential employees will be selected.

3. Selection :- Selection is a process of eliminating those who appear unpromising. The purpose of this selection process is to determine whether a candidate is suitable for employment in the organization or not.

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4. Placement :- Placement means putting the person on the job for which he is selected. It includes introducing the employee to his job.

5. Training :- After selection of an employee, the important part of the programmed is to provide training to the new employee.

6. Development :- A sound staffing policy provides for the introduction of system of planned promotion in every organization.

7. Promotions :- The process of promotion implies the up-gradation of an employee to a higher post involving increasing rank, prestige and responsibilities. Generally, the promotion is linked to increment in wages and incentives but it is not essential that it always relates to that part of an organization.

8. Transfer :- Transfer means the movement of an employee from one job to another without increment in pay, status or responsibilities. Therefore this process of staffing need to evaluated on timely basis.

9. Appraisal :- Appraisal of employees as to how efficiently the subordinate is performing a job and also to know this aptitudes and other qualities necessary for performing the job assigned to him.

10. Determination of Remuneration :- This is the last process which is very crucial as it involves in determining remuneration which is one of the most difficult functions of the personnel department because there are no definite or exact means to determine correct wages.

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3) a) project kick off ⟷ CO3 [10 M]

- a kick off meeting is primarily used to get the project team on the same page in the meeting, project managers explain comman goals to keep in mind as the team executed their task it sets up project success
- kick off meeting also lets the project manager introduce the project team it's important that everyone knows who they're working with and what their roles and responsibilities are this avoids conflicts later in the project that can delay work threaten.

1. project Background
- part of project proposal the project background is a history of the project and how it come to be it shows the research that lead to green lighting and why project is necessary.
- this includes why, where, and how of your project implementation you're detailed the current situation what the project is neccesary what the problem is and how the project solves it.

2. project scope overview
- the project scope is a detailed description of project work your team must complete to have a successful project
- the term of this work is defind by project timeline and the project budget
- By understanding the objectives and requirements necessary to complete project, project manager can more accurately forecast cost and time

3. project timeline overview
- project deliverables are laid out on a chronological timeline which acts
- which act as a roadmap of the project this is the backbone of any project schedule and show include milestones, tasks, any dependencies and due dates at minimum

4. Risk management overview
- when making project plan a project manager will have to develop a risk management plan as well this is the develop a risk process of analysis risks that could occur during the project then you make a determination on what steps will be necenary to respond to those issues when they risk

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5. Roles and Responsibilities

the project manager or project is responsible for determining the roles and responsibilities of project team. that is the team member's position on team the tasks they are assigned and the duties of their particular role on relation to the larger team and project

6. project management methods and tools.

- these are many ways to manage project that includes a more traditional methodology such as waterfall model, as iterative agile approach or hybrid that connects different work management styles
- the project team must know how the project is being managed and what their part will be including the project they'll be using
- In some case this will require a period of training for the team to get them to understand the methodology and how to use project tool

3) b) steps involved in Budgeting the project → 10M [CO3]

1. Break down your project into tasks and milestones

- working with your list will give you an understanding of what you'll need to accomplish and help you with project cost management if you already have a task list that's fine, and you can start right off But if you don't start creating a scope & writting down every-thing that your team needs to do

2. Estimate each item in the task list

Now it's time to give each item that you've written down an optimistic estimation. at this point identify all the resources and materials you'll need to perform well and include them into your estimate when calculate the price

3. Add your estimates together

this is probably one of the easiest parts of the project budgeting process especially if you have a spreadsheet with two columns tasks and costs then, you'll be able to calculate the total fast

4. add contingency and taxes

Better safe than sorry of course you can't be 100% confident about the final state estimate, as things change all the time By adding contingency and taxes, you make sure that project

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doesn't go over budget and your estimate number is closer to final costs you eventually spend if you don't know how much contingency to add project management experts recommend going for 10% of the total

5. Get approval
Talking to your manager to approve projects costs would be the last thing in the project budget creation process

5M [CO3]

4) i) Risk management plan

- every organization is exposed to risks. Risk management is how we handle those Risk, risk response planning for uncertain events, from natural disasters to cybersecurity threats
- Risk management is not only wise to assure business continuity and profitability. most laws, regulations and industry compliance frame works require proof of risk assessments and other method-logies to avoid data breaches and protect sensitive information
- Risk management does not eliminate all Risks. instead, it determines the best action to manage Risk.
- creating Risk management plan has several steps.

i) Risk Identification
Identifying Risk that may occure in our project

ii) Risk Assessment
Review quantitative and qualitative impact a risk on project and map out into risk asessment matrix

iii) Create a Risk Response plan
Risk Responce is a action plan that is taken to handle project risk

iv) Assign Risk owners
assign the Risk owner who is accountable for monitoring the risk

v) understand your triggers
reveiwing project progress if they have considerd reclassificating those existing risks

vi) make up back up plan
it is important to come up with a contingency plan as part of your process.

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vii) measure your Risk threshold

measuring your risk threshold is all about discovering which risk is too high and consulting with your project stakeholders

2) Risk Identification & Risk analysis → 5M [CO3]

- the initial step in the risk management process is to identify the risks that the business is exposed to in its operating environment
- there are many different types of risks
  1) legal risks
  2) environmental risk
  3) market risk
  4) Regulatory risks etc
- it is important to identify as many of these risk factors as possib in a manual environment these risks are noted down manually if the organization has a risk management solution employed all this information is inserted directly into the system

Analyze the Risk:

- once a risk has been identified it needs to be analyzed the scope of the risk must be determined. it also important to understand the link between the risk and different factors within the organization
- to determine the severity and seriousness of the risk it is necessary to see how many business functions the risk affects
- there are risks that can bring the whole business to a standstill if actualized while there are risks that will only be minor inconveniences in the analysis.

3) Risk Response planning → 5M [CO3]

- a risk response plan is a document that explains the strategies that could be taken to mitigate negative project risk
- it is a part of larger risk management plan that is subsequently part of any project management plan
- Risk Response is just as it sounds you're responding to risks to do so. project managers must work with stakeholders, secure resources for the risk response strategies and assign risk

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owners to deploy them.

- Good risk response starts with good risk identification as you can figure out a lot of potential project risks by looking at similar projects you managed. talking to your experienced project team members about what they think could happen and reaching out to stakeholders and mentors

4) project quality planning → 5M [CO3]

- planning is the key to success. planning helps you decide what's most important to your project and is one of the most critical aspects of quality management
- Quality planning is the method of deciding what's most important to project during the planning stage. So we can make sure that everything goes according to plan
- That includes allocating resources needed to deliver the projects determining what you must take steps and specifying requirements that need to be met.
- you should integrate quality goals and plans at the highest level with the organizations overall strategic plans as organization each function fashions its best way of contributing to top-level goals and objectives
- Quality plans assume their role at lower levels as actionable plans it may take many different forms depending on the outcomes they produce Quality plans may also be represented by more than one type of document to produce a given result

- Quality assurance is also essential during this phase it includes audits, testing, and peer reviews, among other things all these activities are done with stakeholder interviews to understand their expectations.

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INTERNAL ASSESMENT TEST: II **DATE: 03/11/22**
COURSE: AI&ML (18CS71) TIME: 90 min **MAX MARKS: 40**
SEM: VII

NOTE: Answer the TWO **full** questions **Q1 or Q2 and Q3 or Q4**

1) What Are Properties Of Knowledge Representation? **5M[CO2]**

2) Explain Four Approaches To Knowledge Representation? **5M[CO2]**
3) Explain Concept Learning Task With An Example? **10M[CO2]**

OR

4) Apply Candidate Elimination Algorithm And Obtain The Version Space Considering The Training Example Given Table(C) **10M[CO2]**

Example	sky	Airtemp	Humidity	Wind	Water	Forcast	Enjoysports
1	Sunny	warm	normal	strong	warm	same	yes
2	Sunny	warm	high	strong	warm	same	yes
3	Rainy	cold	high	strong	warm	change	no
4	sunny	warm	high	strong	cool	change	yes

5) Write Find-S Algorithm. Apply The Find-S For Table G1(C) To Find Maximally Specific Hypothesis. **5M[CO2]**
6) Explain The Concept Of Inductive Bias. **5M[CO2]**

OR

7) Explain ID3 Algorithm And Explain Steps Involved In It? **5M[CO2]**
8) Obtain Decision Tree For Following Expression **5M[CO2]**

I. A n B.
II. A U [B n C].
III. A XOR B.
IV. [A n B] U [C n D] .

9) Explain The Concept Of Decision Tree Learning Discuss The Necessary Measures Required To Select The Attributed For Building A Decision Tree Using ID3 Algorithm. **10M[CO2]**

OR

10) Write Gradient Descent Algorithm To Train A Linear Unit Along With The Derivation. **5M[CO2]**

11) Define Perceptron And Discuss Its Training Rule. **5M[CO2]**

12) Show The Derivation Of Back Propagation Training Rule For Output Unit Weights. **10M[CO2]**

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Internal Assesment Test - II

AI&ML (18CS71)

1) What are properties of knowledge Representation?

i) Representional Adequacy: the ability to represent all kinds of knowledge that are needed in that domain

ii) Inferential Adequacy: the ability to manipulate the represented knowledge corresponding to the infered from the original

iii) Inferential efficiency: the ability to incorporate additional information into the knowledge structure that can be used to focus the attention of inference mechnisam.

iv) Aquisitional efficiency: the ability to acquire new information easily the simplest case involves direct insertion by person of new knowledge in into database

2) Explain four approches to knowledge Representation?

Knowledge Representation schemes

1) Relational knowledge:
- provides a frame work to compare two object
- any instance in which two different objects are compared is a relational type of knowledge

2) Inheritable knowledge:
- It obtain from associated object
- It prescribes a structure in which new object are created which may inherit all or a subset of attribute from existing objects

3) Inferential knowledge:
- It infered from object through relations among objects is infered.

4) Declarative knowledge:
- a statement in which knowledge is specified but the use to which that knowledge is to be put is not given

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3) Explain concept learning task with an example

Concept learning task: Inferring a Boolean valued function from training examples of its input and output.

Example: task of learning the target concept "Days on which John enjoys his favorite water sport

example	Sky	AirTemp	Humidity	Wind	Water	Forecast	Enjoy sport
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Cold	High	Strong	Warm	Change	NO
4	Sunny	Warm	High	Strong	Cool	Change	Yes

Task → to learn to predict the value of Enjoy sport for an arbitrary day based on the values of its other attributes.

What hypothesis representation is provided to the learner?
"Conjunction of constraints on the instance attributes"

Approch:
Let each hypothesis be a vector of six constraints, specifying the values of the six attributes Sky, AirTemp, Humidity, Wind, water and Forecast

For each attribute, the hypothesis will either
- indicated by a "?" that any value is acceptable

→ if some instance x satisfies all the constraints of hypothesis h, then h classifies x as a positive example (h(x) = 1)

→ the hypothesis that person enjoys his favorite sport only on cold days with high humidity is Represented by the expression

(?, Cold, High, ?, ?, ?)

⇒ the most general hypothesis that every day is a positive example is represented by (?, ?, ?, ?, ?, ?)

→ the most specific possible hypothesis that no day is a positive example is represented by (ϕ, ϕ, ϕ, ϕ, ϕ, ϕ)

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Notation

X → the set of items over which the concept is defind is called the set of instances.

Example:

- X is the set of all possible days each represented by the attributes Sky, AirTemp, Humidity, Wind, Water, and Forecast
- the concept or function to be learned is called target concept which is denoted by C. C can be any Boolean valued function defined over the instances X

$$C : X \rightarrow \{0, 1\}$$

- the target concept corresponds to the value of the attribute EnjoySport

  C(x) = 1 if EnjoySport = Yes, and C(x) = 0 if EnjoySport = NO

  instances for which C(x) = 1 → positive examples or members of the target concept

- instances for which C(x) = 0 → negative examples or non-members of the target concept.
- the ordered pair (x, C(x)) → Describes the training example consisting of the instance x and its target concept value C(x).
- D → set of available training examples
- H → set of all possible hypotheses that the learner may consider regarding the identity of the target concept

Each hypothesis h in H represents a Boolean valued function defined over X

$$h : X \rightarrow \{0, 1\}$$

b) Apply candidate elimination algorithm and obtain the version space considering the training example

example	Sky	AirTemp	Humidity	Wind	water	Forecast	EnjoySports
1	Sunny	warm	normal	Strong	Warm	Same	Yes
2	Sunny	Warm	high	Strong	warm	Same	Yes
3	Rainy	Cold	high	Strong	warm	change	NO
4	Sunny	Warm	high	strong	cool	change	Yes

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Set call of all hypotheses in H;
entialling the G_1 boundary set to contain the most general hypothesis in H

G_0 { ?, ?, ?, ?, ?, ?}

entialling the S boundary set to contain the most specific hypothesis

S_0 { ϕ, ϕ, ϕ, ϕ, ϕ, ϕ}

for first example, it is positive example so no update of G_1 boundary S boundary changes.

S_1 { Sunny, warm, normal, strong, warm, same}

G_1 { ?, ?, ?, ?, ?, ?, ?}

for second example, it is also a positive example so need not to make any changes in G_1 boundary Sboundary changes

S_2 { Sunny, warm, ?, Strong, warm, same}

G_2 { ?, ?, ?, ?, ?, ?, ?}

for third example, it is negative example so we need to make changes at G_1 boundary. S boundary remains same

G_3 { Sunny, ?, ?, ?, ?, ?, ?}, { ?, warm, ?, ?, ?, ?}, { ?, ?, Normal, ?, ?},
{ ?, ?, ?, ?, cool, ?}, { ?, ?, ?, ?, ?, same}

G_{13} { Sunny, ?, ?, ?, ?, ?}, { ?, warm, ?, ?, ?, ?}, { ?, ?, ?, ?, ?, same}

S_3 { Sunny, warm, ?, Strong, warm, same}

for fourth example, it is positive example so we need to make changes to get consistent hypothesis

G_4 { Sunny, ?, ?, ?, ?, ?, ?}, { ?, warm, ?, ?, ?, ?}

S_4 { Sunny, warm, ?, Strong, ?, ?}

version space:

{ Sunny, warm, ?, ?, ?, ?}, { Sunny, ?, ?, Strong, ?, ?},
{ ?, warm, ?, Strong, ?, ?}

5) Write a finds algorithm apply the Find S for table to find maximaly specific hypothesis.

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1. Initialize h to most specific hypothesis in H
2. for each positive training instance x
for each attribute constraint ai in h
if the constraint ai is satisfied by x
then do nothing
else Replace ai in h by next most general constraint that is satisfied by x
3. Output hypothesis h

To Ex

- first step of Find-S is to initialize h to the most specific hypothesis in H

h - (ϕ, ϕ, ϕ, ϕ, ϕ, ϕ)

Consider the first training example

x_1 = <Sunny, warm, Normal, Strong, warm, same>, +

h_1 = <Sunny, warm, Normal, Strong, warm, same>

consider the second training example

x_2 = <Sunny, warm, High, Strong, warm, Same>, +

the second training example forces the algorithm to further generalize h, this time substituting a "?" in place of any attribute value in h that is not satisfied by the new example

h_2 = <Sunny, warm, ?, Strong, warm, Same>

- consider the third training example

x_3 = <Rainy, cold, High, Strong, warm, change>, -

upon encountering the third training the algorithm makes no change to h the Find S algorithm simply ignores every negative example.

h_3 = <Sunny, warm, ?, Strong, warm, same>

- consider the fourth training example

x_4 = <Sunny, warm, High, Strong, cool, change>, +

the fourth example leads to a further generalization of h

h_4 = <Sunny, warm, ?, Strong, ?, ?>

h_4 is a maximally specific hypothesis.

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6) Explain the concept of Inductive Bias

the fundamental questions for inductive inference

i) what if the target concept is not contained in the hypothesis space

ii) can we avoid this difficulty by using a hypothesis space that includes every possible hypothesis

iii) How does the size of this hypothesis space influence the ability of the algorithm to generalize to unobserved instances

iv) How does the size of the hypothesis space influence the number of training examples that must be observed.

two types for Inductive Bias

↳ A Biased Hypothesis space

↳ an unbaised hypothesis space

Biased hypothesis space:

- Suppose the target concept is not contained in the hypothesis space H then obvious solution is to enrich the hypothesis space to include every possible hypothesis.
- the hypothesis space is unable to represent even simple disjunctive target concepts such as

Unbiased hypothesis space:

- the solution to the problem of assuring that target concept is in the hypothesis space H is to provide a hypothesis space capable of representing every teachable concept that is representing every possible subset of the instance X

7) Explain ID3 algorithm and explain steps involved in it?

Algorithm (ID3):

Step1: compute entropy for data set entropy (S)

$$\text{Entropy} = \frac{-p}{p+n}\log_2\left(\frac{p}{p+n}\right) - \frac{n}{p+n}\log_2\left(\frac{n}{p+n}\right)$$

Step 2:) for every attribute calculate entropy call other value Entropy (A)

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iii) take the average information entropy for the current attribute

$$I(\text{attribute}) = \frac{P_{\text{attribute}} + N_{\text{attribute}}}{p+n} \text{ Entropy (attribute)}$$

iii) calculate the gain for the current attribute

gain = Entropy(S) - I(attribute)

Step 3: pick the highest gain attribute

Step 4: Repeat until we get what we desire

Step 5: Draw a decision tree

- $\text{Entropy}(S) = -P_{\oplus}\log_2 P_{\oplus} - P_{\ominus}\log_2 P_{\ominus}$

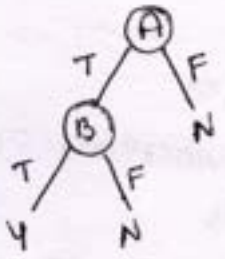
  $p+ \rightarrow$ proportion of positive examples in S

  $p- \rightarrow$ proportion of pos negative examples in S

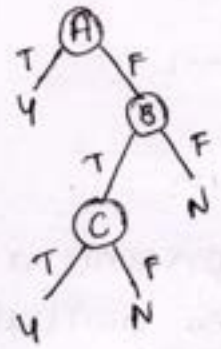
- $\text{Gain}(S, A) = \text{Entropy}(S) - \sum_{v \in \text{values}(A)} \frac{|S_v|}{|S|} \text{Entropy}(S_v)$ (attribute)

8) obtain Decision tree for the following expression

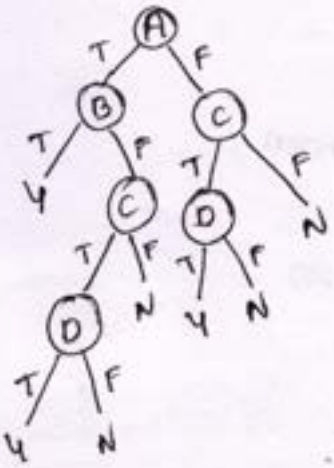
1) A ∩ B



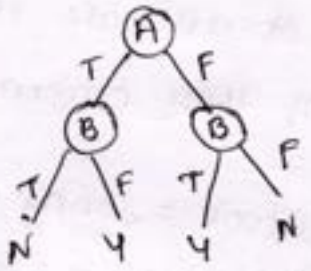
2) A ∪ (B ∩ C)



3) (A ∩ B) ∪ (C ∩ D)



4) A XOR B



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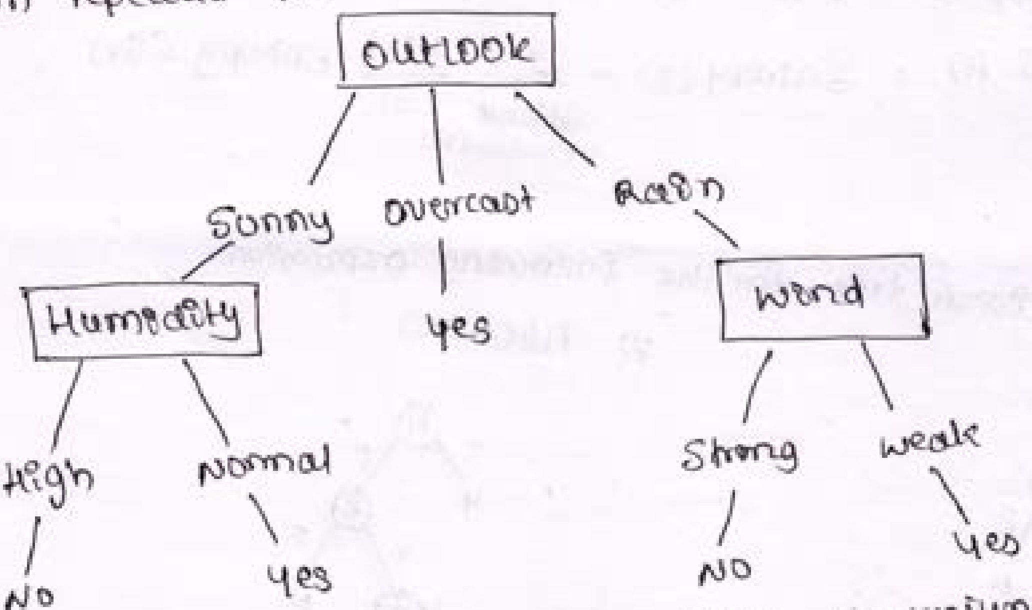
Decision Tree Representation

- Decision trees classify instances by sorting them down the tree from the root to some leaf node which provides the classification of the instance
- each node in the tree specifies a test of some attribute of the instance and each branch descending from that node corresponds to one of the possible values for this attribute
- an instance is classified by starting at the root node of the tree testing the attribute specified by this node then moving down the tree branch corresponding to the value of the attribute in the given example this process is then repeated for the subtree rooted at the new node



- Decision tree represent a disjunction of conjunctions of constraints on the attribute values of instances
- each path from the tree root to a leaf corresponds to a conjunction of attribute tests and the tree itself to a disjunction of these conjunctions
- Example:

(Outlook = Sunny ∧ Humidity = Normal)

∨ (Outlook = Overcast)

∨ (Outlook = Rain ∧ Wind = Weak)

Characteristics:

i) Instances are Represented by attribute-value pairs - instance are described by a fixed set of attributes and their values

ii) the target function has discrete output values - the decision tree assigns a boolean classification (yes or no)

iii) Disjunctive descriptions may be required.

iv) the training data may contain errors. Decision tree learning methods are robust to errors both errors in classifications of the training examples and error in attribute

v) the training data may contain missing attribute values - Decision tree methods can be used even when some training example have unknown values.

10) Gradient Descent Algorithm

GRADIENT_DESCENT (training_example, η)

each training example of the form $(\vec{x}, t)$, where $\vec{x}$ is the vector of input values and t is the target output value. η is the learning rate.

- Initialize w_i to small random value
- until the termination condition is met, do
  - Initialize each Δw_i to zero
  - for each $\langle \vec{x}, t \rangle$ in training examples, do
    - Input the instance $\vec{x}$ to the unit compute output o
    - for each linear unit weight w_i, do

$$\Delta w_i \leftarrow \Delta w_i + \eta (t - o) x_i$$

  - * for each linear unit weight w_i, do

$$w_i \leftarrow w_i + \Delta w_i$$

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compute derivate of E with each compond of vector $\vec{w}$ gradient of E with $\vec{W} \rightarrow \nabla E \vec{W}$

$$\nabla E(\vec{w}) = \left[\frac{\delta E}{\delta w_0}, \frac{\delta E}{\delta w_1}, \cdots, \frac{\delta E}{\delta w_n}\right] - (1)$$

training rule for gradient descent is

$$\vec{w} \leftarrow \vec{w} + \Delta \vec{w}$$

where, $\Delta \vec{w} = -\eta \nabla E(\vec{w}) - (2)$

training rule also written as

$$w_i \leftarrow w_i + \Delta w_i$$

where $\Delta w_i = -\eta \frac{\delta E}{\delta w_i} - (3)$

the vector of $\frac{\delta E}{\delta w_i}$ derivates that gradient can be obtained by differentiating E from

$$E(\vec{w}) = \frac{1}{2} \sum_{d \in D} (t_d - o_d)^2$$

Let $E(\vec{w})$ be E

$$\frac{\delta E}{\delta w_i} = \frac{\delta}{\delta w_i} \frac{1}{2} \sum_{d \in D} (t_d - o_d)^2$$

$$= \frac{1}{2} \sum_{d \in D} \frac{\delta}{\delta w_i} (t_d - o_d)^2$$

$$= \sum_{d \in D} (t_d - o_d) \frac{\delta}{\delta w_i} (t_d - \vec{w} \cdot \vec{x_d})$$

$$\frac{\delta E}{\delta w_i} = \sum_{d \in D} (t_d - o_d)(-x_{id})$$

Substitute $\frac{\delta E}{\delta w_i} = \sum_{d \in D} (t_d - o_d)(-x_{id})$ in $\Delta w_i = -\eta \frac{\delta E}{\delta w_i}$

$$\boxed{\Delta w_i = \eta \sum_{d \in D} (t_d - o_d) x_{id}}$$

11) perceptron:

- It is simple version of neural network
- It is a supervised learning
- Here we are giving the dataset in the form of features and also having mapping

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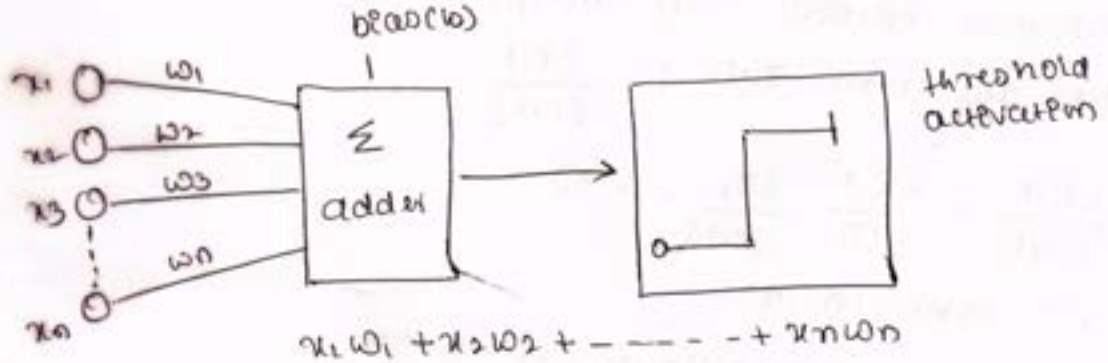
- we will have dataset something like

x	y

x - feature
y - mapping

- perceptron is used to do the classification or data the most important classification is Binary classification
- It look like a neural network



- This circuit multiplies the component input feature with weight and then add all of them we also add here we also add bias to the adder as a input that is ~~that~~ used to predict the threshold activation output.

- threshold output is either 0 or 1 based on condition

$x_0w_0 + b > 0 \rightarrow 1$ and $x_0w_0 + b < 0 \rightarrow 0$

$$\sum_{i=1}^{n} x_i w_i + b$$

12) $E_d(\vec{w}) = \frac{1}{2}(t_d - o_d)^2$ → Gradient descent → iterated through training example one at time i.e for each training example every weight w_{ji} is updated by adding to it Δw_{ji}

$$\Delta w_{ji} = -\eta \frac{\delta E_d}{\delta w_{ji}} \quad - ①$$

where,

$$E_d(\vec{w}) = \frac{1}{2}(t_k - o_k)^2$$

$$\Delta w_{ji} = -\eta \frac{\delta E_d}{\delta w_{ji}} \quad - ②$$

use a chain rule for $\frac{\delta E_d}{\delta w_{ji}}$

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$$\frac{\delta E_d}{\delta w_{ji}} = \frac{\delta E_d}{\delta net_j} \frac{\delta net_j}{\delta w_{ji}}$$

$$\frac{\delta E_d}{\delta w_{ji}} = \frac{\delta E_d}{\delta net_j} x_{ji}$$

eqn (1) we need to derive convenient expression for $\frac{\delta E_d}{\delta net_j}$

unit j is either a hidden unit or an output unit

case 1: training Rule for output only through O_j

net_j can influence network only through O_j

Therefore, use the chain rule for $\frac{\delta E_d}{\delta net_j}$

$$\frac{\delta E_d}{\delta net_j} = \frac{\delta E_d}{\delta O_j} \frac{\delta O_j}{\delta net_j} \quad \text{--- (2)}$$

consider 1st term in (2)

$$\frac{\delta E}{\delta O_j} = a\frac{1}{2} \sum_{k \in \text{outputs}} \frac{(t_k - O_k)^2}{\delta O_j}$$

$\frac{\delta (t_k - O_k)^2}{\delta O_j}$ will be zero for all output unit k except when $k = j$

Therefore, drop all other terms where $k \neq j$

$$\frac{\delta E_d}{\delta O_j} = \frac{a(\frac{1}{2})(t_j + O_j)^2}{\delta O_j}$$

$$= \frac{1}{2} 2(t_j - O_j) \frac{\delta (t_j - O_j)}{\delta O_j} = -(t_j - O_j) \quad \text{--- (3)}$$

Consider 2nd term in (2)

we know that, $O_j = \sigma(net_j)$

the derivative $\frac{\delta O_j}{\delta net_j}$ is a derivative of sigmoid function

i.e equals to $\sigma(net_j)(1 - \sigma(net_j))$

therefore,

$$\frac{\delta O_j}{\delta net_j} = \frac{\delta \sigma(net_j)}{\delta net_j}$$

$$\frac{\delta O_j}{\delta net_j} = O_j(1 - O_j) \quad \text{--- (4)}$$

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Sub ④ & ⑧ in ⑤ we get,

$$\frac{\delta E_d}{\delta net_j} = -(t_j - o_j) o_j (1 - o_j) \quad - ⑨$$

combining ④ & ① we get stochastic gradient descent for output units

$$\delta w_{ji} = -\eta \frac{\delta E_d}{\delta w_{ji}}$$

$$\Delta w_{ji} = -\eta \frac{\delta E_d}{\delta net_j} x_{ji}$$

$$\Delta w_{ji} = -\eta [-(t_j - o_j) o_j (1 - o_j)] x_{ji}$$

$$\Delta w_{ji} = \eta (t_j - o_j) o_j (1 - o_j) x_{ji} \quad - ⑩$$

Case 2 : Training Rule for Hidden unit weights

j → hidden / internal unit

to derive training rule for w_{ji}, consider the indirect ways w_{ji} can influence the network and so term E_d refer to all the units immediately downstream of unit j in the network → downstream(j)

net_j can influence the network outputs only through units in Downstream(j) therefore,

$$\frac{\delta E_d}{\delta net_j} = \sum_{k \in downstream(j)} \frac{\delta E_d}{\delta net_k} \frac{\delta net_k}{\delta net_j}$$

$$\frac{\delta E_d}{\delta net_j} = \sum_{k \in downstream(j)} -\delta_k \frac{\delta net_k}{\delta net_j}$$

net_k can influence the network through the outputs of units in downstream(j) Hence apply chain rule to get,

$$\frac{\delta E_d}{\delta net_j} = \sum_{k \in downstream(j)} -\delta_k \frac{\delta net_k}{\delta o_j} \frac{\delta o_j}{\delta net_j}$$

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$$\frac{\delta E_d}{\delta net_j} = \sum_{k \in downstream(j)} -\delta_k w_{kj} O_j (1 - O_j)$$

use δ_j to represent $\frac{\delta E_d}{\delta net_j}$, therefore we get.

$$\delta_j = O_j (1 - O_j) \sum_{k \in downstream(j)} \delta_k w_{kj}$$

and from (a)

$$\Delta w_{ji} = -\eta \frac{\delta E_d}{\delta w_{ji}} = -\eta \frac{\delta E_d}{\delta net_j} x_{ji} = \eta \left(\frac{-\delta E_d}{\delta net_j} \right) x_{ji}$$

$$\boxed{\Delta w_{ji} = \eta \delta_i x_{ji}}$$

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Department of Electronics & Communication Engineering

Academic Year: 2022-23

First Internal Assessment Test

Subject: Communication Theory (21EC44) **Year/Sem: II/IV**

		PART -A		
1	a)	**Define Amplitude Modulation? Derive expression for AM signal?**	**10M**	**CO1**
	b)	**Explain the operation of switching modulator with circuit diagram and waveform.**	**10M**	**CO1**
		OR		
2	a)	**Derive an expression for modulation index and percentage of modulation index in AM.**	**10M**	**CO2**
	b)	**Explain the generation of DSB-SC wave using Ring modulator with waveform.**	**10M**	**CO1**
		PART-B		
3	a)	**Explain how costas receiver can be used for demodulating DSB-SC SIGNAL.**	**10M**	**CO1**
	b)	**Explain frequency discrimination scheme for the generation of SSB modulated wave**	**10M**	**CO1**
		OR		
4)	a)	**With relevant diagrams explain the operation of the quadrature carrier multiplexing transmitter scheme and receiver scheme.**	**10M**	**CO2**
	b)	**Explain Frequency division multiplexing.**	**10M**	**CO2**

Note: Answer any one full question from Part-A & answer any one full question from Part-B

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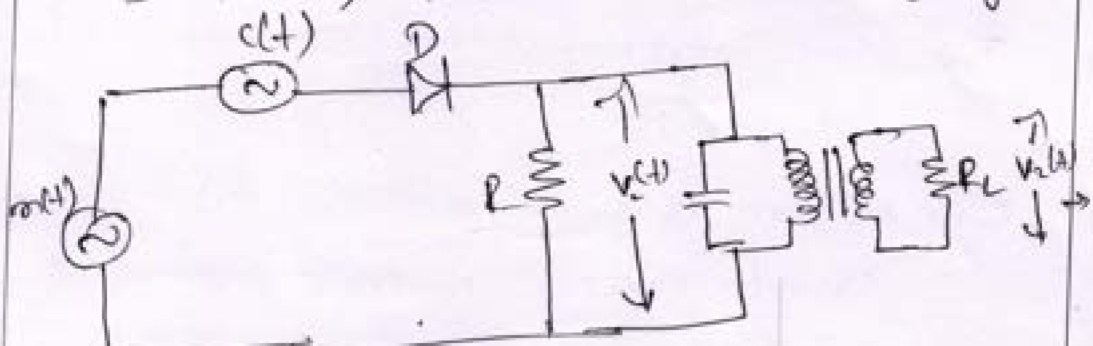
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
ACADEMIC YEAR 2022-23(Even semester)

I- INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	POOPA .T. C
PROGRAMME:	ECE
COURSE TITLE:	Communication theory
COURSE CODE:	21EC44
SIGNATURE:	[signature]

Q.NO	SOLUTION	MARKS
1 a	Definition of amplitude modulation. A Modulation is a process of varying amplitude of the carrier signal in accordance with the message signal by keeping frequency & phase constant.	2m
	Expression for AM Signal, carry	6m
	waveform of frequency domain & Time domain.	2m
		(10m)
1 b	Switching modulator circuit diagram 	2m
	Ideal voltage & output diode characteristics & waveforms	2m
	Derivation	6m
		(10m)

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Q.NO	SOLUTION	MARKS
2 (a)	Modulation index derivation	5m
	Percentage of modulation index in AM	5m
		(10m)
(b)	Ring modulation circuit diagram	2m
	Generation of DSB-SC wave expression	6m
	waveform of DSB-SC wave	2m
		(10m)
3 (a)	Costas Reciever circuit diagram & Explanation	4m
	Demodulated DSB-SC signal derivation	4m
	waveform of demodulation	2m
		(10m)
(b)	Frequency descriminator Schematic diagram	2m
	Explation & generation SSB modulated wave	8m
		(10m)

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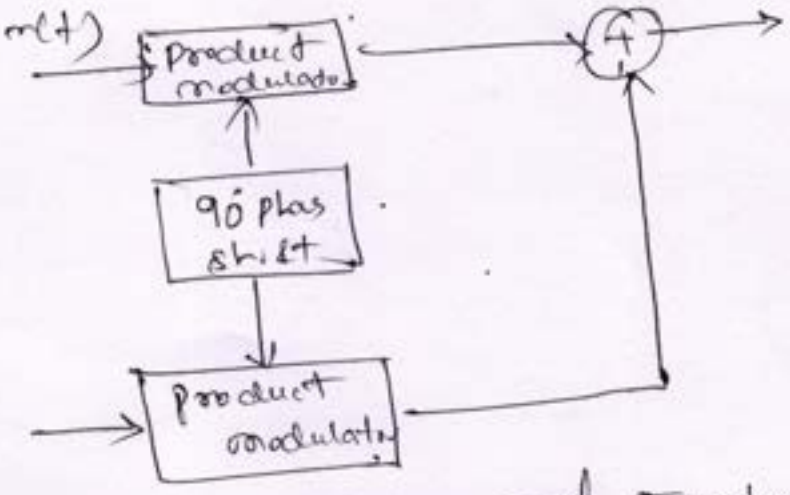
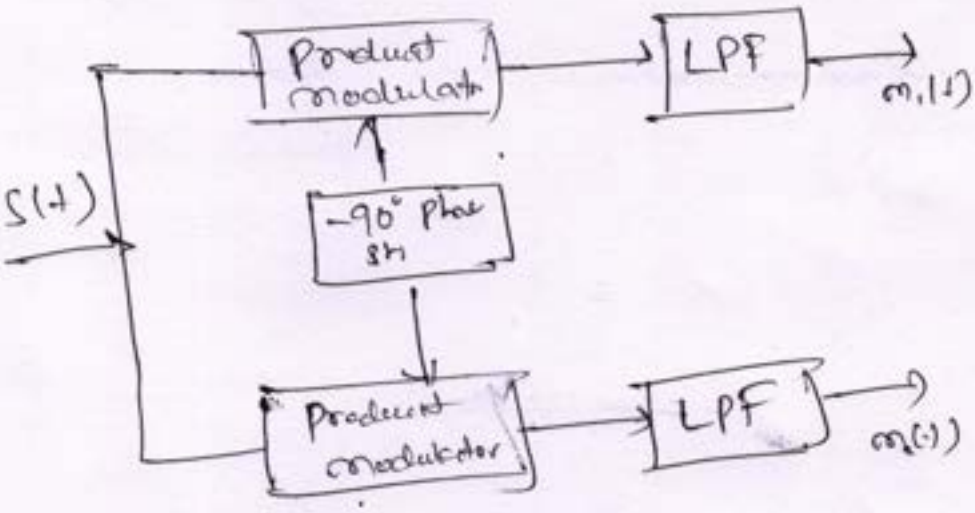
Q.NO	SOLUTION	MARKS
4 (a)	Quadrature multiplexing transmitter Scheme  Derivation and Explain	2m 3m
	Quadrature multiplexing Receiver  Derivation & explain	2m 3m
		10m

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Department of Electronics & Communication Engineering
Academic Year: 2022-23
Second Internal Assessment Test

Subject: Communication Theory (21EC44) **Year/Sem: II/IV**

Note: Answer any one full question from Part-A & answer any one full question from Part-B

		PART -A		
1	a)	Derive the time domain expression for wide band FM or show that WBFM has infinite number of side bands.	12M	CO2
	b)	Write basic definition in FM a) Instantaneous frequency b) Angle of FM Signal c) Max frequency deviation d)carrier swing e)Modulation index.	04M	CO2
		OR		
2	a)	Explain direct method of generating FM wave. Draw block diagram of generating WBFM wave with frequency stabilization.	12M	CO2
	b)	List out the properties of NBFM and WBFM	04M	CO2
		PART-B		
3	a)	With neat block diagram explain superheterodyne receiver	8M	CO1
	b)	List out the comparison of WBFM and NBFM.	8M	CO1
	c)	Write short note on PLL	4M	CO2
		OR		
4)	a)	What is noise? Explain Thermal noise.	10M	CO3
	b)	With relevant equations explain how noise is produced in a receiver model.	10M	CO3

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2022-23(Even semester)

II- INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	ROOPA. T. C
PROGRAMME:	ECE
COURSE TITLE:	Communication theory
COURSE CODE:	21EC44
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1 a)	Derivation of time domain expression for wide band FM signal	6m
	Showing that the WBFM has infinite number of side band.	6m
		12m
b)	a) Instantaneous frequency definition with expression.	
	$\lvert m(t)\rvert = A_m$	2m
	$f_i(t) = f_c + K_f A_m$	
	$f_{max} = f_c + K_f A_m$	
	$f_{min} = f_c - K_f A_m$	
	(b) Angle of FM signal $f_i(t) = \frac{1}{2\pi}\frac{d\theta_i(t)}{dt}$	2m

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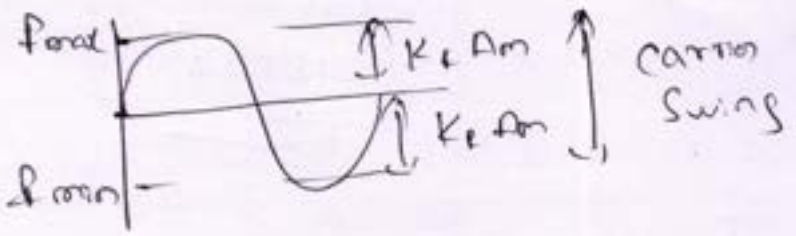
(c) maximum frequency deviation

$\Delta f_{max} = k_f \Delta m$ — 2m

Δ_{fm} = max freq of fm sign

(d) carrier swing $= 2\Delta f_{max}$



2m

(e) Modulation Index — 1m

8m

2 (a) Direct method of generating FM wave — 3m

Block diagram

Wide band FM signal generation — 3m

Explanation — 6m

Derivation.

12m

(b) properties of Narrow band FM — 4m

Each properties carries —

Properties of wide band FM — 4m

Each properties carries —

8m

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Q.NO	SOLUTION	MARKS
3 (a)	Block diagram of Super heterodyne reciever.	- 2m
	Explanation of Super heterodyne	- 4m
	Expression & derivation	2m
		(8m)
(b)	Comparision of WBFM & NBFM & difference between FM	(8m)
(c)	Phase locked loop. Block diagram	- 2m
	Explanation.	2m
		(4m)
4 (a)	Noise is defined as the disturbance (or) the unwanted signal in the message signal.	(2m)
	Thermal Noise explanation	4m
	Derivation of $P_n = KTB_n$	(2m)
	$V_n = \sqrt{4KTB_nR_s}$	

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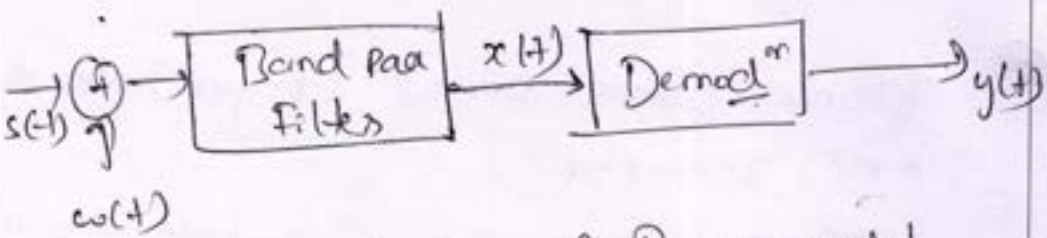
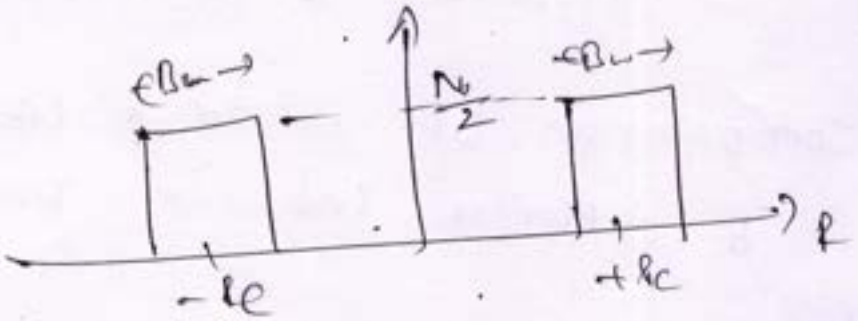
(6)



2m

Block diagram of Recier model.



2m

Ideal characteristics of BW

Noise in receiver model

Derivation of FOM → 6m

10m

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Department of Electronics & Communication Engineering

Academic Year: 2022-23

Third Internal Assessment Test

Subject: Communication Theory (21EC44) **Year/Sem: II/IV**

Note: Answer any one full question from Part-A ,Part-B and Part-C

		PART -A		
1	a)	Explain direct method of generating FM wave. Draw block diagram of generating WBFM wave with frequency stabilization.	12M	CO2
	b)	Write short note on zero crossing detector method	08M	CO2
		OR		
2	a)	Prove that Figure of merit for single tone frequency modulated signal is $1.5\beta^2$	12M	CO3
	b)	Explain capture effect and FM threshold effect in FM system	08M	CO3
		PART-B		
3	a)	State and prove sampling theorem and reconstruction of low pass signal using Nyquist criterion	12M	CO4
	b)	Explain time division multiplexing with neat block diagram.	8M	CO4
		OR		
4	a)	What is PAM? Explain the generation and reconstruction of PAM.	10M	CO3
	b)	With neat block diagram explain PPM generation and detection.	10M	CO3
		PART-C		
5	a)	What is line coding? For binary stream 10110101 sketch the following line codes:i) Unipolar RZ ii) Unipolar NRZ , iii) Polar RZ Iv) Bipolar NRZ , V) Polar NRZ , vi) Split Phase Manchester Vii) Bipolar RZ	10M	CO5
	b)	With neat block diagram explain PCM system.	10M	CO5
		OR		
6	a)	Derive an expression for signal to quantization noise ratio	10M	CO5
	b)	Explain delta modulation.	10M	CO5

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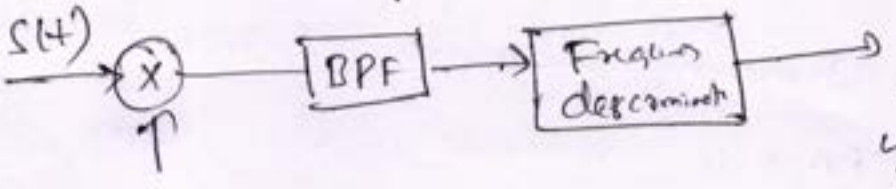
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2022-23(Even semester)

III- INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	ROOPA, T. S
PROGRAMME:	ECE
COURSE TITLE:	Communication Theory
COURSE CODE:	21EC44
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1 a)	Generation of FM wave using direct method.	
	Block diagram of FM modulation	
		2m
	$(SNR)_c = \frac{A_c^2}{2N_0 W}$ —	
	Find Expression of SNR of output	4m
	Deriving figure of merit	6m
		12m

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Q.NO	SOLUTION	MARKS
6	Zero crossing detector Explanation carrect	8m
2 a	Block diagram . carrect – 2m SNR ratio calculation – 4m Provide Single tone frequency modulated Signal is 1.5β2 – 6m	12m
b	Capture effect Explanation FM threshold effect in FM Signal	4m 4m 8m
3 a	Sampling theorem Statement – 2m Nyquist criterion. – 4m Prove Sampling theorm – 6m	12m
b)	TDM - Block diagram – 4m Explanation – 4m	8m

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4 a)	PAM defination - 2m Wave form of PAM - 3m Derivation & Explanation - 5m	10m
6)	PPM block diagram - 3m Wave form of PPM - 2m Derivation & Explanation - 5m	10m
5 (a)	Line coding definition - 2m for each line code formats - 1m manchester code - 2marks	10m
(6)	PCM block diag - 3m Explanation - 7m	10m
6 (a)	Explanation - 4m derivation of Signal to quanti -zation ratio - 6m	10m
6)	Delta modution definition - 2m waveform & Explanation - 8m	10m

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Department of Electronics & Communication Engineering

Academic Year: 2022-23

First Internal Assessment Test

Date: 10-11-2022

Subject: Digital Signal Processing (18EC52)

Year/Sem: III/V

		PART -A		
1	a)	With the diagram, explain digital signal processors based on the Harvard architecture.	8 M	CO5
	b)	Explain the following special digital signal processor hardware units i) Multiplier and Accumulator ii) Shifter iii) Address Generator	8M	CO5
	c)	Represent the decimal number 0.560123 in Q-6 Format.	4M	CO5
		OR		
2	a)	Let $x(n) = (1,2,0,3,-2,4,7,5)$. Evaluate the following : i) X(0) ii) X(4) iii) $\sum_{K=0}^{7} X(K)$ iv) $\sum_{K=0}^{7} \lvert XK \rvert^2$	8M	CO1
	b)	Find the DFT of the sequence $x(n)=1;\ 0 \le n \le 2$ for N=4.Sketch the magnitude and phase Spectrum.	8M	CO1
	c)	Compute the DFT of the sequence x(n) ={ 1, j ,-1, -j} using Formula method.	4M	CO1
		PART-B		CO1
3	a)	Find the circular convolution of two sequences $x_1(n)$={ 1,2,2,1} and $x_2(n)$ ={ 1,2,3,1} using i) Concentric circle method ii) Matrix method	8M	CO1
	b)	Find the N-point DFT of the following sequences i) $x(n)= e^{j\omega mn}$; $0 \le n \le N-1$ ii) $x_1(n) = \delta(n)$ iii) $x_2(n) = \delta(n-n_0)$	8M	CO1
	c)	Find the IDFT of X(K) = { 1,0,1,0} using formula method.	4M	CO1
		OR		CO1
4)	a)	Find the circular convolution of $x_1(n)$={ 2,1,2,1} and $x_2(n)$ = { 1,2,3,4} using Stockham's (DFT- IDFT) method.	8M	CO1
	b)	State and prove Parseval's theorem in related to DFT.	8M	CO1
	c)	State and Prove multiplication two DFT sequences property.	4M	CO1

SUBJECT TEACHER 09/11/2022

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2022-23(Odd Semester)

I - INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Dr. Pradeep K. G. M
PROGRAMME:	UG/B.E III YEAR V SEM
COURSE TITLE:	DIGITAL SIGNAL PROCESSING
COURSE CODE:	18EC52
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1(a)	With the diagram, explain digital signal processors based on the Harvard architecture	8M
Soln	Architecture diagram – 4 Marks Explanation. – 4 Marks Execution cycle diagram	
1(b)	Explain the following special digital signal processor hardware units. i) Multiplier & Accumulator ii) Shifter iii) Address Generator	

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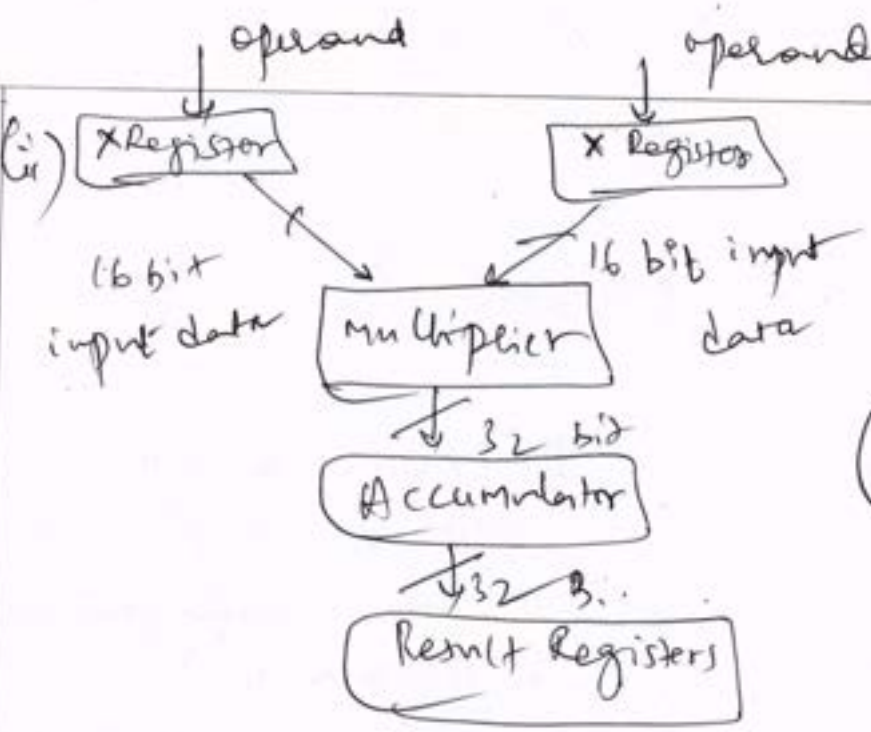
Ans: (i)



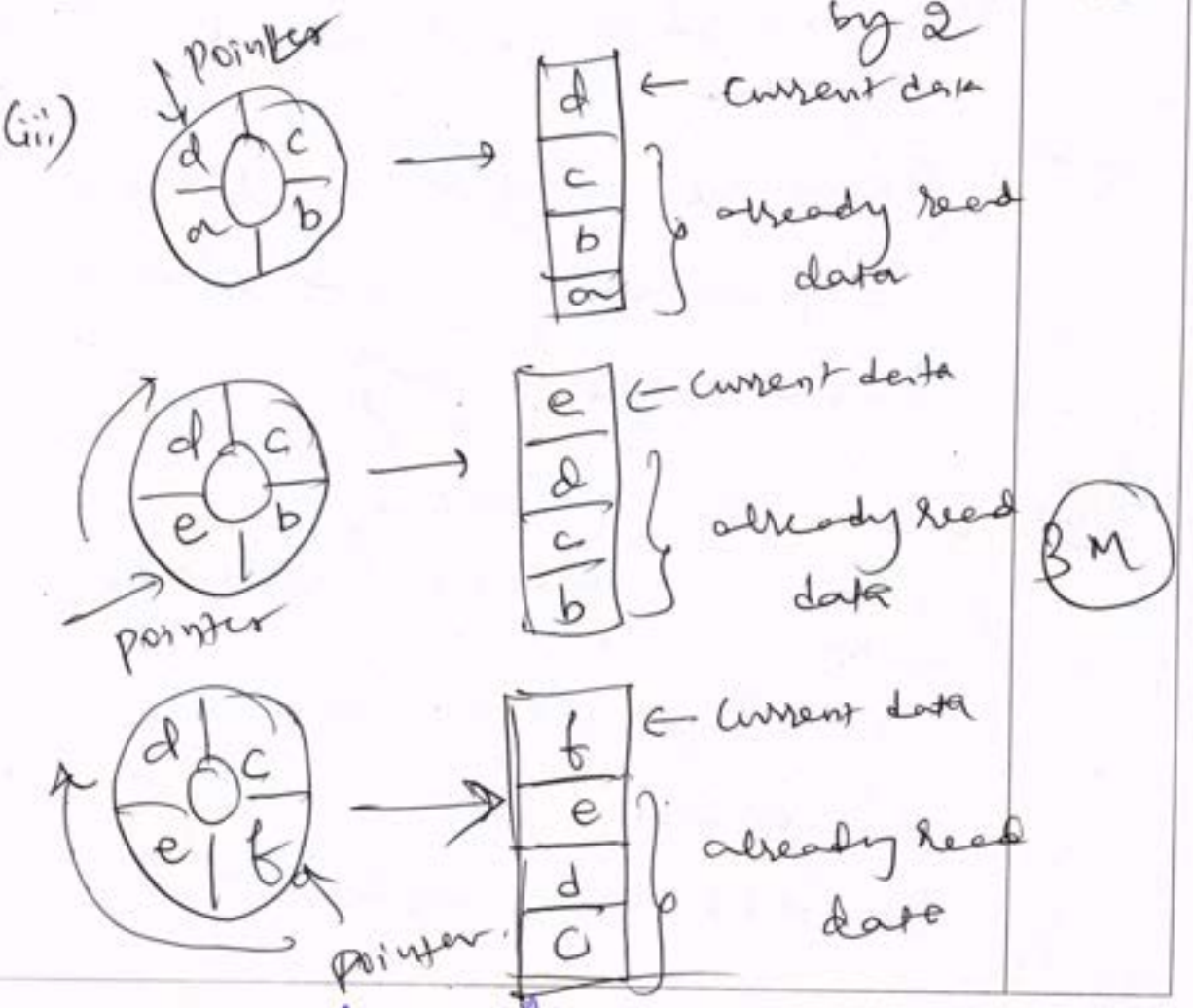
3M

(ii) Scaling down = Shifting Right ⇒ Divide by 2

Scaling up ⇒ Shifting left = Multiply by 2

2M

(iii)



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Q.NO	SOLUTION	MARKS

1 C) Represent the decimal number 0.560123 in Q-6 format. — 4M

$0.560123 \times 2 = 1.120246$ → 1 (MSB)

$0.120246 \times 2 = 0.240492$ → 0

$0.240492 \times 2 = 0.480984$ → 0

$0.480984 \times 2 = 0.961968$ → 0 — 4M

$0.961968 \times 2 = 1.923936$ → 1

$0.923936 \times 2 = 1.847872$ → 1 (LSB)

Q6-format = $(0.100011)_2$

2 a) Let $x(n) = (1, 2, 0, 3, -2, 4, 7, 5)$

Evaluate the following

i) $X(0)$ ii) $X(4)$ iii) $\sum_{k=0}^{7} x(k)$ (iv) $\sum_{k=0}^{7} |x(k)|^2$

Sol:

i) $X(0) = 20$ — 2M

ii) $X(4) = 8$ — 2M

iii) $\sum_{k=0}^{7} x(k) = 8$ — 2M

(iv) $\sum_{k=0}^{7} |x(k)|^2 = 864$ — 2M — 8M

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Q.NO	SOLUTION	MARKS

(2) (b) Find the DFT of the sequence $x(n)=1;\ 0\le n\le 2$ for $N=4$. Sketch the magnitude and phase spectrum.

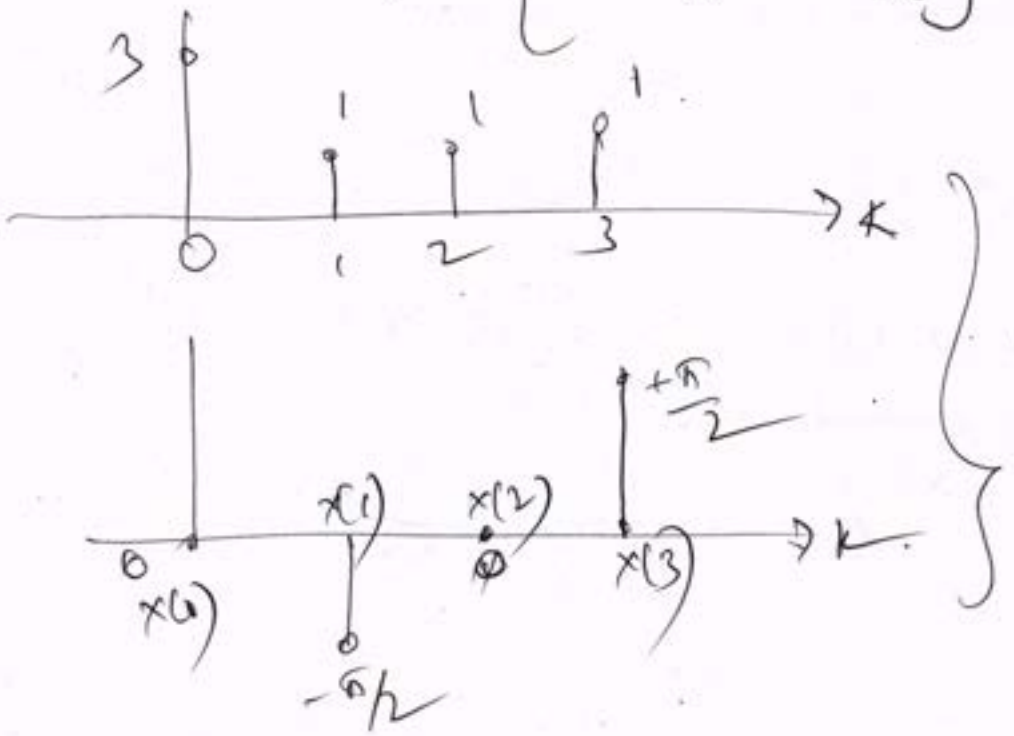
Soln: $x(0)=3$, $x(1)=j$, $x(2)=1$, $x(3)=j$

$$X(k)=\{3,-j,1,j\}$$

$$|X(k)|=\{3,1,1,1\}$$

$$\angle X(k)=\left\{0,-\frac{\pi}{2},0,\frac{\pi}{2}\right\}$$

6M



2M

(2) (c) Compute the DFT of the sequence $x(n)=\{1,j,-1,-j\}$

Soln: $$X(k)=\sum_{n=0}^{N-1} x(n)\, e^{-j2\pi kn/N}$$

$k=0,1,2,\ldots N-1$

$k=0,1,2,3---$

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Q.NO	SOLUTION	MARKS
	$X(0) = 0$ $X(1) = 4$ $\quad X(k) = \{0, 4, 0, 0\}$ $X(2) = 0$ $X(3) = 0$	4m
3 a	Find the Circular Convolution of two sequences $x_1(n) = \{1, 2, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 1\}$ using i) Concentric Circle method. ii) Matrix Method.	
	Soln:	
	$y(0) = 11$ - 1M $y(1) = 9$ - 1M $y(2) = 10$ - 1M $y(3) = 12$ - 1M	$x_1(n) \textcircled{N} x_2(n)$ $= \{11, 9, 10, 12\}$
	Matrix Method $x_1(n) \textcircled{N} x_2(n) = \begin{bmatrix} 11 \\ 9 \\ 10 \\ 12 \end{bmatrix}$	

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Q.NO	SOLUTION	MARKS
3 b	Find the N-point DFT of the following sequences (i) $x(n) = e^{j\omega n}$; $0 \le n \le N-1$ (ii) $x_1(n) = \delta(n)$ (iii) $x_2(n) = \delta(n-n_0)$	8M
Soln	a) $X(k) = \begin{cases} 0, & k \neq m \\ N, & k = m \end{cases}$	3M
	(i) $x_1(k) = 1 \times W_N^{kn}\Big\vert_{n=0} = 1$	2M
	(ii) $x_2(k) = e^{\frac{-j2\pi}{N} kn_0}$	3M
3 c	Find the IDFT of $X(k) = \{1, 0, 1, 0\}$ using formula Method.	
Soln:	$x(0) = \frac{1}{2}$ $x(1) = 0$ $x(2) = 0.5$ $x(3) = 0$ $x(n) = \{0.5, 0, 0.5, 0\}$	4M

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Q.NO	SOLUTION	MARKS

(4)(a) Find the Circular Convolution of $x_1(n) = \{2, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$ using Stockham's (DFT-IDFT) Method.

Soln: $y(n) = x_1(n) \textcircled{N} x_2(n) \longleftrightarrow X_1(k)\, X_2(k)$

$X_N = W_N x_N \quad v = y$

$X_4 = W_4 x_4$

(i) DFT of $x_1(n) = X_1(k) = \begin{bmatrix} 6 \\ 0 \\ 2 \\ 0 \end{bmatrix}$ — 3M

(ii) $X_2(k)\, X_2(k) = \begin{bmatrix} 60 \\ 0 \\ -8 \\ 0 \end{bmatrix}$ — 3M

$y(n) = \{13, 17, 13, 17\}$ — 2M

(4)(b) State and prove parseval theorem — 8M

Soln: $x(n) \xleftrightarrow[N]{DFT} X(k)$

$y(n) \xleftrightarrow[N]{DFT} Y(k)$

$$\sum_{n=0}^{N-1} x(n)\, y^*(n) \longleftrightarrow \frac{1}{N} \sum_{k=0}^{N-1} X(k)\, Y^*(k)$$

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Q.NO	SOLUTION	MARKS

$$\sum_{n=0}^{N-1} x(n)\,y^*(n) = \frac{1}{N}\sum_{k=0}^{N-1} X(k)\,Y^*(k)$$

4 (c) State and prove multiplication of two DFT sequences property

Soln:- $x_1(n) \xleftrightarrow[N]{DFT} X_1(k)$

$x_2(n) \xleftrightarrow[N]{DFT} X_2(k)$

$$DFT\{x_1(n)\cdot x_2(n)\} = \frac{1}{N}\left[X_1(k) \textcircled{N} X_2(k)\right]$$ 2M

$$DFT\{x(n)\} = \frac{1}{N}\sum_{n=0}^{N-1} x(n)\,e^{-j2\pi kn/N}$$

$$DFT\{x_1(n)\,x_2(n)\} = \frac{1}{N}\sum_{n=0}^{N-1}\{x_1(n)\,x_2(n)\}\,e^{-j2\pi kn/N}$$

$$x_2(n) = \sum_{l=0}^{N-1} x_2(l)\,e^{j2\pi ln/N}$$

$$x_1(k-l) = \frac{1}{N}\sum_{n=0}^{N-1} x_1(n)\sum_{l=0}^{N-1} x_2(l)\,e^{-j2\pi(k-l)n/N}$$

$$= \frac{1}{N}\sum_{n=0}^{N-1} x_1(n)\,X_1(k-l)$$ 2M

$$= \frac{1}{N} X_1(k) \textcircled{N} X_2(k)$$

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Department of Electronics & Communication Engineering

Academic Year: 2022-23

Second Internal Assessment Test

Date: 16-12-2022

Subject: Digital Signal Processing (18EC52)

Year/Sem: III/V

PART -A

1	a)	The **IIR filter** $y(n)= 2x(n) + 0.5\ y(n-1)$ Uses The Direct Form-I realization , and for a particular application, the maximum input is $I_{max} = (0.010..00)_2= 0.25$ .Develop the DSP implementation equation in the Q-15 fixed point system.	6 M	CO5
	b)	Given the **FIR filter** $y(n)=0.9x(n) + 3x(n-1) - 0.9x(n-2)$ with the passband gain of 4.and assuming that the input range occupies only ¼ of the full range for a particular application. Develop the DSP implementation equations in the Q-15 fixed point system.	6M	CO5
	c)	Discuss the following IEEE Floating point formats i) Single Precision Format ii) Double Precision Format	8 M	CO5
		OR		
2	a)	Explain TMS320**C3X** architecture of **floating point** digital signal processor.	10 M	CO5
	b)	Describe TMS320**C54X** architecture of **fixed point** digital signal processor.	10 M	CO5

PART-B

3	a)	Consider a FIR filter within impulse response h(n)={ 3,2,1,1} ,if the input is x(n) {1, 2, 3, 3, 2, 1, -1 ,-2, -3, 5, 6 , -1, 2, 0, 2, 1 }, Find the output of the filter using **Overlap Add method** assuming length of block as 7	8M	CO2
	b)	**Using overlap-save method,** compute y(n), of a FIR filter with impulse response h(n) {3,2,1} and input x(n)= { 2,1,-1,-2,-3,5,6,-1,2,0,2,1}.Use only 8-point circular convolution in your approach.	8M	CO2
	c)	Convert -3.75 as a floating point number using IEEE single precision format.	4M	CO5
		OR		
4)	a)	Write the computational procedure to find the filtered output using overlap save method.	8M	CO1 CO1
	b)	Write the computational procedure to find the filtered output using overlap add method.	8M	CO1
	c)	Convert the decimal number -24.542 to floating point format.	4M	CO1

SUBJECT TEACHER 14/12/2022

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2022-23(Odd Semester)

II - INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Dr. Pradeep K. G. M
PROGRAMME:	VG/B.E
COURSE TITLE:	Digital Signal Processing
COURSE CODE:	18EC52
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1(a)	The IIR filter $y(n) = 2x(n) + 0.5y(n-1)$ uses the Direct form-I realization, and for a particular application, maximum input is $I_{max} = (0.\ldots01)_2 = 0.25$ Develop the DSP implementation equation in the Q-15 fixed point system.	8M
Soln	$H(z) = \frac{2}{1 - 0.5z^{-1}}$ $H(z) = \frac{2z}{z - 0.5}$	4M
	$h(n) = \frac{2z}{z - 0.5}$	
	$h(n) = 2(0.5)^n u(n)$	
	$S = I_{max} \times \sum \lvert h(k) \rvert$	4M
	$S = 1$	
	$x(s)\,[n] = x(n)$	
	$y_s(n) = 0.5\,x(n) + 0.125\,y_f(n-1)$	

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Q.NO	SOLUTION	MARKS
1 (b)	Give the FIR filter $y(n) = 0.9x(n) + 3x(n-1) - 0.9x(n-2)$ with the pass band gain of 4 and assuming that the input range occupies only 1/4 of the full range for a particular application. Develop the DSP implementation equations in Q-15 fixed point system.	
Soln:	$S = [\max \{ \lvert h(0) \rvert + h(1) + \lvert h(2) \rvert \}]$	
	$S = \frac{1}{4} \{ 0.9 + 3 + 0.9 \}$	3M
	$S = 2$	
	$x_s(n) = \frac{x(n)}{2}$ $\quad y_s(n) = \frac{1}{4} \cdot \frac{1}{2} y(n)$	
	$= \frac{1}{8} y(n)$	3M
	$y_s(n) = 0.9x(n) + 3x(n-1) - 0.9x(n-2)$	
	$y_s(n) = 0.225\, x_s(n) + 0.75\, x_s(n-1) - 0.0225\, x_s(n-2)$	
1 (c)	Discuss the following IEEE floating point formats.	
	i) Single precision Format	
	ii) Double precision Format	

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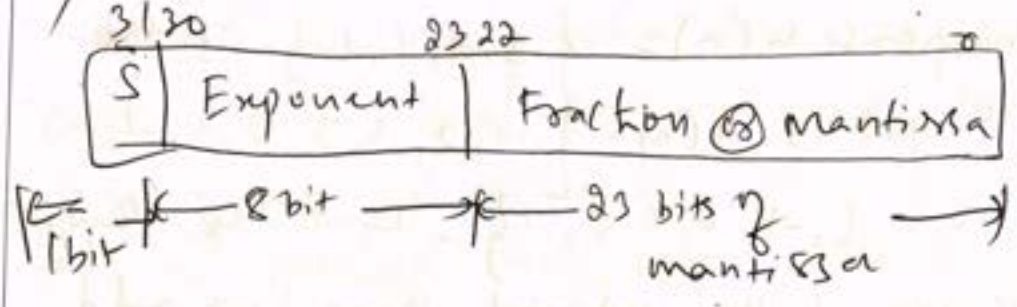
Q.NO	SOLUTION	MARKS

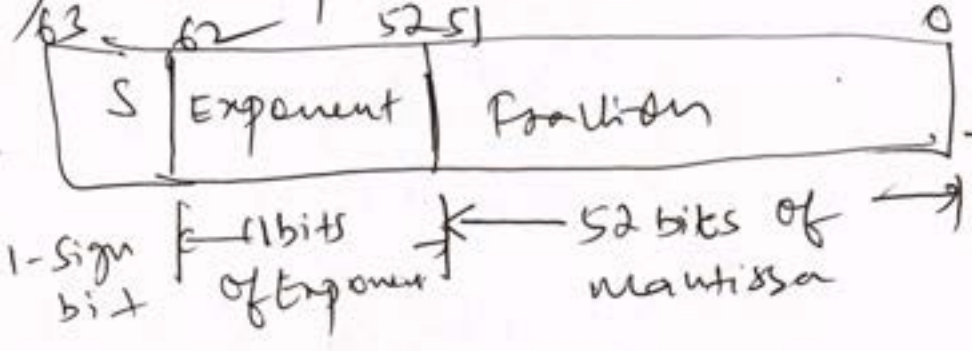
Soln: i) Single precision Format



2M

Equation / Formula → 2M

ii) Double Precision format



2M

Formula / Explanation → 2M

(2)(a) Explain TMS320C3X architecture floating point digital signal processor 8M

Soln:

Architecture diagram → 4M

Explanation → 4M

(2)(b) Explain TMS320C54X architecture of fixed point digital signal processor 8M

Soln:

Architecture Diagram ⇒ 4 Marks

Explanation ⇒ 4 Marks

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PART-B

Q.NO	SOLUTION	MARKS
3 a	Consider a FIR filter with impulse response $h(n) = \{3, 2, 1, 1\}$ if the input is $x(n) = \{1, 2, 3, 3, 2, 1, -1, -2, -3, 5, 6, -1, 2, 0, 2, 1\}$. Find the output of the filter using overlap add method. Assuming length of block is 7	8M
Sol:	$y_1(n) = \{3, 8, 14, 16, 11, 6, 3\}$ $y_2(n) = \{6, 7, 1, -5, -4, -3, -2\}$ $y_3(n) = \{-9, 9, 25, 11, 9, 5, -1\}$ $y_4(n) = \{6, 4, 8, 9, 4, 3, 1\}$	4M
	Formulas — 1 mark	
	Final answer $y(n) = \{3, 8, 14, 16, 17, 13, 4, -5, -13, 6, 23, 11, 15, 9, 7, 9, 4, 3\}$	3M
3 b	Using overlap save method, compute $y(n)$ of a FIR filter with impulse response $h(n) = \{3, 2, 1\}$ and input $x(n) = \{2, 1, -1, -2, -3, 5, 6, -1, 2, 0, 2, 1\}$ use only 8-point Circular Convolution in your approach.	8M

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Q.NO	SOLUTION	MARKS
Soln:	$y_1(n) = \{7, 5, 6, 7, 1, -7, -14, 7\}$ $y_2(n) = \{-5, 10, 25, 14, 10, 3, 8, 7\}$ $y_3(n) = \{6, 7, 4, 1, 0, 0, 0, 0\}$	4M
	$y(n) = \{6, 7, 1, -7, -14, 7, 25, 14, 10, 3, 8, 7, 4, 1\}$	4M
3(c)	Convert -3.75 as a floating point numbers using IEEE single precision Format	4M
Soln:	$x = (-1)^S \times (1.F) \times 2^{E-127}$ $(-1)^1 \times (1.111) \times 2^{128}$ $S = 1$ $\quad S = 128 = 10000000$ $F = 11100000000000000000000$	2M
	1 | 10000000 | 11100000000000000000000 1-sign bit; 8 bits of Exponent; 23 bits of mantissa	2M

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Q.NO	SOLUTION	MARKS
4 a	Write the Computational Procedure to find the filtered output using Overlap Save method.	8M
Soln:	Procedure — 4 mark (4M)	
	Realization diagram - 4 mark (4M)	
4 b	write the Computational procedure to find the filtered output using overlap add method	8M
Soln:	Procedure - 4 marks (4M)	
	Realization Diagram - 4 marks (4M)	
4 c	Convert the decimal number -24.542 to floating Point Format.	
	$x = M \cdot 2^E$ $M = \frac{x}{2^1}$	2 mark
	$x = -24.542$	
	$E = +5$ $M = -0.766925$	
	0101 100111011110	2 mark
	Exponent Part Mantissa Part	

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Department of Electronics & Communication Engineering

Academic Year: 2022-23

Third Internal Assessment Test

Date: 23-01-2023

Subject: Digital Signal Processing (18EC52)

Year/Sem: III/V

		PART -A		
1	a)	Determine the lattice co-efficients corresponding to the FIR filter with system function $H(z)=A_3(z) = 1+ (13/24)\ Z^{-1}+(5/8)\ Z^{-2}+(1/3)\ Z^{-3}$ .And sketch the lattice structure.	8 M	CO3
	b)	List out the comparison between IIR and FIR filter.	8M	CO3
	c)	Mention the advantages and disadvantages of FIR filter.	4M	CO3
		OR		
2	a)	In the direct computation of N-point DFT of a sequence, how many multiplications, additions and trigonometric function evaluation are required?	8M	CO2
	b)	**Derive** radix-2 **DIF-FFT** algorithm.	8M	CO2
	c)	Compute 4-point DFT of the sequence x(n) ={0,1,2,3} using **DIF-FFT** algorithm.	4M	CO2
		PART-B		
3	a)	Design the symmetric FIR filter whose desired frequency response is given as $H_d(w) = \begin{cases} e^{-j\omega\tau} & \text{for } \lvert\omega\rvert \leq \omega_c \\ 0 & \text{for Otherwise} \end{cases}$ The length of the filter should be 7 and cutoff frequency $=\omega_c = 1$ radians/sample.Use Rectangular Window Technique.	8M	CO3
	b)	Obtain the cascade form realization of system function $H(z) = 1+ (5/2)\ Z^{-1}+ 2\ Z^{-2}+ 2\ Z^{-3}$	8M	CO3
	c)	Consider a three stage FIR lattice structure having co-efficient $K_1 = 0.65$, $K_2 = -0.34$ and $K_3 = 0.8$.Realize this filter in direct Form	4M	CO3

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		OR		CO1
4)	a)	**Develop the computational arrangement** of 8-point radix-2 **DIT-FFT** algorithm and draw the signal flow graph.	8M	CO2
	b)	Derive radix-2 **DIT-FFT** algorithm in detail.	8M	CO2
	c)	Compute 4-point DFT of a sequence x(n)={1,-1,1,-1} using **DIT-FFT** Algorithm.	4M	CO2

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
ACADEMIC YEAR 2022-23(ODD semester)
III- INTERNAL ASSESSMENT SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Dr. Pradeep K.G.M
PROGRAMME:	B.E/UG/5th Semester
COURSE TITLE:	Digital Signal Processing
COURSE CODE:	18EC52
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1 (a)	$H(z) A_3(z) = 1 + (13/24)z^{-1} + (5/8)z^{-2} + (1/3)z^{-3}$. Calculation Procedure - 4 marks Formula - 2 marks Lattice structure - 2 marks	8M
1 (b)	Comparision between IIR & FIR filter IIR filter Point - 4 marks FIR filter points - 4 marks	8M

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(2)(a) In the direction computation of N-point DFT of a sequence, how many multiplications, additions and trigonometric functions evaluati.

Soln:

multiplication - 3 marks
Functions

Addition explanation - 3 marks — 8M

Trigonometric functions - 2 marks

(2)(b) Radix-2 DIF-FFT algorithm.

Soln:

$$X(k) = \sum_{m=0}^{\frac{N}{2}-1} f_1(m) W_{N/2}^{km} + W_N^k \sum_{m=0}^{\frac{N}{2}-1} f_2(m) W_{N/2}^{km}$$ — 4M

$$X(k) = F_1(k) + W_N^k F_2(k)$$

$$X\left(k+\frac{N}{2}\right) = F_1(k) - W_N^k F_2(k)$$ → 4M

(2)(c) $x(n) = \{0, 1, 2, 3\}$

Calculation procedure - 2M

Butterfly Diagram & answer - 2M — 4M

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PART-B

(3) (a) Design the Symmetric FIR filter whose desired frequency response is given as. (8M)

$$H_d(\omega) = \begin{cases} e^{-j\omega\tau} & \text{for } |\omega| \le \omega_c \\ 0 & \text{for otherwise} \end{cases}$$

Soln:

$$h_d(n) = \begin{cases} \dfrac{\sin(n-\tau)}{\pi(n-\tau)} & \text{for } n \neq \tau \\ \dfrac{1}{\pi} & \text{for } n = \tau \end{cases} \quad -(4M)$$

$$h(n) = \begin{cases} h_d(n) & \text{for } 0 \le n \le 6 \\ 0 & \text{Otherwise} \end{cases} \quad -(2M)$$

(8M)

Final answer

$h(0) = h(6-n)$ $\quad h(n) = h(M-1-n)$

$h(1) = h(5)$ $\quad M = 7$ $\quad -(2M)$

$h(2) = h(4)$

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Q.NO	SOLUTION	MARKS

(3)(b) Obtain the Cascade form realization of system function:

$H(z) = 1 + (5/2)z^{-1} + 2z^{-2} + 2z^{-3}$

Formula - (2M)

Calculation & Procedure - (3M)

Realization Diagram - (3M)

8M

(3)(c) $k_1 = 0.65$, $k_2 = -0.34$ & $k_3 = 0.8$

$a_2(1) = 0.429$

$a_3(1) = 0.157$

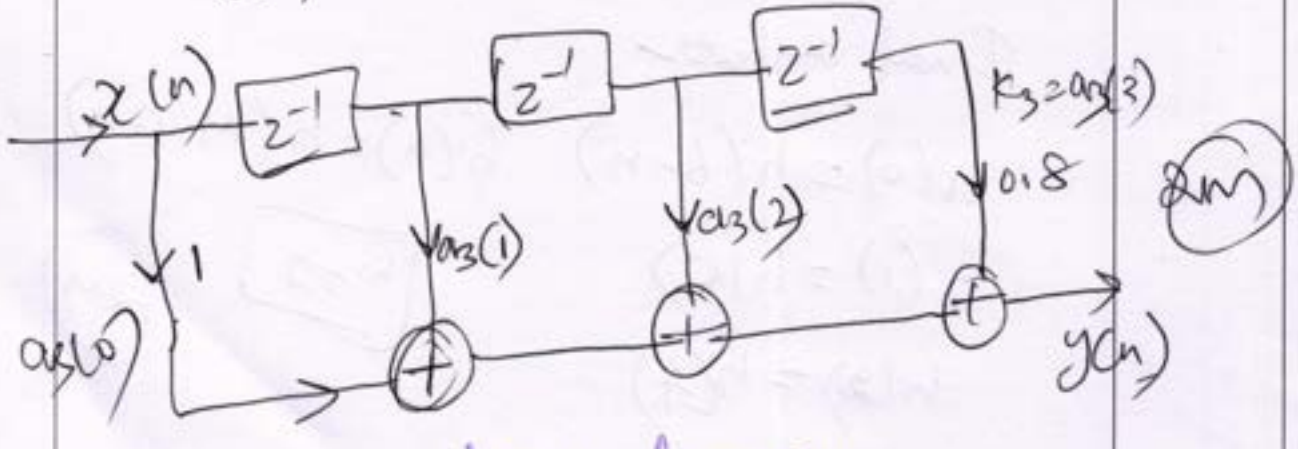
$a_3(2) = 0.0032$

} 6 marks

$a_1(1) = 0.65$

$H(z) = 1 + 0.157z^{-1} + 0.0032z^{-1} + 0.8z^{-1}$

6M



8M

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Q.NO	SOLUTION	MARKS
4 a	Calculation / procedure for computational arrangement - 4 marks Signal flow graph - 4 marks	4M 4M
4 b	Radix-2 DIT-FFT Algorithm	

$$X(k) = \sum_{n=0}^{N-1} x(n) W_N^{kn}$$

$$X(2k) = \sum_{n=0}^{\frac{N}{2}-1} \left[x(n) + x\left(n+\frac{N}{2}\right) \right] W_N^{2kn}$$

$$X(2k+1) = \sum_{n=0}^{\frac{N}{2}-1} \left[x(n) - x\left(n+\frac{N}{2}\right) \right] W_N^{n} W_{N/2}^{kn}$$

4M

$g_1(0) = x(0) + x(4)$
$g_1(1) = x(1) + x(5)$
$g_1(2) = x(2) + x(6)$
$g_1(3) = x(3) + x(7)$

$g_2(0) = [x(0) - x(4)] W_8^0$
$g_2(1) = [x(1) - x(5)] W_8^1$
$g_2(2) = [x(2) - x(6)] W_8^2$
$g_2(3) = [x(3) - x(7)] W_8^3$

4M

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4 (c)

$x(n) = \{1, -1, 1, -1\}$

Signal Flow graph - 2 marks

Calculation/procedure - 2 marks

4M

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING			
AY:2021-2022	SEM : V	TITLE: Internal Assessment Test-1	DATE:22-11-2021
SUB NAME /CODE: Electromagnetic Waves/18EC55			

Answer two full questions

Max.marks 40

1. A) State coulomb's law. Derive expression for force F and mention it in vector form. 10M

   B) Derive the expression for Electric field at a point due to infinite line charge. 10M

OR

2. A) Derive the expression for Electric field at a point due to infinite Sheet of charge. 10M

   B) State Gauss law. Derive expression of Gauss law. 10M

3. A) Let a point charge Q_1=400μC located at (1, -1, -3) m experiences a force $F = 8\hat{a}_x - 8\hat{a}_y + 4\hat{a}_z$ N due to point charge Q_2 at (3, -3, -2)m. Determine Q_2. 10M

   B) Derive the expression for field due to a continuous volume charge distribution. 10M

OR

4. A) Define Electric flux density. Derive the expression for Electric filed density. 10M

   B) Two-point charges Q_1=50μC and Q_2=10μC are located at (-1, 1, -3) m and (3,1,0) m respectively. Find the force on Q_1. 10M

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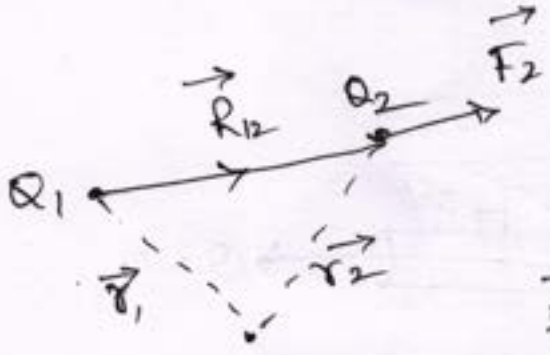
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2022-23 (odd semester)

I - INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Dr. UMESHA. G. B
PROGRAMME:	BE. 5th Sem.
COURSE TITLE:	Electromagnetic waves
COURSE CODE:	18EC55
SIGNATURE:	

Q.NO	SOLUTION	MARKS
Q.1	A) Statement.	2M
	Derivation	8M.
	Sol: $F = K \frac{Q_1 Q_2}{R^2}$	
	$K = 1/4\pi\epsilon_0$ $F = \frac{Q_1 Q_2}{4\pi\epsilon_0 R^2}$	
	 $\vec{R_{12}} = \vec{r_2} - \vec{r_1}$ $\vec{F_2} = \frac{Q_1 Q_2}{4\pi\epsilon_0 R_{12}^2} \hat{a}_{12}$	
Q.1	B) Derivation for Electric field due to	10M

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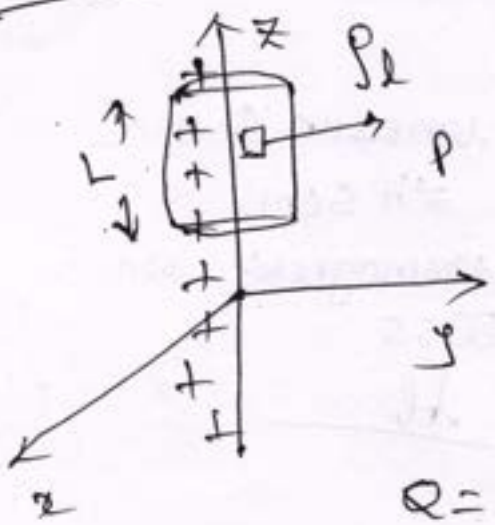
Infinite line charge

Sol:



$$\vec{D} = D_\rho \hat{a}_\rho \quad -(1)$$

$$\vec{ds} = \rho \, d\phi \, dz \, \hat{a}_\rho \quad -(2)$$

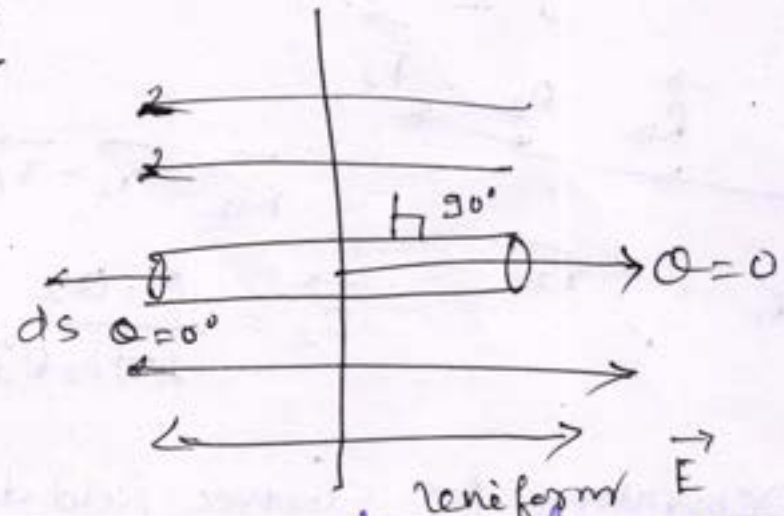
$$Q = \int_{\text{lateral}} \vec{D}.ds$$

$$\vec{B} = \rho_L / 2\pi\rho \, \hat{a}_\rho$$

$$\boxed{\vec{E} = \frac{\rho_L \rho_\rho}{2\pi\rho\epsilon}}$$

Q.2 A) Infinite Sheet of charge 10 M

Sol:



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Q.NO	SOLUTION	MARKS

$$\oint E\,ds = \int_{\text{Curved}} E\,ds\cos\theta^{0} + \int_{\theta=90} E\,ds\cos\theta +$$

$$\int_{\text{flat-1}\ \theta=0^\circ} E\,ds\cos\theta \int_{\text{flat-2}\ \theta=0^\circ} E\,ds\cos\theta$$

$$= 2EA$$

$$\oint E\,ds = Q/\epsilon_0 \qquad \boxed{E = \frac{\sigma}{2\epsilon_0}}$$

Q3 A) $Q_1 = 400\,\mu C$ — 10 M

$Q_2 = ?$

$F = 8\hat{a}_x - 8\hat{a}_y + 4\hat{a}_z$

Sol: $\vec{F_1} = \frac{Q_1 Q_2}{4\pi\epsilon_0 R_{21}^2}\hat{a}_{21}$

$\boxed{Q_2 = -30\,\mu C}$

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Q.NO	SOLUTION	MARKS
3.B)	Derivation $\Delta\vec{E} = \int_{vol} \frac{\rho_v dv (\vec{r}-\vec{r'})}{4\pi\epsilon_0 \lvert\vec{r}-\vec{r'}\rvert^3}$	10M
4) A)	 $\vec{D} = \frac{Q_1 Q_2}{4\pi b^2} \hat{a_R}$	10M
B)	$Q_1 = 50\,\mu C \quad Q_2 = 10\,\mu C$ $F_1 = ?$ $\vec{F_1} = \frac{Q_1 Q_2}{4\pi\epsilon_0 \hat{R}_{21}^2} \hat{a}_{21}$ $\vec{F_1} = 0.144\,\hat{a_x} - 0.108\,\hat{a_z}$	10M

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

AY:2022-2023	SEM : V	TITLE: Internal Assessment Test-2	DATE:19-12-2022

SUB NAME /CODE: Electromagnetic Waves/18EC55

Answer two full questions

Max.marks 40

1. A) State and prove uniqueness theorem. 10M

   B) Derive the expression for Parallel plate capacitor. 10M

OR

2. A) Derive the expression for Poisson's and Laplace equation. 10M

   B) Prove that E = - del V. 10M

3. A) Derive the expression for Line of Integral. 10M

   B) Derive the expression for Divergence of the vector. 10M

OR

4. A). Derive the expression for Co axial Capacitor. 10M

   B) Derive the expression for Gauss,s law to point charge. 10M

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2022-23 (odd semester)

II - INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Dr. UMESHA. G.B
PROGRAMME:	Em waves, 5th sem
COURSE TITLE:	Em waves
COURSE CODE:	18EC55
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1	A) uniqueness theorem Sol: Solutions of laplace's equation V_1 & V_2 $\therefore \nabla^2 V_1 = 0$ & $\nabla^2 V_2 = 0$ — (1) $\nabla^2 (V_1 - V_2) = 0$ — (2) $V_1 = V_2 = V_b$ — (3) $V_1 - V_2 = 0$ — (4) Any solution of laplace equation which satisfies the same boundary conditions must be the only solution regardless of the method used.	10 M

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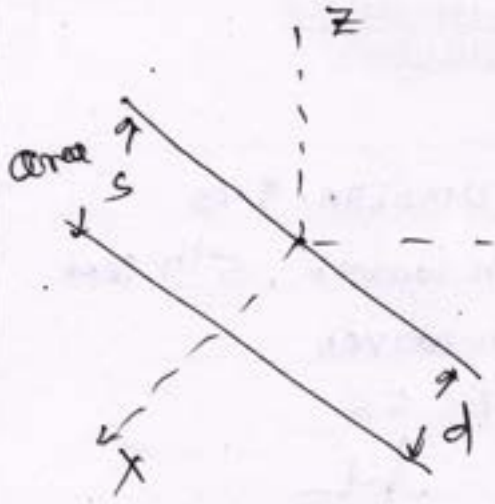
1. B) parallel plate capacitor. 10M



$x=0,\ V=0$

$x=d,\ V=V_0$

$\nabla^2 V = 0 \quad \partial^2V/\partial x^2 + \partial^2V/\partial y^2 + \partial^2V/\partial z^2 = 0$

$d^2V/dx^2 = 0 \quad -②$

$V = V_0 x/d \quad -①$ $\quad E = -V_0/d\,\hat{a}_x$

$D = -\epsilon V_0/d\,\hat{a}_x \quad Q = -\epsilon V_0 S/d$

$\boxed{C = \epsilon S/d}$

2. A) Poisson's & Laplace's equation. 10M

Sol:

$\nabla \cdot \vec{D} = \rho_{ve} \quad -①$

$D = \epsilon \vec{E} \quad -②$

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$$\nabla^2 V = \partial^2 V/\partial x^2 + \partial^2 V/\partial y^2 + \partial^2 V/\partial z^2$$

$$= -\rho_v/\epsilon \quad -(6)$$

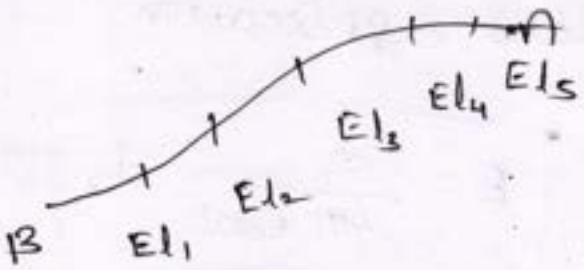
2. B) $E = -\nabla V$ 10M

Sol:

$$\nabla = \partial/\partial x + \partial/\partial y + \partial/\partial z$$

3 A) Line of Integral 10M

Sol



$$W = -Q\left(El_1 \Delta l_1 + El_2 \Delta l_2 + \cdots + El_6 \Delta l_6\right)$$

$$W = -Q \int_B^A \vec{E} \cdot d\vec{l}$$

B) Divergence of vector. 10M

Sol:

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Q.NO	SOLUTION	MARKS

Sol:

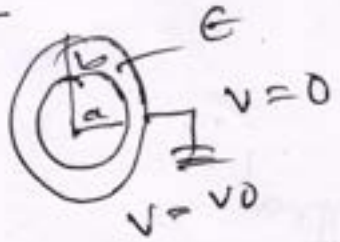
$$\vec{D_0} = D_{x0}\hat{a}_x + D_{y0}\hat{a}_y + D_{z0}\hat{a}_z \quad -①$$

Gauss law

$$\oint_s \vec{D}\cdot d\vec{s} = Q \quad -①$$

4. A) co axial capacitor — 10m

Sol:



$$C = \frac{2\pi\epsilon L}{\ln(b/a)}$$

B. Gauss law application. — 10m.

$$E = \frac{Q}{4\pi\epsilon_0 a^2}\hat{a}_r$$

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Department of Electronics & Communication Engineering

Academic Year: 2022-23

First Internal Assessment Test

Subject: Digital Communication (18EC61) **Year/Sem: III/VI**

1	a)	Define Hilbert Transform.List the properties & applications of Hilbrert Transform.	10 M	CO1
	b)	Derive the expression for the complex low pass representation of band pass systems	10M	CO1
		OR		
2	a)	Obtain the canonical representation of band pass signals.	8M	CO1
	b)	Explain the time-domain procedure for the complex representaion of band pass signals and systems.	8M	CO1
	c)	Find the Hilbert transform of i) $x(t)=e^{-j2\pi ft}$ ii) $x(t)=\delta(t)$	4M	CO1
		OR		
3	a)	Derive an expression for power spectral density of manchester format and draw the spectrum.	8M	CO1
	b)	What is line coding? For binary stream 1011010 sketch the following line codes: i) Unipolar RZ ii) Unipolar NRZ , iii) Polar RZ Iv) Bipolar NRZ , V) Polar NRZ , vi) Split Phase Manchester Vii) Bipolar RZ (AMI Sugnalling)	8M	CO1
	c)	Draw the power spectra of NRZ unipolar and NRZ polar format	4M	CO5
		OR		
4)	a)	With a neat diagram expalain the generation of PN sequences and state its properties	8M	CO5
	b)	What is spread spectrum. Explain the model of a spread spectrum digital communication system.Mention the types of spread spectrum.	8M	CO5
	c)	Write a short note on application of spread spectrum in wireless LAN.	4M	CO5

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2022-23(Even semester)

I- INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Prof. Roopa. T. C
PROGRAMME:	ECE
COURSE TITLE:	Digital Communication
COURSE CODE:	18EC61
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1 a)	Definition of Hilbert Transform when phase angle of all components of a given signals are subjected by the frequencies $\pm 90°$. That selecting function is known as Hilbert transform	2m 6m
	properties of Hilbert transform	2m
	Application of Hilbert transform	10m
(6)	frequency response of Band pass system & Spectrum of signal s(t)	4m
	Derivation & Explanation	6m 10m

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Q.NO	SOLUTION	MARKS
2 a)	Canonical representation of Band pass signal frequency spectrum Explanation & derivation	2m 6m (8m)
b)	Time - domain procedure for the complex representation of band pass signals & system Explain Time - dom. spectrum —	6m 2m (8m)
3 a)	Spectrum of power spectral density of manchester format & draw the Derivation & Explain	3m 5m
b)	Line coding definition. i) Unipolar RZ ii) polar RZ iii) Unipolar NRZ iv) polar NRZ	2m

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Q.NO	SOLUTION	MARKS
	v) Bipolar NR2 vi) Bipolar R2 vii) Split phase manchester	(6m) (8m)
c)	Power spectra of NR2 bipolar - 2m Power spectra of NR2 polar - 2m	(4m)
4 a)	Block diagram of generation of PN sequences & ~~stat~~ Explanation & derivation properties of PN generation	3m 3m 2m (8m)
6)	Definition of Spread Spectrum - 2m Model of a Spread Spectrum digital communication system - 4m Types of spread Spectrum - 2m	(8m)

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c) Wireless LAN Application & Explanation. (4m)

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Department of Electronics & Communication Engineering
Academic Year: 2022-23
Second Internal Assessment Test
Subject: Digital Communication (18EC61) **Year/Sem: III/VI**

1	a)	Explain signal space diagram of BPSK and QPSK.	10 M	CO3
	b)	Explain coherent BPSK detector and probability of errors.	10M	CO3
		OR		
2	a)	Explain power spectral density of BPSK signal. List the properties of power spectral density of BPSK.	10M	CO3
	b)	Explain QPSK transmitter and receiver.	10M	CO3
3	a)	Explain BFSK using non coherent detectioin.	10M	CO2
	b)	What is DPSK? Explain signal space diagram for DPSK.	10M	CO2
		OR		
4	a)	Explain generation and detection of DPSK.	10M	CO2
	b)	Explain FSK techniques using coherent detection	10M	CO2

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06

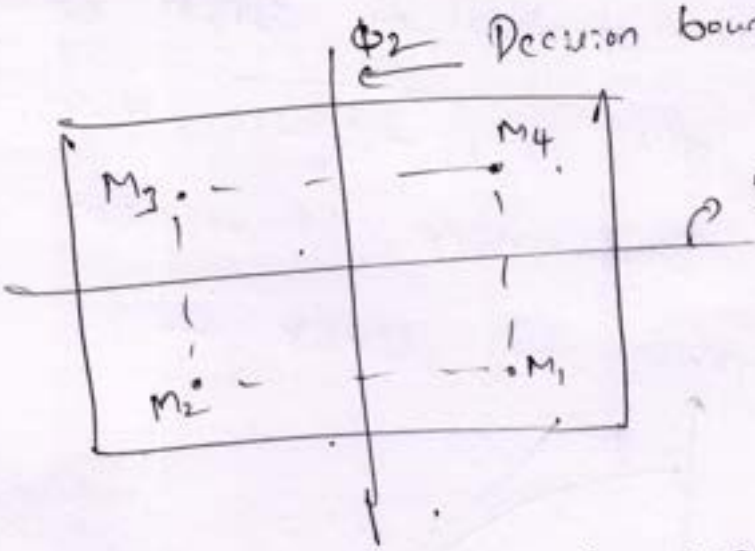
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2022-23(Even semester)

II- INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Prof, ROOPA. T. C
PROGRAMME:	ECE
COURSE TITLE:	Digital Communication
COURSE CODE:	18ECG1
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1 a)	Signal Space diagram of BPSK  Explanation of BPSK – 2m Signal Space diagram of QPSK 3m Explanation of QPSK & Derivation of QPSK Signal 2m	3m 10m

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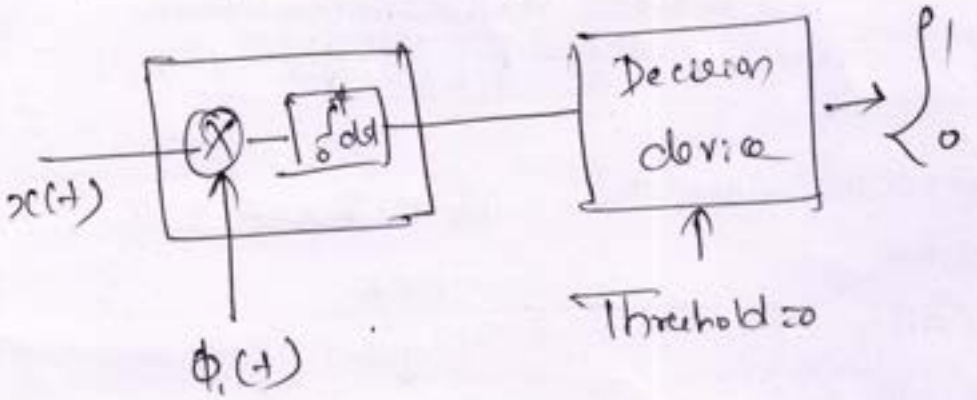
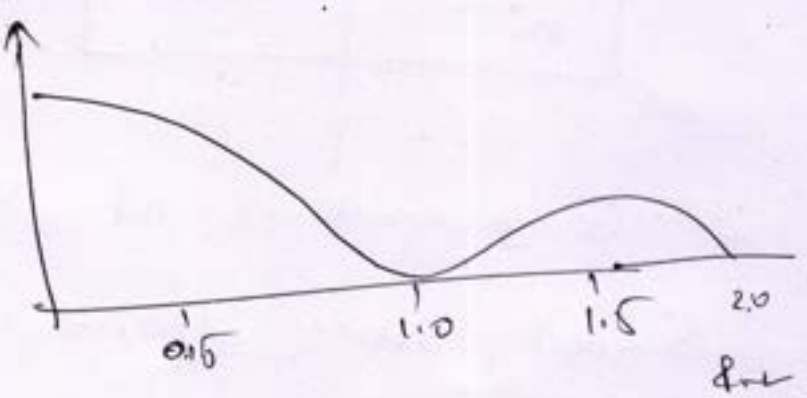
Q.NO	SOLUTION	MARKS
6	Coherent BPSK detector 	2m
	Explanation – & derivation	4m
	Properties of errors	4m
		10m
2 a)	power spectral of BPSK signal	
	$g(t) = \sqrt{\frac{2E_b}{T_b}}$, $0 \le t \le T_b$	6m
	Derivation – 6m	
	Properties of BPSK — 	4m
		10m

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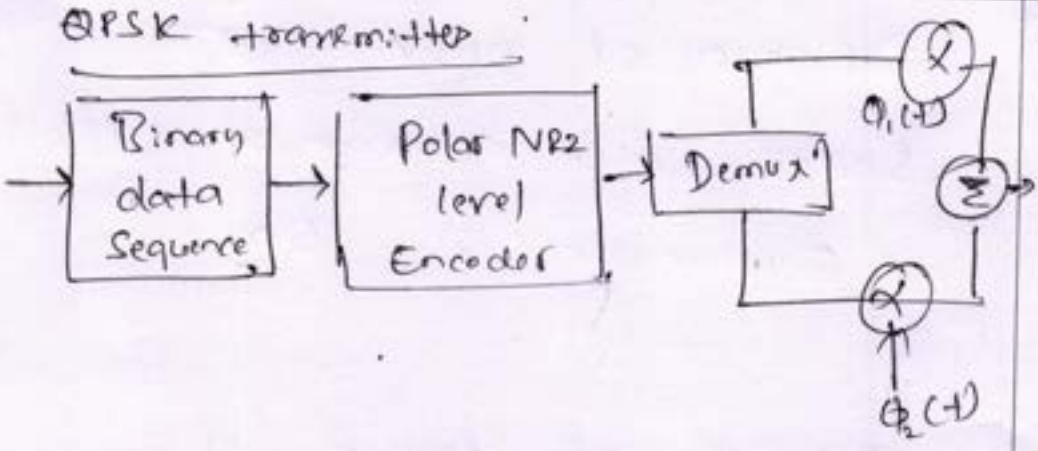
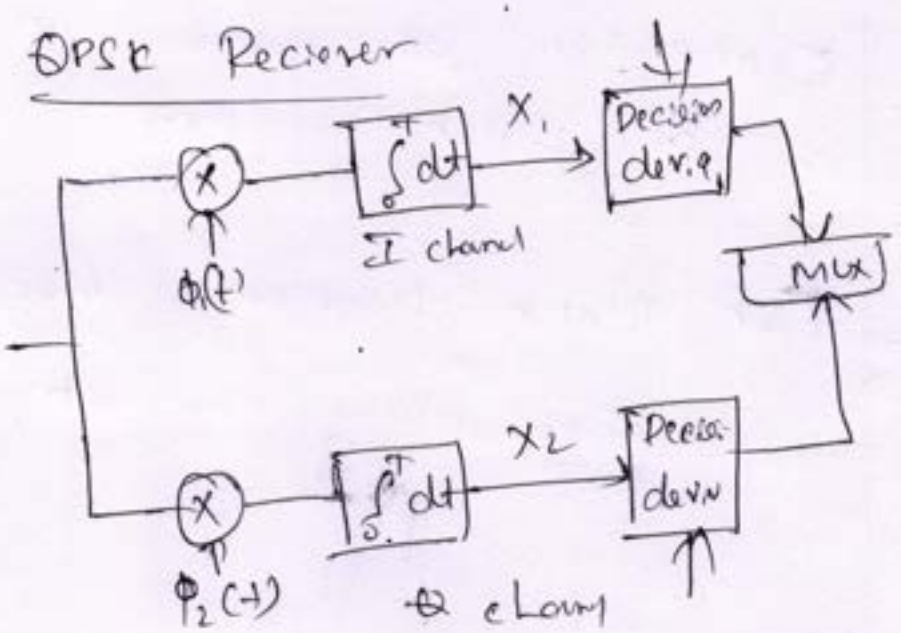
Q.NO	SOLUTION	MARKS
6)	QPSK transmitter  Explanation -	3m 2m
	QPSK Reciever  Explanation	3m 2m
		10m
a)	BPSK Block diagram - 4m Explanation - 6m	10m

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Q.NO	SOLUTION	MARKS
(6)	Definition of DPSK - 2m Signal Space diagram of DPSK - 3m Explantion - 5m	(10m)
4 (a)	Detection of DPSK Block diagram - 4m Explanation of generation of DPSK - 6m	(10m)
(6)	FSK Block diagram - 4m Explantion - 6m	(10m)

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ESTD: 2002

Department of Electronics & Communication Engineering
Academic Year: 2022-23
Third Internal Assessment Test

Subject: Digital Communication (18EC61) **Year/Sem: III/VI**

		PART -A		
1	a)	Explain Block diagram of digital PAM with equations..	8 M	CO4
	b)	Stae and prove Nyquist condition for zero ISI.	8M	CO4
	c)	Briefly explain Eye pattern with its diagram.	4M	CO4
		OR		
2	a)	Explain Bandlimited Signals with Controlled ISI-Partial-Response Signals	10M	CO3
	b)	Explain zero-forcing equalizer	5M	CO4
	c)	Explain Linear adaptive equalizer based on the MSE criterion	5M	CO3
		PART-B		
3	a)	Explain Spread-Spectrum Digital Communication System With Block Diagram.	8M	CO5
	b)	Explain Direct Sequence Spread-Spectrum Systems and Demodulation of DS spread-spectrum signal.	12M	CO5
		OR		
4)	a)	Explain Frequency-Hopped Spread Spectrum.	8M	CO5
	b)	Explain CDMA System Based on IS-95-Forward Link.	8M	CO5
	c)	Write short notes on applications of Spread spectrum. .	4M	CO5

Note: Answer any one full question from Part-A & answer any one full question from Part-B

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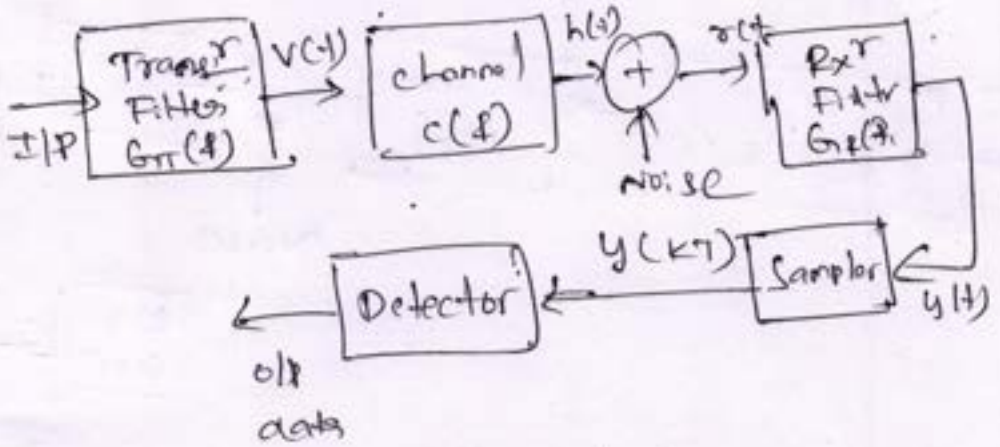
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2022-23(Even semester)

III- INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Prof. Roopa. T. C
PROGRAMME:	ECE
COURSE TITLE:	Digital Communication
COURSE CODE:	18EC61
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1 a)	Digital PAM System Block diagram  Explanation	4m 4m (8m)
6)	Statement of Nyquist condition for zero ISI — 2m Proof — 6m	(8m)

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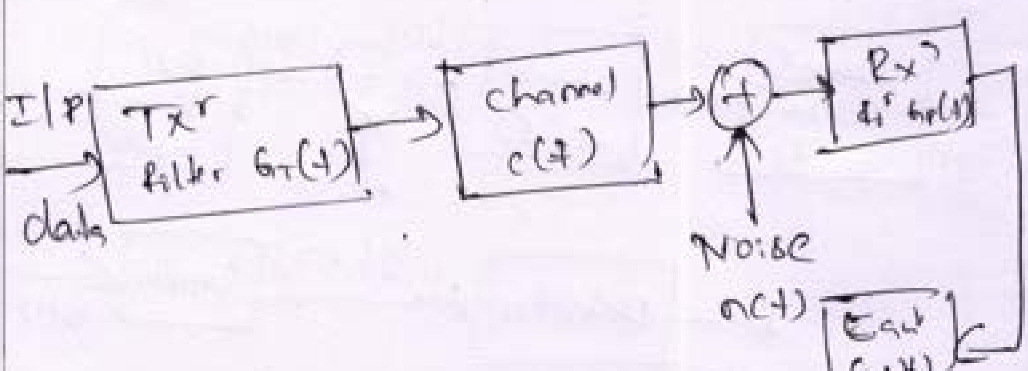
Q.NO	SOLUTION	MARKS
c)	Eye pattern & Filter diagram	2m
	Explanation	2m
2(a)	Band limited Signals with controlled ISI - partial - Response Signal	
	Block diagram - 3m	
	Derivation & Explanation - 7m	10m
b)	Zero forcing Equaliser	
		- 4m
	Explanation -	6m
		10m
3 (a)	Spread Spectrum digital comm s/m -	4m
	Block diagram	
	Explan	6m
		10m

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b)	Direct Sprd Sequence – S/m & de – modulation of DS Spread Spectrum Signal	4m
	Explanatin	6m
		(10m)
4 a)	Block diagram & FHSS – 2m	
	Explanation — 6m	(8m)
6)	CDMA Block diagram — 4m	
	Explan — 6m	(10m)
c)	Each application of Sprd Spectrum carrie 1 mark	(4m)
	For 4 application	

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Department of Electronics & Communication Engineering
Academic Year: 2022-23
Third Internal Assessment Test **Date: 21-12-2022**
Subject: Computer Networks (18EC-71) **Year/Sem: IV/VII**

1	a)	Explain the Architecture & Format of Electronic Mail.	10 M	CO5
	b)	Distinguish between Local Login & Remote Login	10M	CO4
		OR		
2	a)	Explain Persistent & Non-Persistent Connections in HTTP	10 M	CO5
	b)	Write a note DNS Recursive & Iterative Resolutions	10M	CO4
3	a)	Explain the working of DHCP Configuration Protocol.	10M	CO3
	b)	Explain Distance Vector algorithm using Bellaman Equations	10M	CO2
		OR		
4)	a)	Write a note on Class full & Classless Addressing	7M	CO3
	b)	Explain the simple implementation of network address translation	7M	CO2
	c)	Explain path vector routing with neat diagram	6M	CO3

SUBJECT TEACHER

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ESTD:2002

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
ACADEMIC YEAR 2022-23(VII semester)
III- INTERNAL ASSESSMENT SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Prof. Pradeep Kumar S.S.
PROGRAMME:	B.E
COURSE TITLE:	Computer Networks
COURSE CODE:	18EC71
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1-a)	Architecture of Electronic Mail ⟶	05M
	Format of Electronic Mail ⟶	05M
b)	Five Differences between local login and Remote login }	05×02 → 10M
2-a)	persistant Connection in HTTP ⟶ Diagram + Explanation	05M
b)	Non persistant connection in HTTP ⟶ Diagram + Explanation	05M

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Q.NO	SOLUTION	MARKS
2 b)	DNS Recursive solution ⟶	05M
	DNS Iterative solutions ⟶	05M
3.a)	DHCP configuration protocol	
	Diagram ⟶ 05M	
	Explanation ⟶ 05M	
3.b)	Distance Vector Algorithm	
	Vector Algorithm ⟶	05M
	Bellman equations ⟶	05M
4.a)	Classfull Addressing	
	Diagram + Explanation ⟶	04M
	Classless Addressing	
	Diagram + Explanation ⟶	03M

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ESTD:2002

4.b) Network address Resolution

Diagram ⟶ 03M

Explanation ⟶ 04M

4.c) path routing Algorithm

Diagram of path Routing ⟶ 03M

Explanation ⟶ 03M

Q.NO	SOLUTION	MARKS

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SIRA ROAD, TUMKUR – 572106.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING			
AY:2022-2023	SEM : VII	TITLE: Internal Assessment Test-II	DATE:01-12-2022
SUB NAME /CODE: VLSI DESIGN/18EC72			

Answer two full questions

Max.Marks 40M

1) A) Explain Lambda based design rules. 10M

B) Explain flowchart of VLSI Design. 10M

OR

2) A). Draw a circuit diagram to implement $Y=\overline{AB+C}$ and sketch stick diagram 10M

B). Explain with diagram RC delay Model and Linear Delay Model. 10M

3) A) Explain Pass transistor and static CMOS using 2:1 Multiplexer. 10M

B) Explain P well and n well process with neat diagram. 10M

OR

4). A) what is Scaling? Explain full scaling with neat diagram. 10M

B) What is stick diagram? Explain color codes and pattern. 10M

Staff in charge

1/12/22

HOD

1/12/22

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06

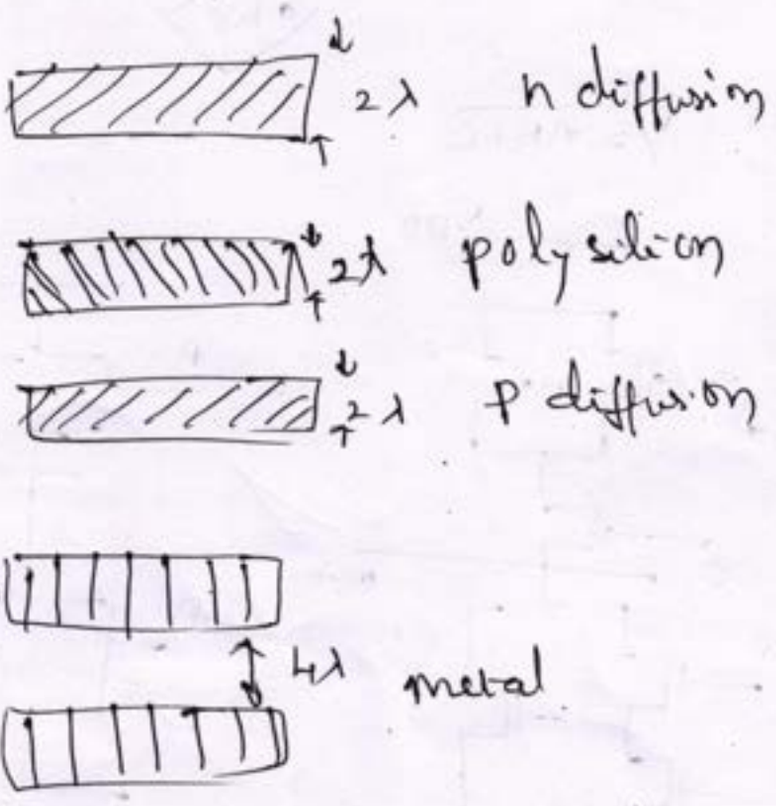
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2022-23 (odd semester)

II - INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Dr. UMESHA G.B
PROGRAMME:	VLSI design 7th sem
COURSE TITLE:	VLSI design
COURSE CODE:	18EC72
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1.	A) Lambda based design rules Sol  	10M.

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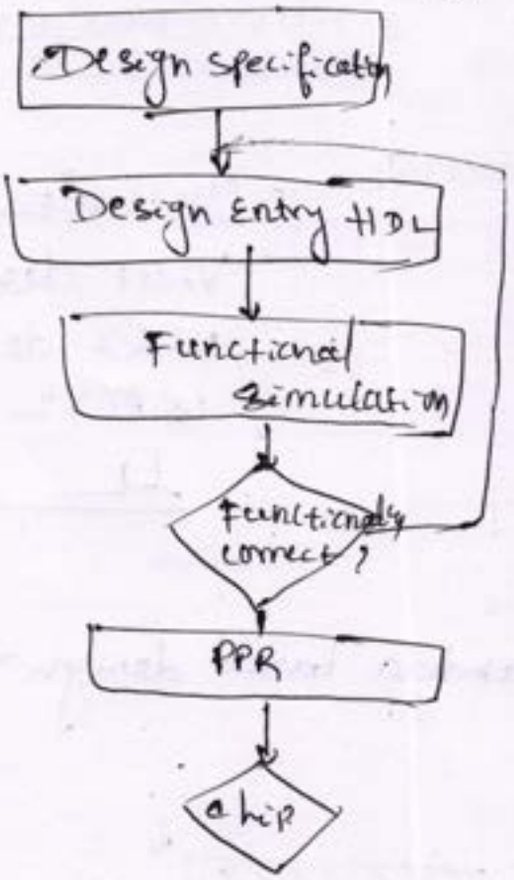
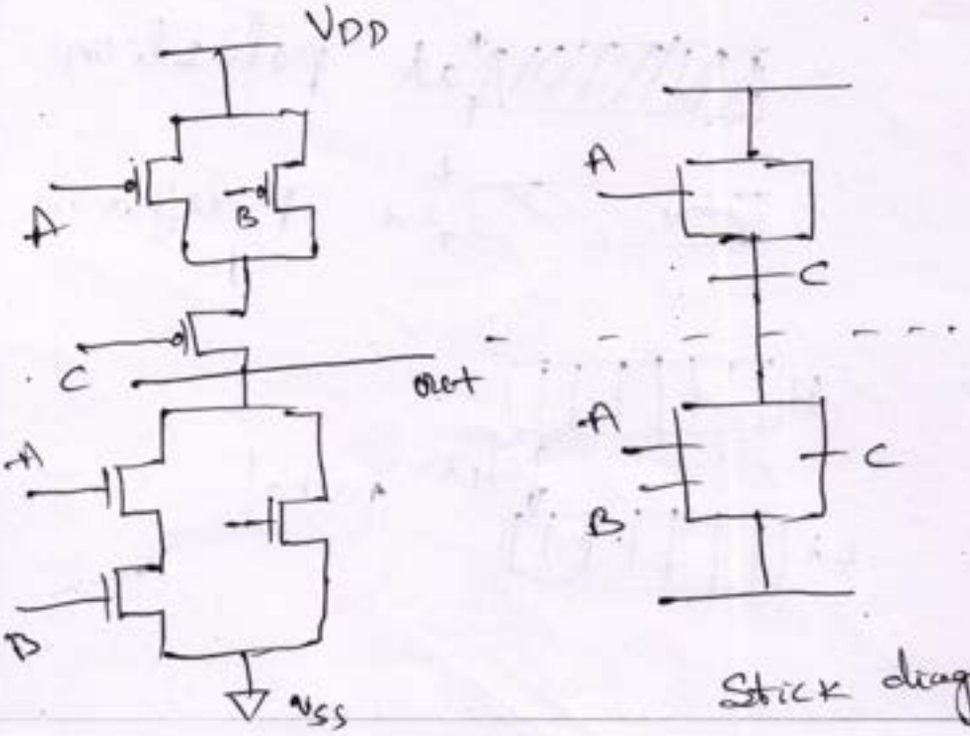
B) Flow chart of VLSI design — 10 M.



2. A) $Y = \overline{AB+C}$ — 10 M



Stick diagram

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B. RC & linear delay model 5+5 10M

Sol

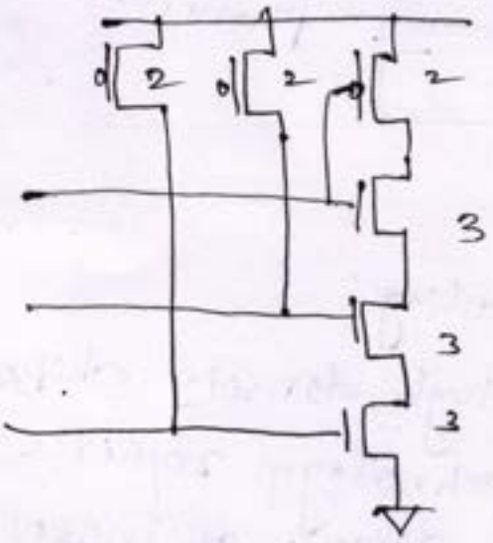

Fig. 3 I/p NAND gate.
with unit rise & fall

3. A) pass transistor & CMOS 2:1 mux 10M

Sol 5+5

pass transistor.

3. B) P & n well process 5+5 10M

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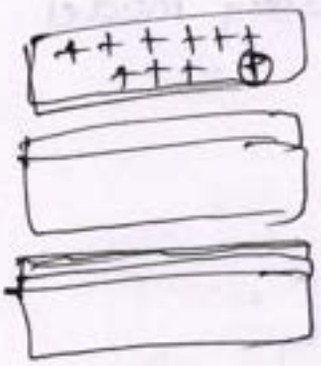
Q.NO	SOLUTION	MARKS

Sol



10 M.

4. A) MOSFET Scaling.

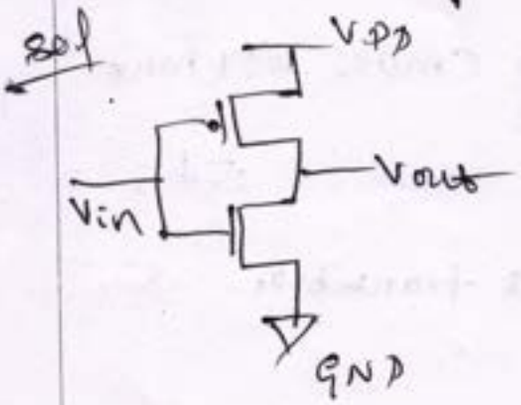
10 M.

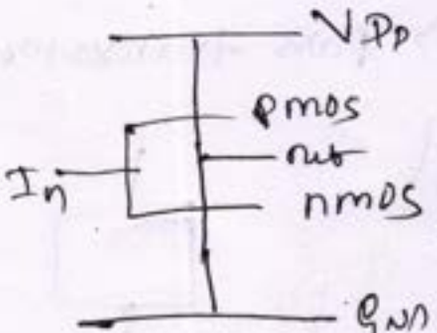
Sol The design of high density chips in MOS VLSI technology requires that the packing density of MOSFETs used in the circuit.

B. Stick diagram.

10m.

Sol





Stick diagram.

Signature of Incharge

Signature of HOD

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Shridevi Institute of Engineering and Technology, Tumkur – 06
VI Semester : I Internal Assessment Test: April 2023
Department of Mechanical Engineering
18ME641 – NON TRADITIONAL MACHINING

Time: 90 Min] [Max. Marks: 40

Note: *Answer TWO full questions*

Sl No		Marks	CO
1a)	What are the various aspects to be considered before selecting Nontraditional machining process discuss briefly	6M	CO1
b)	List the advantages, limitations and applications of NTM processes	7M	CO1
c)	Explain the classification of NTM process based different source of energy	7M	CO1
2a)	With the help of neat sketch explain working principle of ultrasonic machining process	10M	CO2
b)	Explain with neat sketch working principle of abrasive jet machining and also give advantages and applications of AJM Process	10M	CO2
3a)	Differentiate between conventional and non-conventional machining process	6M	CO1
b)	Explain the need for nontraditional machining	7M	CO1
c)	Discuss the following variables that influence the material removal rate in USM process	7M	CO2

[Faculty]

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I Internal Assessment Test

1) a) 1) Physical parameters of the process [6M]

a) Voltage (V)
b) current (Amp) & power (w)
c) working medium
d) Gap b/w workpiece & tool.

2) Machining characteristics or process capability

a) Metal Removal Rate
b) Tolerance maintained
c) surface finish obtained
d) surface damage depth.

3) Economics of the processes

a) capital cost
b) Tooling maintained.
c) surface finish obtained
d) power consumption cost
e) Tool wear

4) capacity to shape

a) Drilling operation
b) Micro drilling operation
c) surface contouring operation
d) Through cutting operation.

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1) b) Advantages [7M]

1) Tool material need not be harder than w/p mate.
2) complex shapes can be easily produced.
3) There is no or negligible tool wear.
4) No burr is left on machined surface.
5) high accuracy & surface finish.

Disadvantages :-

1) High capital & maintenance cost
2) low MRR.
3) Skilled operaters are required.
4) complex set-up of equipment.
5) Depth of cut is limited in LBM

Applications of Non-Traditional machining

1) N.T.M is used for machining of hard & brittle materials like glass, ceramics, carbides.
2) N.T.M is used in electronics industry for machining of circuit boards.
3) N.T.M is used in automobile industries for machining fiber glass body components.

1) c) ① Mechanical energy Based processes: [7M]

Mechanical energy in the form of high frequency vibrat-ons or KE of an abrasive jet or water jet is employ-ed to remove the material from the workpiece

Eg:- USM, AJM, WJM.

② Thermal Energy based processes:-

Thermal Energy is employed to melt & vaporize the w/p material. Thermal energy is generated from electrical energy.

Eg:- EBM, EDM, LBM, PAM.

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③ Electro chemical energy based processes:-

Electrical energy & chemical energy are employed to remove the material from the workpiece by using cathode tool & electrolyte solution.

Eg:- ECM, ECG.

④ Chemical Energy based processes:-

Chemical energy is used to remove the excess material from the w/p by using chemical reagents

Eg:- CHM.

2) a) [10M]

USM Equipment & operation

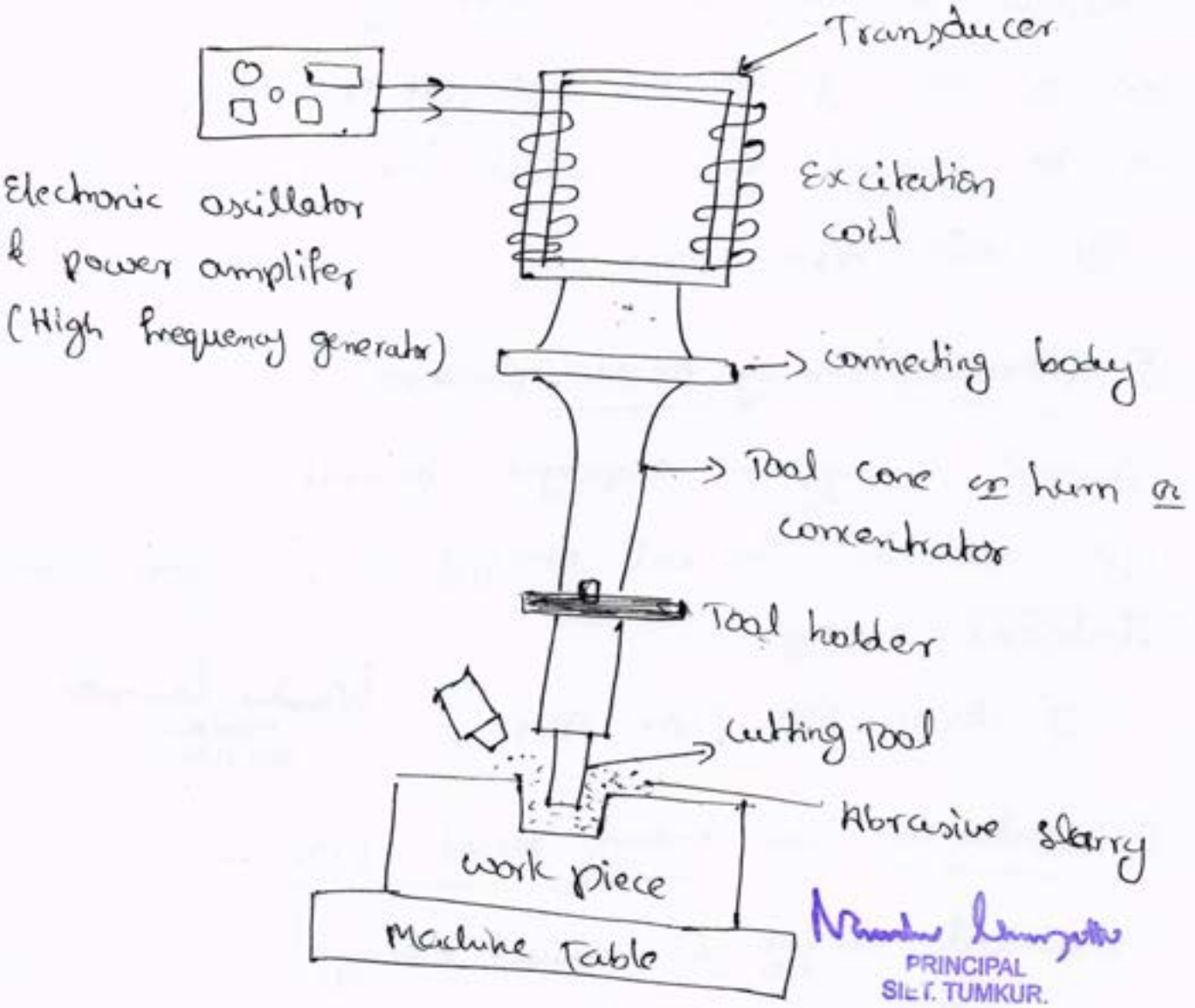

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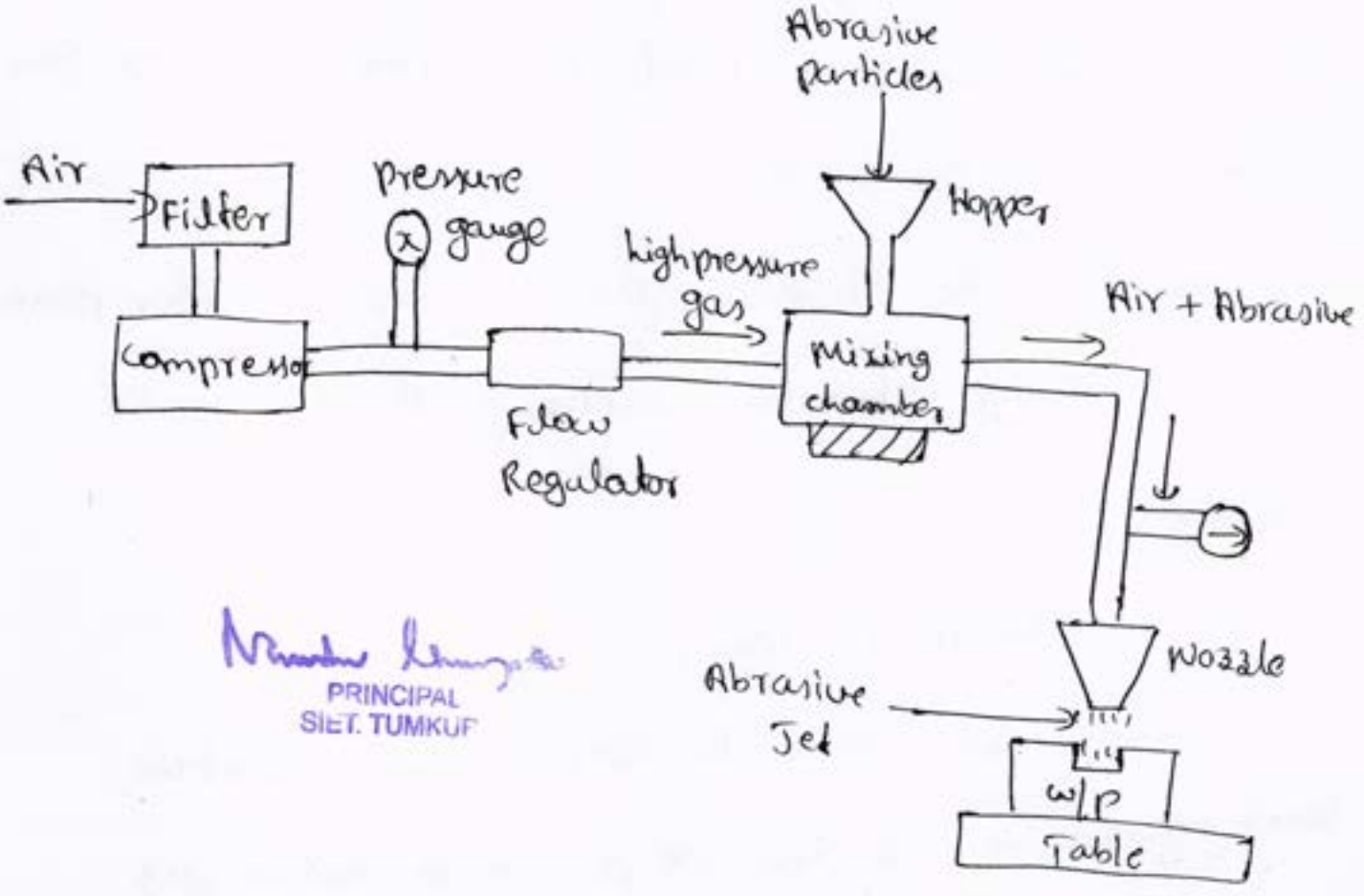
Fig: Ultrasonic Machining Equipment

working of USM

* Electronic oscillator and power amplifies convert low frequency electrical singnal to high frequency electrical signal.
* This high frequency electrical signal is transmitted to the ultrasonic transducer.

* The tool vibrates at very high frequency with desired amplitude
* Abrasive slurry is pumped b/w the vibrating tool & work piece.
* The removed work material is carried away by the abrasive slurry.

2) b) [10M]



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1) Filter:- It filters the gas before entering the compressor and mixing chamber.

2) Compressor:- It pressurizes the gas. Gas used are carbon-di-oxide.

4) Mixing chamber

It is used to mix the gas & abrasive particles.

5) Hopper:-

Hopper is used for feeding the abrasive particles to the mixing chamber.

6) Vibrator:- It is provided below the mixing chamber.

operation of AJM

* Dry air or gas is filtered and compressed by passing it to Compressor.
* The removed work material is carried away by gas stream i.e carries gas.
* In operation the filtered gas is supplied under pressure into the mixing chamber containing abrasive particles.

Advantages

* Initial investment is low.
* AJM units are easy to operate and maintain.
* Heat generator is low → passing of air or gas.
* Good accuracy & surface finish.

disadvantages

* low M.R.R.
* Abrasive particles cannot be reused.

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* Nozzle life is limited
* Tapes is present in deep cuts.

Applications

i) Used for m/c of brittle and heat sensitive materials like ceramic, glass, quartz.

ii) Semiconductors like Silicon, germanium

iii) used to cut intricate shapes.

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3) a)

[6M]

Conventional Machining	Non Conventional Machining.
* The cutting tool must be harder than the workpiece material.	* cutting tool need not be harder than the workpiece material.
* Tool life is less due to wear.	* Tool life is comparatively more.
* Difficult to obtain high accuracy & surface finish	* NTM processes result in high accuracy & surface finish
* It involves direct contact blw the tool & work piece	* There is no physical contact blw the cutting tool & work piece.
* conventional process use mechanical energy for metal removal	* NTM processes utilize different energy sources like mechanical electrical, chemical & thermal.

3) b) * Extremely hard & brittle materials or difficult to machine materials are difficult to machine by traditional machining processes. [7M]

* when the workpiece is too flexible or slender to support the cutting or grinding forces.

* when the shape of the part is too complex.

* Machining of composites.

* Intricate shaped third hole - e.g. square hole of 15mm x 15mm with a depth of 30mm

* Deep ~~the~~ hole with small hole diameter - e.g ϕ 1.5mm hole with l/d = 20.

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3) c) [7M]

① Material Removal Rate

② Tool wear

③ Accuracy

④ Surface finish.

① Material Removal Rate:

① Glass → 485 mm^3/min

② Mica → 390 mm^3/min

③ Ceramics → 185 mm^3/min

④ Steel → 30 mm^3/min.

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* USM process gives high MRR for w/p whose hardness is greater than 50 HRC
* USM process is not suitable for w/p whose hardness is less than 50 HRC
* Therefore USM is best suitable for machining hard and brittle materials.

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Shridevi Institute of Engineering and Technology, Tumkur – 06
VI Semester : II Internal Assessment Test: MAY 2023
Department of Mechanical Engineering
18ME641 – NON TRADITIONAL MACHINING

Time: 90 Min] [Max. Marks: 40

Note: *Answer TWO full questions*

Sl No		Marks	CO
1a)	With a neat sketch explain electro chemical grinding(ECG)	(8M)	CO3
b)	Explain various process characteristics in ECM	(8M)	CO3
c)	Discuss different applications of ECM	(4M)	CO3
2a)	Briefly explain ECM process. Explain the elements of ECM.	(10M)	CO3
b)	What are the functions of electrolyte? Mention any two electrolytes used in ECM	(10M)	CO3
3a)	Explain the sequence of operation in chemical machining process.	(10M)	CO3
b)	List factors to be considered in the selection of Etchants in chemical machining.	(10M)	CO3

[Faculty]

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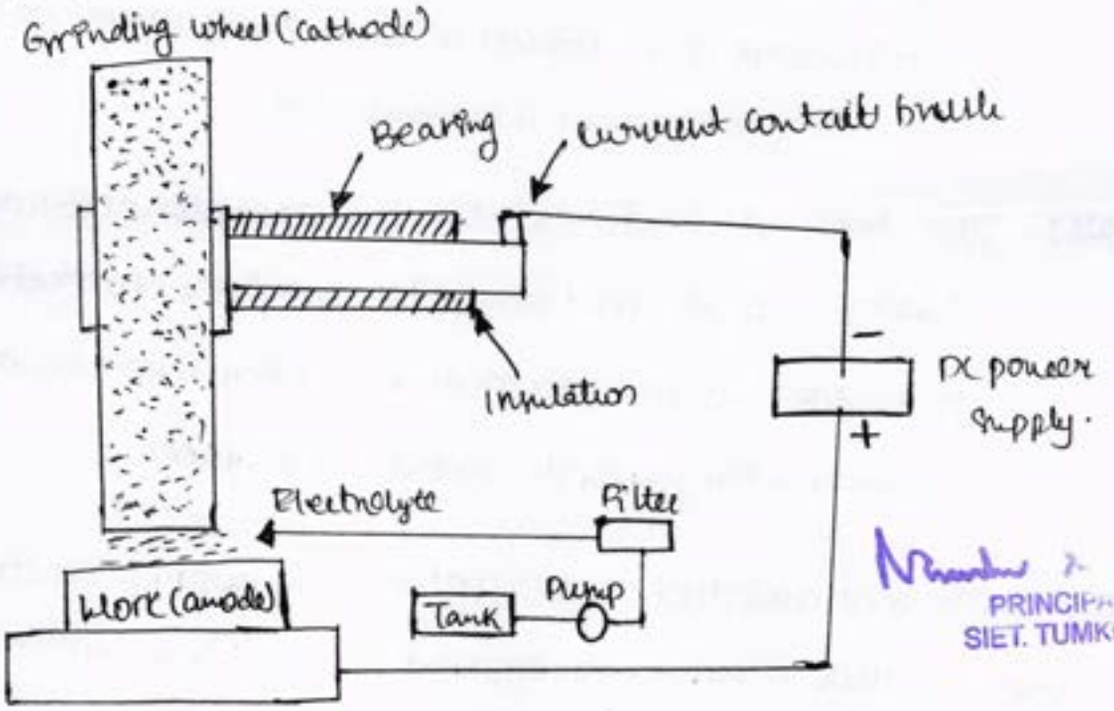
2A Internals

1) a) With a neat sketch explain electro chemical grinding (ECG) [8M]

Electro CHEMICAL GRINDING:- also called as electrolytic grinding is a variation process of the basic electro chemical machining (ECM), wherein, material effect of electrochemical process and the mechanical action of the abrasive particles (grinding) on the workmaterial



ECG PROCESS

The process of a metallic grinding wheel which is embeaded with insulating abrasive particle such as aluminium oxide or diamond set in a conducting binding material. The grinding wheel acts as a cathode, while a workpiece, the anode. The electrolyte, usually sodium nitrate in water is supplied through a nozzle on to the grinding wheel near the workpiece such that the wheel carries it through the cutting process thereby resulting in an electrochemical action. Contact wire brushes are used on the spindle of the grinder to supply current into the spindle from which it then flows to the grinding wheel.

When a DC voltage of about 5-15V is applied between the workpiece and the grinding wheel, suitable current densities are created, removing material

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removing material from the work surfaces by electrochemical action coupled with the abrasive action of the grinding wheel. Nearly about 10-1 of the volume of electro chemical action. The workpiece metal goes into solution as metal ions (anodic dissolution), and bubbles of hydrogen are generated at the wheel.

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1)b) [8M]

Explain various process characteristics in ECM.

Current density:- current density is simply in the current density. If the feed rate is increased, the electrical resistance of the tool-work gap reduces to allow more current to flow resulting in high metal removal rates.

Tool feed rate:- The tool feed rate is directly proportional to current density. If the feed rate is increased, the electrical resistance of the tool - work gap reduces to allow more current to flow resulting in high metal removes rate.

Gap between workpiece and tool:- The tool and the workpiece are positioned as close together to encourage efficient electrical transmission.

Velocity of electrolyte flow:- Electrolyte flow may be between 15-60 ml/s. If electrolyte flow is too low, the heat and by products of the electrolytic reaction build in the gap causing non-uniform metal removal.

Type of electrolyte, its Concentration & temperature:- The type of electrolyte selected depends on the tool and the workpiece material. Potassium sodium chloride is cheap and possesses good conductivity.

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1)c) [4M]

Discuss different applications of ECM.

There are different application of ECMare;

Industrial sectors utilizing ECM technology include tool and die making industries

- automotive
- aerospace
- Power generation
- oil and gas industries.

Specifies application of ECM include turning complex three dimensional surfaces, deburring includes

- grinding
- honing
- cutting-off
- die-sinking
- profiling
- trepanning
- broaching
- multiple hole drilling

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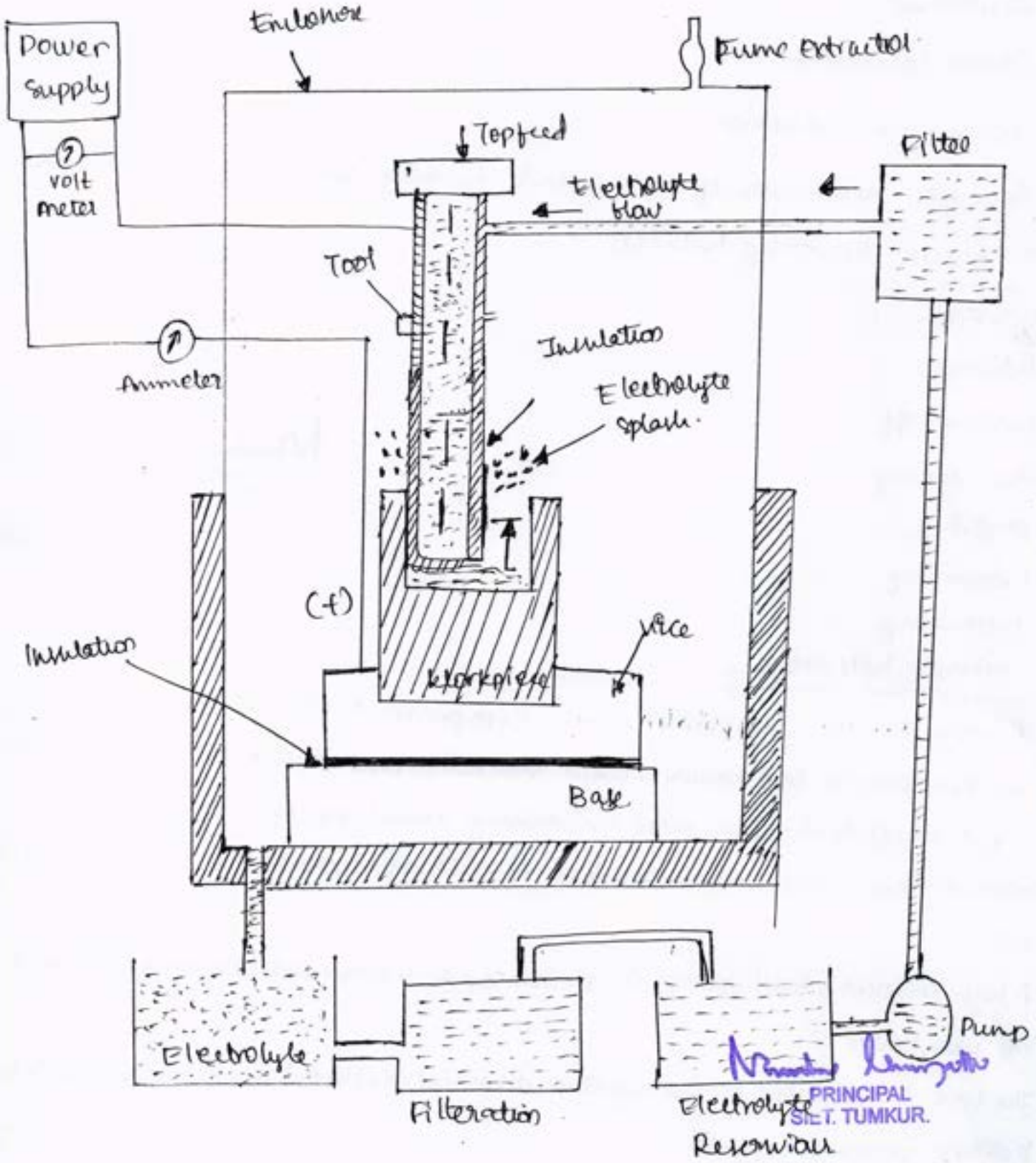
Briefly ..... explain ECM process. Explain the elements of ECM. [10M]

In Operation, the tool having a shape, similar to that ~~desired~~ in the workpiece is fed towards the workpiece maintaining a small gap of approximately 0.25mm between them. This is accomplished by utilizing a servo-drive on the tool feed axis.

A high-current, low-voltage DC-power supply is connected between the tool and the workpiece.

The tool is connected to the negative terminal (cathode) and the workpiece to the positive terminal (anode).

The electrolyte is pumped at a high pressure through the small gap between the workpiece, thus providing the necessary path for electrolyte. When the current is passed dissolution of the workpiece (anode) occurs. Meanwhile, the flowing electrolyte washes the metal ions away from the work piece (anode) occurs.



8) What are the functions of electrolyte? Mention any two electrolytes used in ECM? [10M]

Electrolytes in Electrochemical Machining (ECM) serve several functions including providing a conductive medium for the electrochemical reactions, aiding in the removal of material from the workpiece, and cooling the machining area.

They also help maintain a stable electrical circuit and control the machining process.

The two commonly electrolytes in ECM are

Sodium chloride (NaCl)

Sodium nitrate ($NaNO_3$)

Sodium chloride (NaCl):- Sodium chloride is used for ECM of steel and other ferrous materials.

Sodium Nitrate ($NaNO_3$):- Sodium Nitrate is often used for machining non-ferrous metal like aluminium and its alloys

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9) Explain the sequence of operation in chemical machining process [10M]

The sequence of operation in the chemical machining process typically involves the following steps:

Cleaning and preparation

Masking

Application of Resist

Exposure of chemical Etchant

Monitoring and Control

Rinsing and Cleaning

Removal of Masking or Resist

Finishing Steps

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Cleaning and preparation: The workpiece is thoroughly cleaned to remove any contaminants, oil or dirt that could interfere with chemical machining process.

Masking :- Certain areas of the workpiece that need to be protected from chemical attack are covered with a masking material such as tape or a special material.

Application Of Resist:- In some cases, a resist material is applied to the areas that need to be protected from chemical etching.

Exposure to Chemical Etchant:- The workpiece is immersed in or exposed to a chemical etchant solution that selectively removes material from the exposed areas.

Monitoring and Control:- During the etching process, various parameters are monitored and controlled such as temperature, concentration of the etchant.

Rising and Cleaning:- After the desired material removal is achieved, the workpiece is removed from the etchant solution and thoroughly rinsed to remove any residual etchant.

Removal of Masking or Resist:- If masking materials or resists were applied, they are removed at that stage.

Inspection:- The final etched workpiece is inspected to ensure that the desired dimensions, tolerances, and surface quality have been achieved.

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List factors to be considered in the selection of Electron in chemical machining. [10M]

The selection of Electron in chemical machining are:

Material Compatibility

Etch Rate

Selectivity

Environmental impact

Safety

Availability and cost

Temperature and Concentration

Etching Uniformity

Surface Finish

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Material Compatibility: The etchant should be compatible with the material being processed.

Etch Rate: The etchant's etch rate, or the speed at which it removes material, should match the desired machining rate.

Selectivity: The etchant should selectively attack the material to be removed without significantly affecting the masking or resist materials used to protect other areas.

Environmental Impact: Consider the environmental impact of the etchant. Some etchants may contain hazardous or toxic chemicals that require careful handling.

Safety:- Safety is paramount. The chosen etchant should have minimal health and safety risks to operators. It should be handled and stored safely.

Availability and Cost: The etchant should be readily available in the required quantities and at a reasonable cost

Temperature and Concentration:- The etchant's performance can be influenced by temperature and concentration.

Etching Uniformity:- The etchant should provide uniform etching across the workpiece surface to achieve consistent material removal

Surface Finish:- The etchant should yield the desired surface finish after machining.

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Shridevi Institute of Engineering and Technology, Tumkur – 06

VI Semester : III Internal Assessment Test: JULY 2023

Department of Mechanical Engineering

18ME641 – NON TRADITIONAL MACHINING

Time: 90 Min] [Max. Marks: 40

Note: *Answer TWO full questions*

Sl No		Marks	CO
1a)	Explain the mechanism of metal removal in PAM	10M	CO4
b)	With the help of a neat sketch, explain working principle of EDM process	10M	CO4
2a)	With a sketch , explain the principle of EBM	10M	CO5
b)	Comment on the parameters influencing MRR in EBM	10M	CO5
3a)	With a neat sketch , explain the mechanism of metal removal in LBM process	10M	CO5
b)	Explain the thermal features and analysis of the LBM	10M	CO5

[Faculty]

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3rd Internal

1a)
Explain the mechanism of metal removal in PAM. [10 M]

Metal removing in plasma machining is basically due to high temperature produced in the workpiece material. The heating phenomenon that takes place at the workpiece is a combination of anodic heating.

Due to direct electron bombardment, and convection * heating from the high temperature plasma that accompanies the arc:

The resulting heat is sufficient to raise the temperature of the workpiece material above its melting point, and the flowing high velocity gas stream effectively blows the molten metal away resulting in metal removal to take place.

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1) b) [10 M]
With the help of a neat sketch, explain working principle of EDM process.

Initially the gap between the tool & the workpiece which consists of the dielectric fluid, is not conductive. But, under the pulsed application of DC, the dielectric fluid in the gap is ionized, causing the spark to discharge or jump between tool & the workpiece as shown in fig.

The spark impinges on the elevated surface of the workpiece at a very high temperature of around 10,000°C causing a small portion of the workpiece to melt and / or vaporize as shown in figure.

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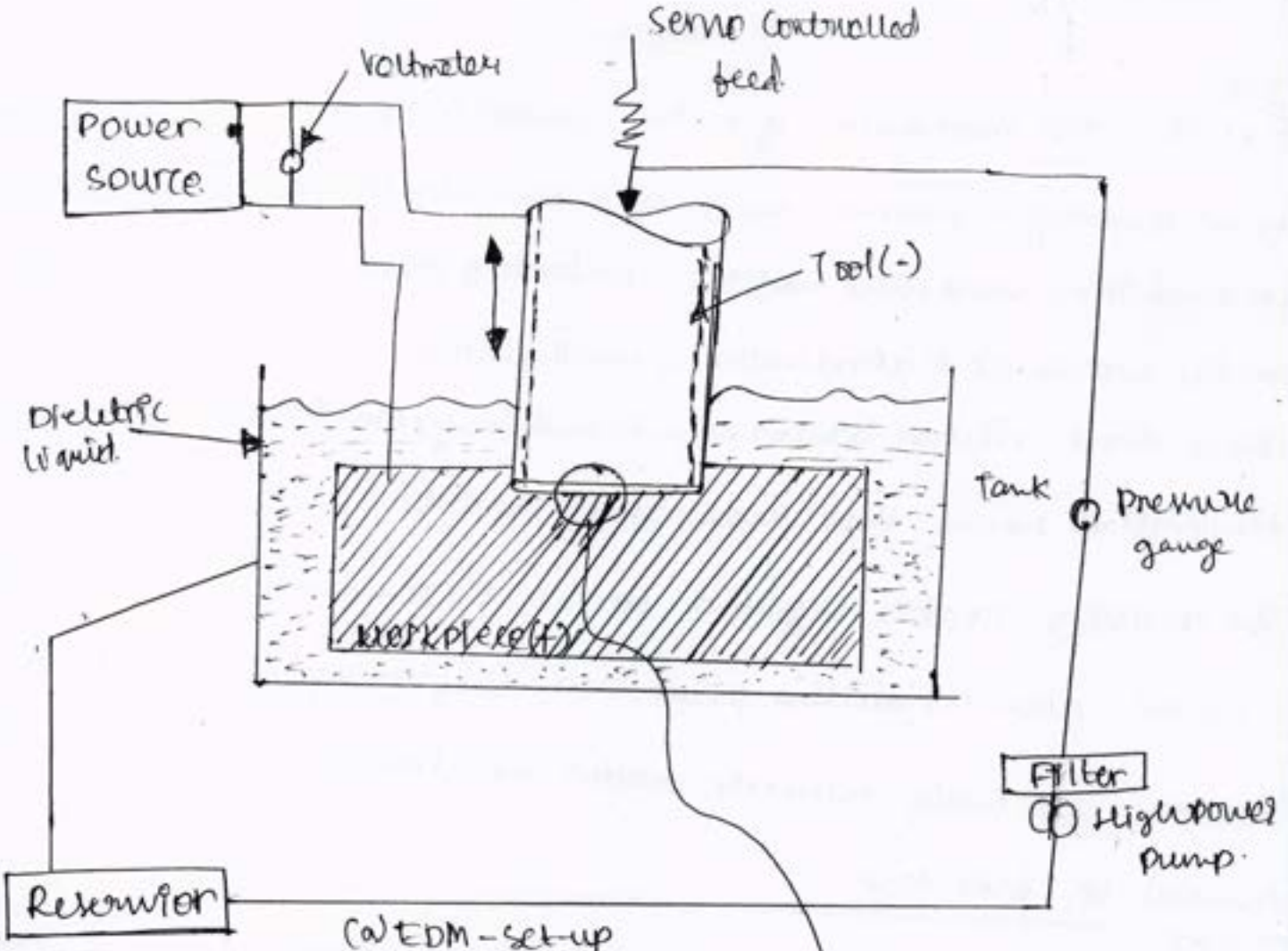
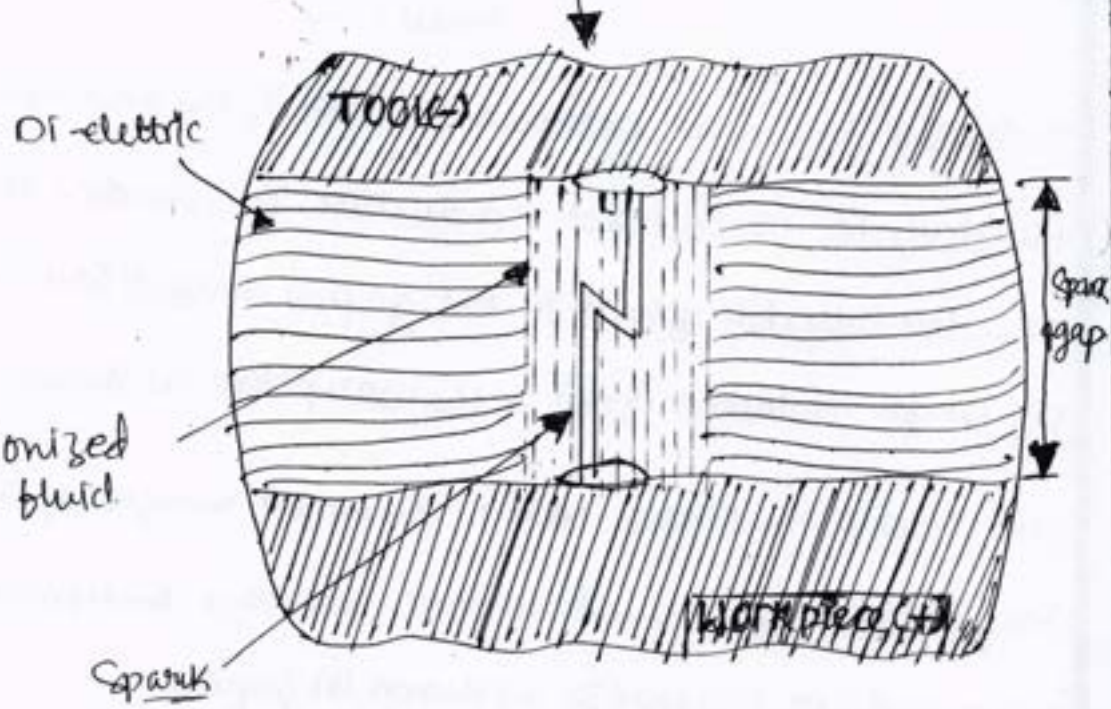


(a) EDM - set-up



Enlarged view of metal removal mechanism.

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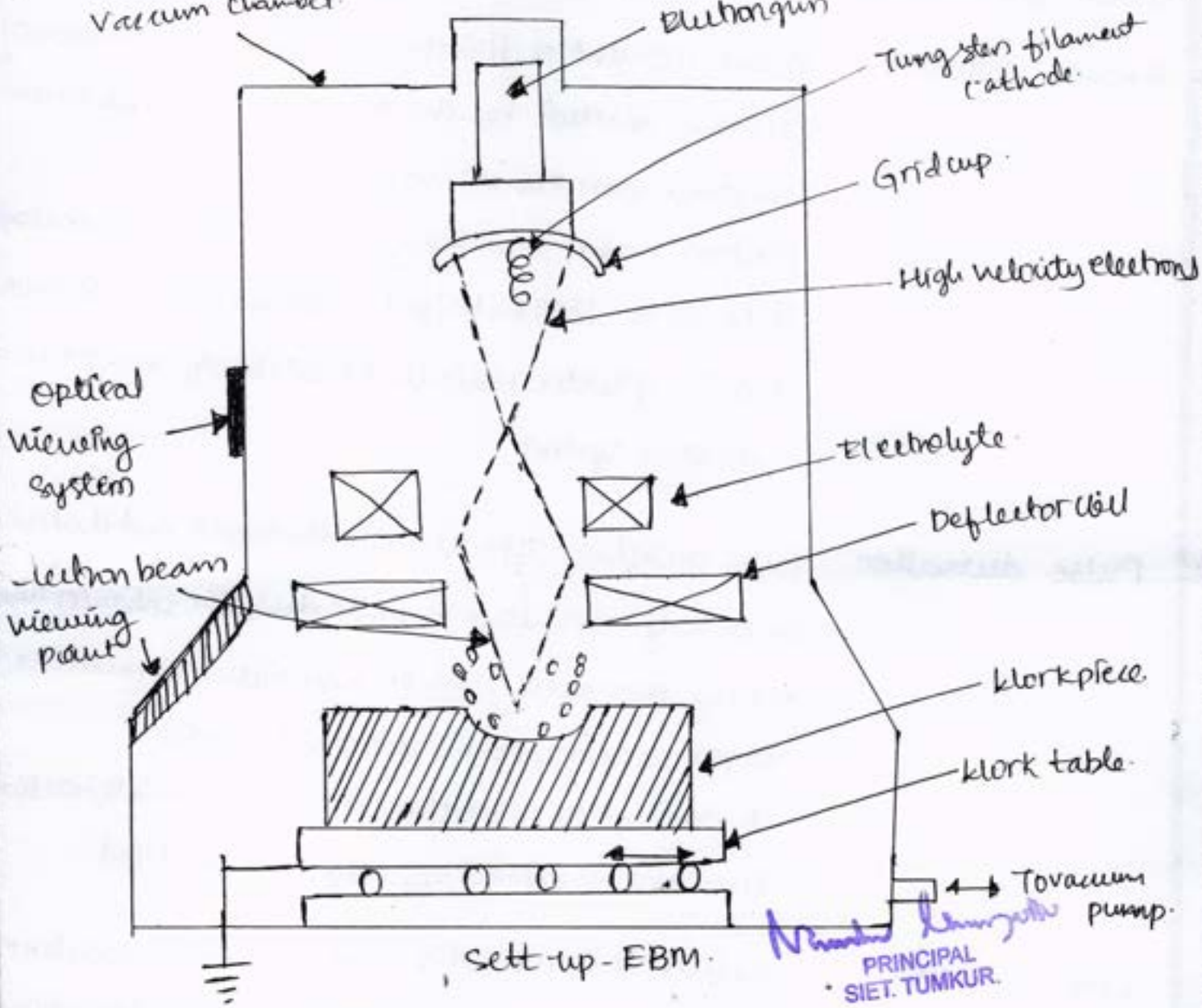
2)a With a sketch, explain the principle of EBM [10M]



Set-up - EBM

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Mechanism of Metal Removal:

In electron beam machining, the electrons impinge on the work surface with velocities exceeding one-half of the speed of light, their kinetic energy is transformed into thermal energy (heat energy). The way in which the focused beam penetrates the work piece is still not completely understood owing to the complexity of the mechanism involved. However it has been justified that the workpiece surface is melted by a combination of electron pressure and surface tension. The melted liquid metal / liquid metal on the work surface is rapidly ejected and vaporized to effect material

2(b) Comment on the parameters influencing MRR in EBM.

Various parameters influencing MRR in EBM [10M]

a) Beam Current:- Beam current is directly related to the number of electrons emitted by the cathode. Beam current can range from 200 μA to 1 A.

Electron beam machining can generate pulse energies in excess of 120 Joules/pulse, a value which is 200 to 400% greater than that available in laser drilling systems.

b) Pulse duration:- Pulse duration affects both the depth and the diameter of the hole. Increase in pulse duration enhances the energy per pulse. High energy pulses can machine larger and deeper holes in thick plates.

Shorter pulse duration will allow less interaction time for thermal effects to materialized.

c) Lens Current:- Lens current is used as the parameter to determine the working distance between the focal point and the electron beam gun.

The diameter of the focused beam spot dictates the diameter of the hole produced.

A higher power density results in increased energy per pulse, however the spot size is smaller.

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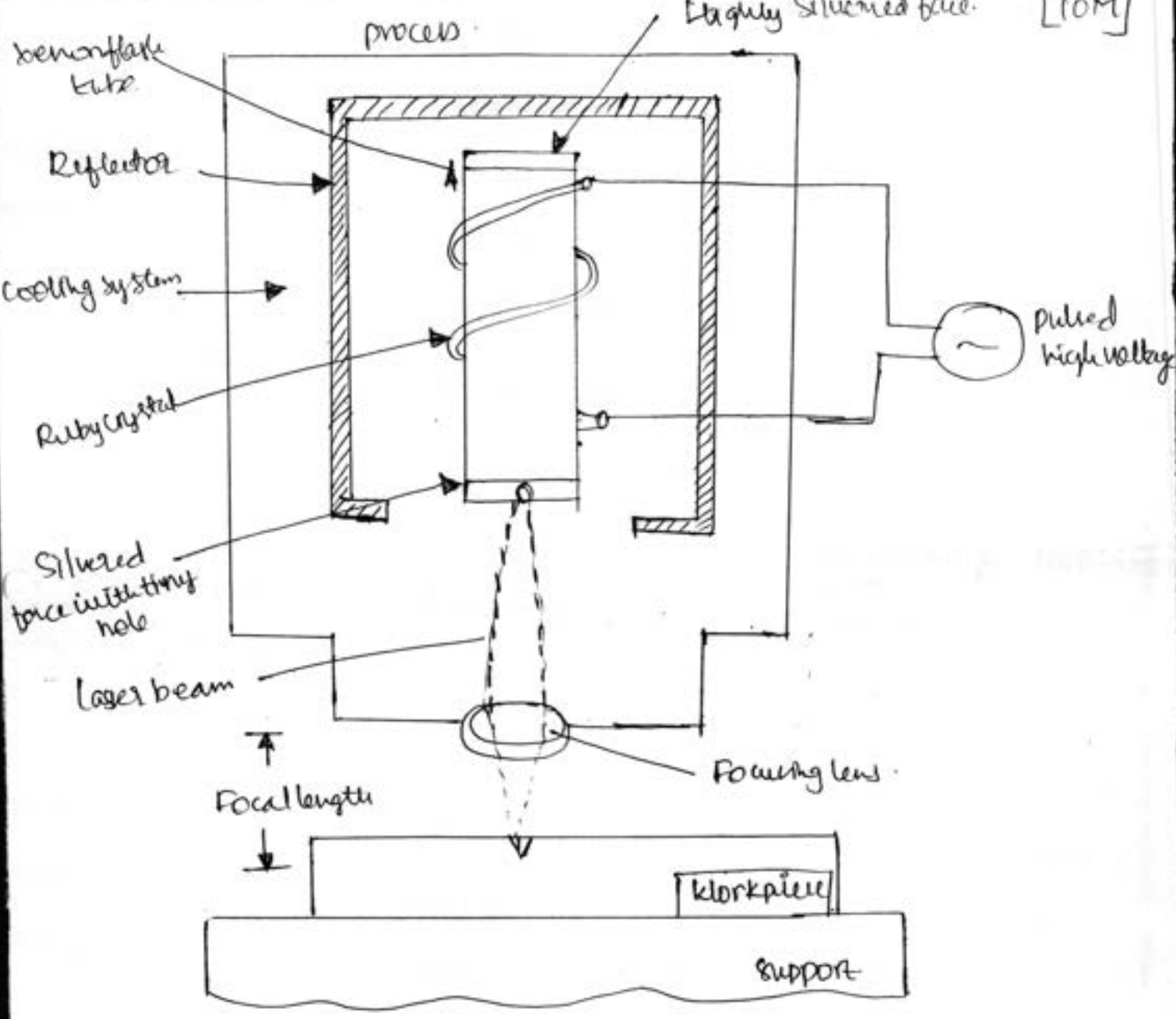
3(a) Write a neat sketch, explain the mechanism of metal removal in LBM process. [10M]



Mechanism of Metal Removal:-

Metal removal by a laser beam is achieved through a combination of melting and evaporation, although with some carbon based materials and certain ceramics, the mechanism is purely one of evaporation. When a high energy density laser beam is focused on a small workpiece, the thermal energy is absorbed, which heats and transforms the work volume into a volume of high pressure molten, vaporized state that can easily be removed by the flow of high pressure assisted gas jet, which accelerates the transformed material and ejects it from the machining zone.

3(b) Explain the thermal features and analysis of the LBM. [10M]

The thermal features of LBM.

1) Apart of the incident beam energy gets reflected and remains untraced. This reflected energy can increase incase of highly reflective metal surfaces (smooth surface). Hence, it is important that the work surface should not reflect back too much of the incident energy. This can be achieved by modification of surface condition of the workpiece material.

2) Most of the incident energy gets absorbed and propogates into the work metal raising the surface temperature to molten state and leading to instantaneous vapourization. Absorption is found to take place at depths less than 1μm

3) A very small part of the energy is conducted into the un-melted work material. However the conduction of this heat energy is extremely effect and hence no adequate theory of heat conduction has yet been applied.

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Shridevi Institute of Engineering and Technology, Tumkur – 06
Department of Mechanical Engineering
VIII Semester: I - Internal Assessment Test: 20/03/2023
18ME824 – Automobile Engineering

Time: 90min **Note: 1. Answer any two full questions** Max marks: 40

1. a) with a neat sketch explain the components of IC engine (08 marks)
   b) Briefly explain V type engine (06 marks)
   c) Briefly explain valve timing diagram for 4 stroke petrol engine (06 marks)

2. a) Explain connecting rod with a neat sketch (08 marks)
   b) Explain overhead cam shaft mechanism (08 marks)
   c)) Write the difference between SI engine and CI engine (04 marks)

3. a) With a neat sketch explain dry liner and wet liner (10 marks)
   b) Explain with sketch any two types of SI engine Chamber design (10 marks)

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
Department of Mechanical Engineering
VIII Semester: II- Internal Test: April 2023
18ME824 – Automobile Engineering

Time: 90 Minutes] [Max Marks: 40

Note: 1. Answer any 2 full questions

1.	a) With a neat sketch explain the working of Radiator	**(08marks)**C02
	b) With a neat sketch explain the functions of a propeller shaft	**(06marks)** C03
	c) Explain briefly Universal joint system	**(06marks)** CO3
2.	a) Explain Briefly the requirement of a good lubricant	**(10 marks)** CO3
	b) Explain with neat sketch the working of Hotchkiss drive system	**(10 marks)** C04
3.	a) With a neat sketch explain planetary type of transmission system	**(10marks)** CO4
	b) With a neat sketch explain the differential mechanism	**(10 marks)** C03

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
Department of Mechanical Engineering
VIII Semester: III- Internal Test: May 2023
18ME824 – Automobile Engineering

Time: 90 Minutes] [Max Marks: 40

Note: 1. Answer any 2 full questions

1. a) Draw a neat sketch of general layout of power transmission & explain the working of each components briefly **(10marks)**C02
   b) What is the function of differential & explain its operation with neat diagram **(10marks)**C03

2. a) with a neat sketch ,explain the exhaust gas recirculation system(EGR) **(10 marks)** CO3
   b) Explain the construction and working of catalytic converter **(10 marks)** C04

3. a) With a neat sketch explain the hotch Kiss drive **(10marks)** CO4
   b) With a note on controlling the air fuel mixture. Name the various pollutants and discuss their ill effects on human body **(10 marks)** C03

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I A Test - 01

18ME824 : Automobile Engineering -

1a. with a neat Sketch Explain the components of IC Engine

Sol :- The components of IC Engine are as follows :-

1. Cylinder
2. piston
3. Connecting rod
4. Crank - Shaft
5. Valves and Valve actuating mechanism.

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Cylinder : The Cylinder is an mainbody of an Engine. in which piston reciprocates to develop the power.

It has to with stand very high - pressure and high temp - perature around 2800°C.

A cylinder block and crankcase are made integral then the construction is called 'Monoblock'

The cylinder material should be such that it Sho - uld retain strength at high temperature, should be good conductar of heat and should.

Piston : The piston is a reciprocating part of the Engine and converts the combustion pressure in the cylinder to a force on the crankshaft

→ pistons are slightly smaller in diameter than cylinder bore

→ The space is provided b/w piston and cylinder wall is called.

→ it's mad of Al alloy, caststeel, CI or chromium Nickel.

Connecting Rod:

Connecting rods are used to Connect pistons to the Cran Crankshaft.

→ Upper end of rod Oscillates while lower / bigger end rotates.

→ It converts reciprocating motion of the piston into r -tary motion of the Crank-shaft.

Crank-shaft:

Crank Shaft provides a constant turning force to the wheels It receives power from connecting rod and Subsequently transmits to the wheels.

→ It is made of alloy steel or cast-Iron

Valves: The valves are plugs with long stem that open and close the ports in the cylinder head

* Each Engine Cylinder has 2 valves i.e Inlet valve and Exhaust valve howevere, some Special racing Engine have 4 valves per Cylinder.

Valve-actuating mechanism: The valves located in the Cylinder head are operated by an Eccentric prosection Caused Cam. which is driven at half the crank-Shaf Speed.

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1b. Briefly explain V type engine.

Sol: In this type, two Cylinders are placed with their axes at 60°.

→ The Cylinder-arms are arranged to form a letter 'V' with a common Crank Case and Crank-shaft.

→ It is more compact and rigid hence runs more smoothly at high speed.

V-type engine is also termed as a Vee engine which has a common configuration for internal combustion Engines. The configuration of a V engine consists of two cylinders in each and every bank which are inter connected to a common crankshaft. The cylinder banks are particularly arranged at an angle to each other to form a V shape from the I axis whenever viewed from the front of an engine

The V-engines are found having a shorter length as compared to any other Engines and specifically compared to inline engines whereas the trade-off is off a larger width.

1c. Briefly explain valve timing diagram for 4 stroke petrol engine.

Sol: Valve-Timing refers to when the valves open and close in Relation to piston position.

→ when a valve open or close how fast it will rise, how fast it will close depends upon the shape of Camlobe and position of cam-shaft in relation to Crank-shaft.

→ The exact no of degree of valve open or close before TDC or BDC depends on Engine design

→ The diagram shows the Crank position when various operations like suction compression etc.

Valve timing diagram :-

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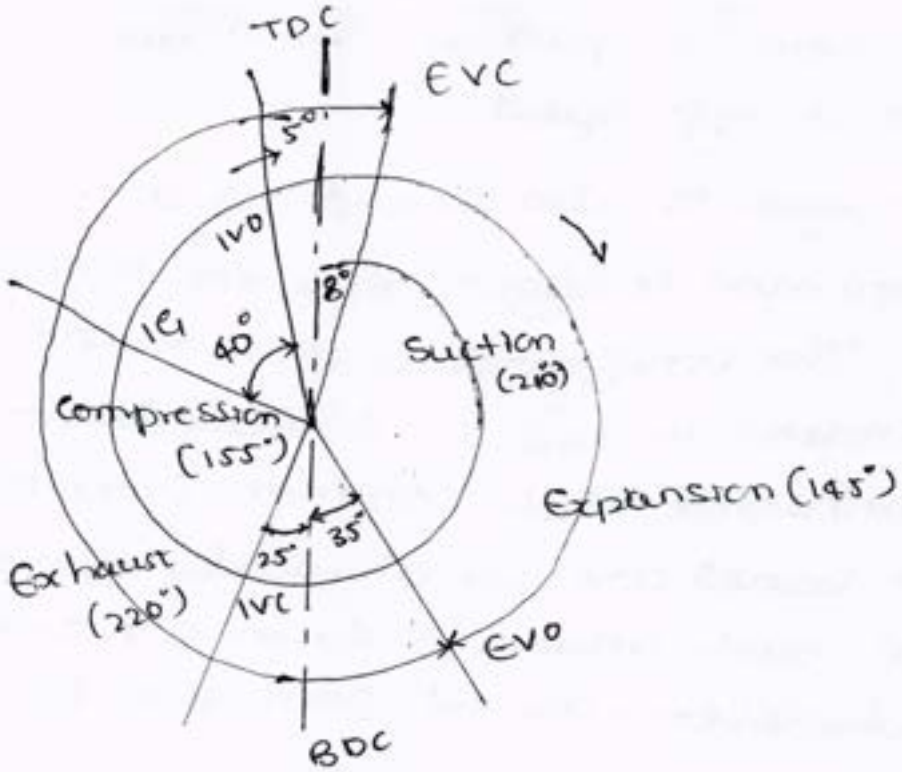

2a. Explain Connecting ~~end~~ rod with a neat sketch

Sol: Connecting Rod:

Connecting rods are used to connect pistons to the Crankshaft.

→ Upper end of rod Oscillates while lower / bigger end rotates.

→ It converts reciprocating motion of the piston into rotary motion of the crank-shaft.

In the connecting rod

* Upper end has a hole through it for the piston-pin.
* lower end must be a split-type
* A combination of axial and bending stresses act on the rod

→ Connecting rod are manufactured by casting of forging process.

→ The rod has an I-beam C/s to provide maximum rigidity with minimum weight

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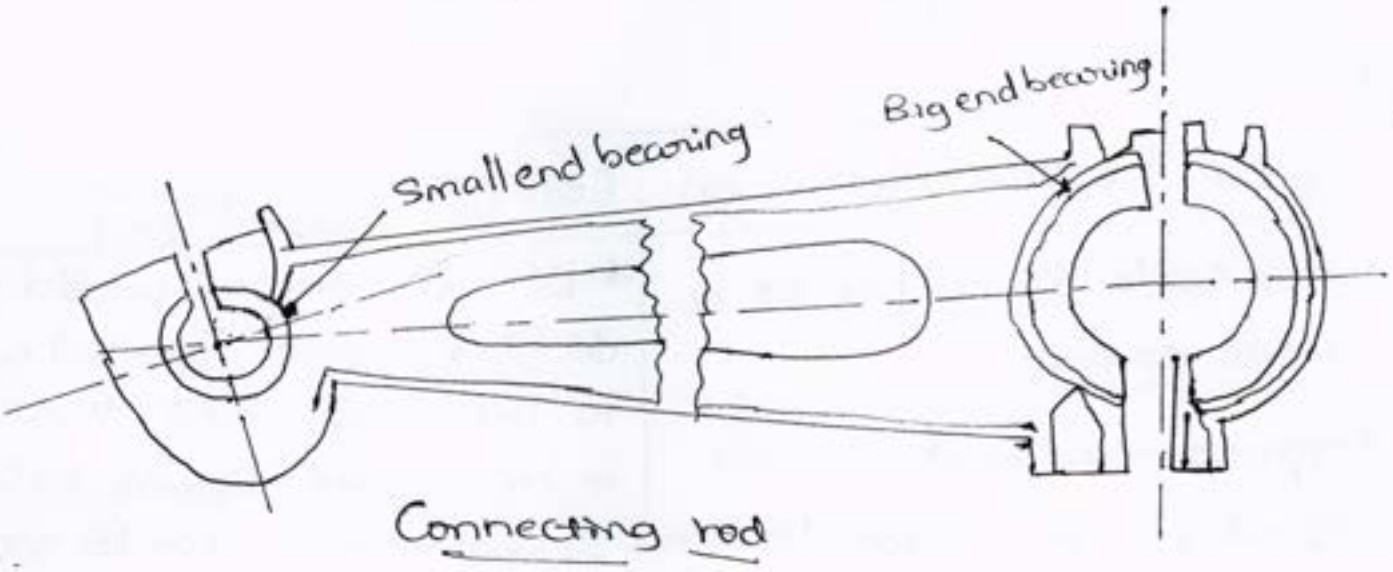

2. Explain overhead Cam shaft mechanism

Sol: An Overhead Cam Shaft Engine is a type of Pist
-n engine in which the camshaft is located in the
Cylinder head above the combustion chamber. This
Contrasts with Earlier Overhead valve Engines,
where the camshaft is located below the combusti
-on Chamber in the Engine.

This mechanisms suitable for I and F head
ingine

The Cam operater the value lifter which intern
actuater the push rod.

This action rotates the racker arm about the
Shaft or a ball Joint design to push down on
the value stem to open the valve.

advantages are as follows:

higher volumetric efficiency

leaner air-fuel mixture can be burnt

~~leaner~~ higher compressions can be used.

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2c. write the difference between SI engine and CI engine.

Sol:

Spark Ignition Engine (SI)	Compression Ignition Engine (CI)
* Otto cycle is employed in petrol engine	* Diesel Engines works on diesel cycle. Diesel cycle is less efficient than
* operating speed is more Speed range is 3000 to 6000rpm	* operating speed is less Speed range 400 to 3500 rpm
* starting is easy, since cranking effort required is less.	* starting is difficult since more cranking effort is required.
* merits: Initial cost & maintenance cost are less	* Demerits: More initial and maintenance costs since the construction is heavy and study
* produces less noise	* produces more noise
* weight per unit power is less	* weight per unit power is more
* Specific fuel consumption is more	* specific fuel consumption is less.
* The fuel used is petrol	* fuel used is diesel

3a. with a neat Sketch Explain dry linear and wet line

Sol: Dry - liner:

* Dry liners are made in the form of barrel and flange is provided at the top which keeps the liner into its position.

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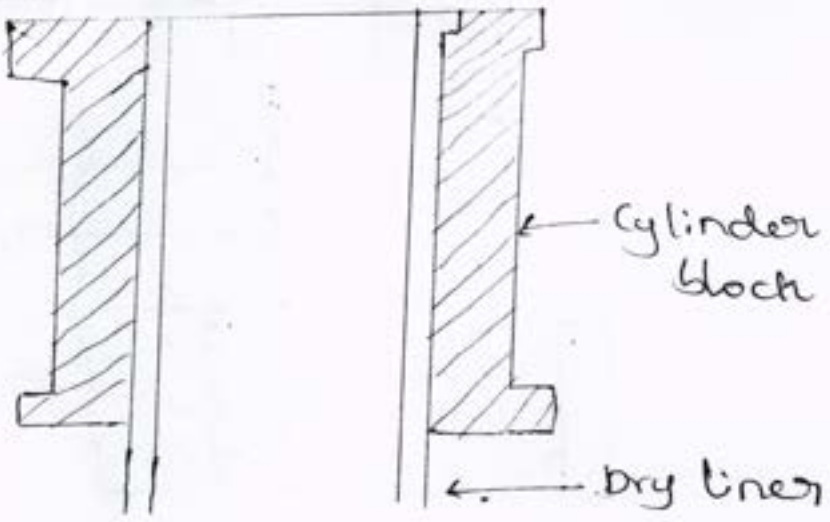

→ Dry liners are quite thin & uses metal block to give its full length support.

→ Outer surface of the liner maker contact with the cylinder block.

→ It's neccessary to machine the liner surface accurately both from inside & outside.

Wet - liners:

wet-liners are pressed into cylinder bre and it's supported at the top and bottom.

→ wet liners make direct contact with cooking water on the outside hence does not requires accurate machining on the entire outer surface.

→ A flange is provided at the top which fits into the groove in the cylinder block.

→ Three grooves are provided at the bottom. middle one is empty and top & bottom groove are inserted with rubbers packings.

→ For water leakage, drainage arrangements are provided from the middle groove.

→ Sometimes wetliners coated with Al on the outside to make the surface corrosion resistant

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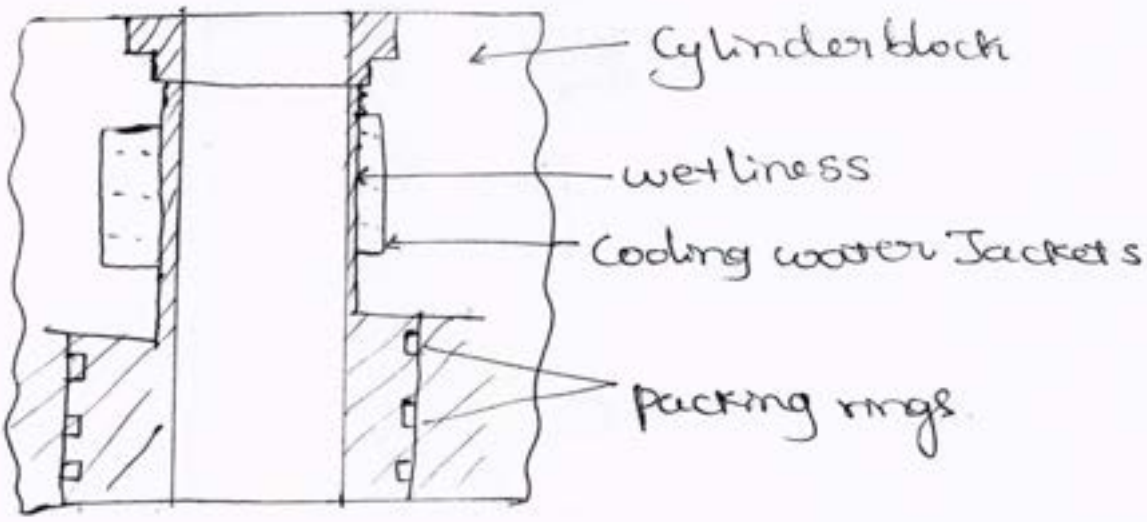
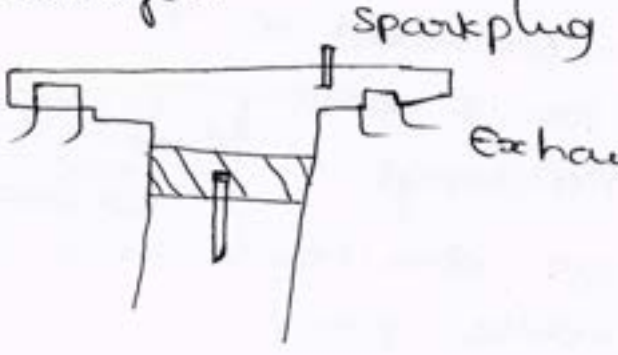


3b. Explain with sketch any two types of SI engine Chamber design.

Sol: T-head Type:-

Check out t-head d-type of the combustion Chamber for the spark ignition Engines. As you can see there will be two valves on each side and a Spark plug from the top side. This type of Combustion chambers was used in early stages of the Engine development. In this type Knocking tends is more because of the distance across the Combustion chamber is long. There is need of two Cam Shafts for the two valves which is another disadvantages.



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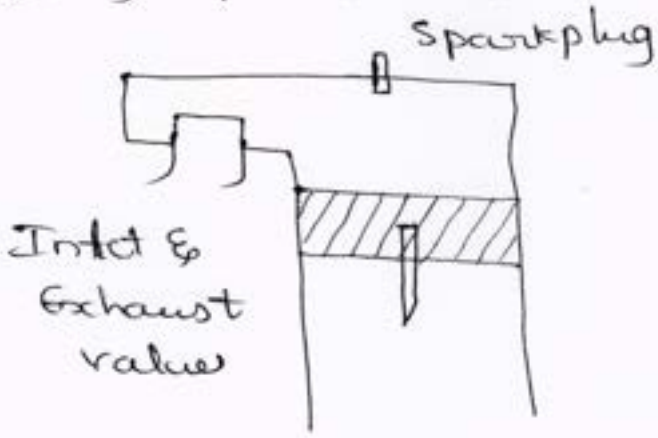
L- Head type: As you can see one of disadvantage in t-head is having two values on either side which

needs two camshafts to operate them. bringing this both on one side solves the problem. In L-type you can see both the Inlet & Exhaust valve one at one side & operated by the same camshaft.



The head design will be helpfull to create the turb-ulence for the charge to keep the velocity for Improo-ving the combustion process.

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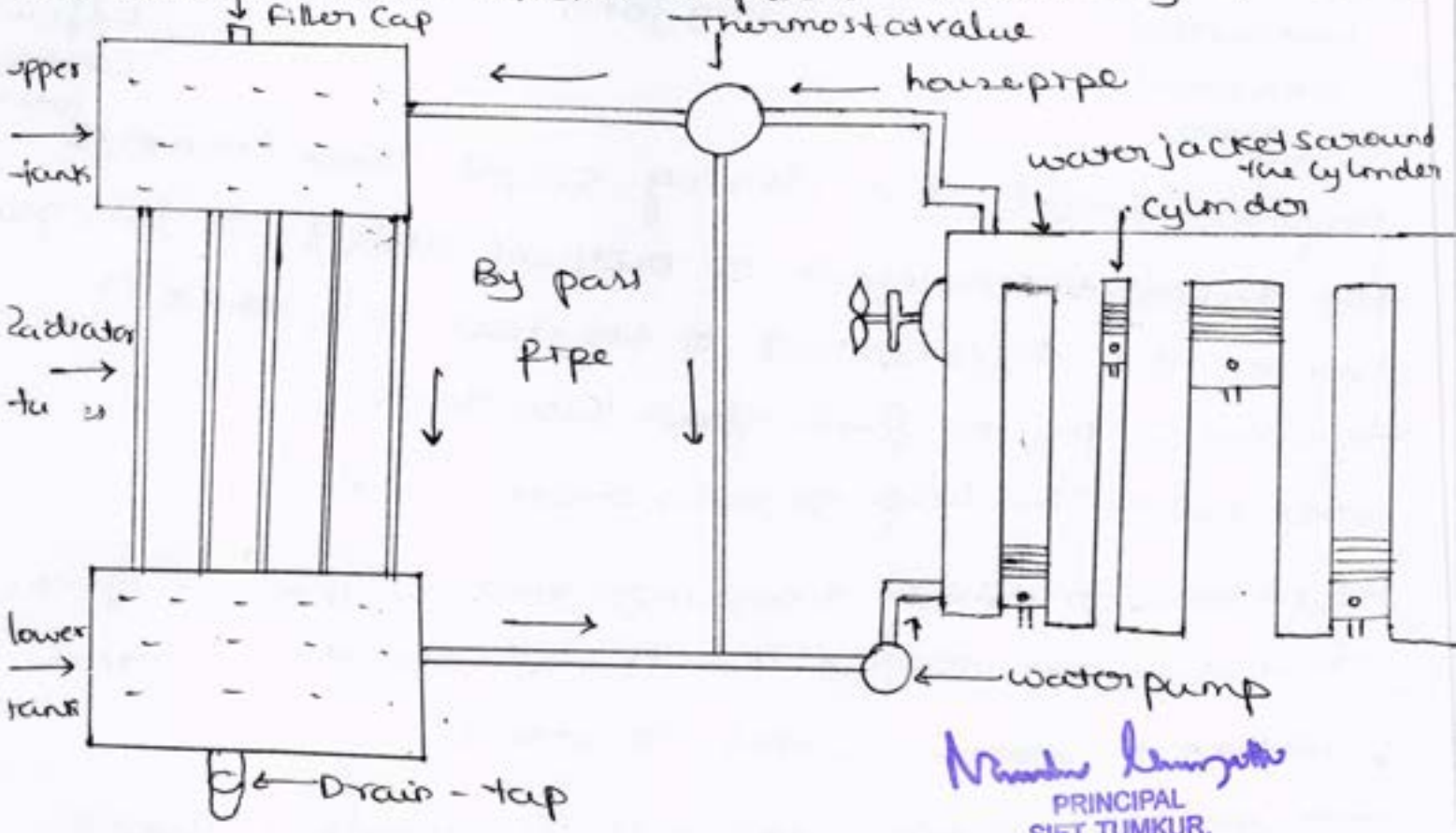
I A - 08

18ME824 - Automobile Engineering

1a With a neat Sketch Explain the working of Radiator



Radiator is a heat Exchanger.

→ The hot Coolant from Engine Enters to the top of tank of the radiator and passes through the Core to the bottom tank of the radiator.

→ Cool atmospheric is drawn over the Core by the cooling fan leading to cooling of radiator.

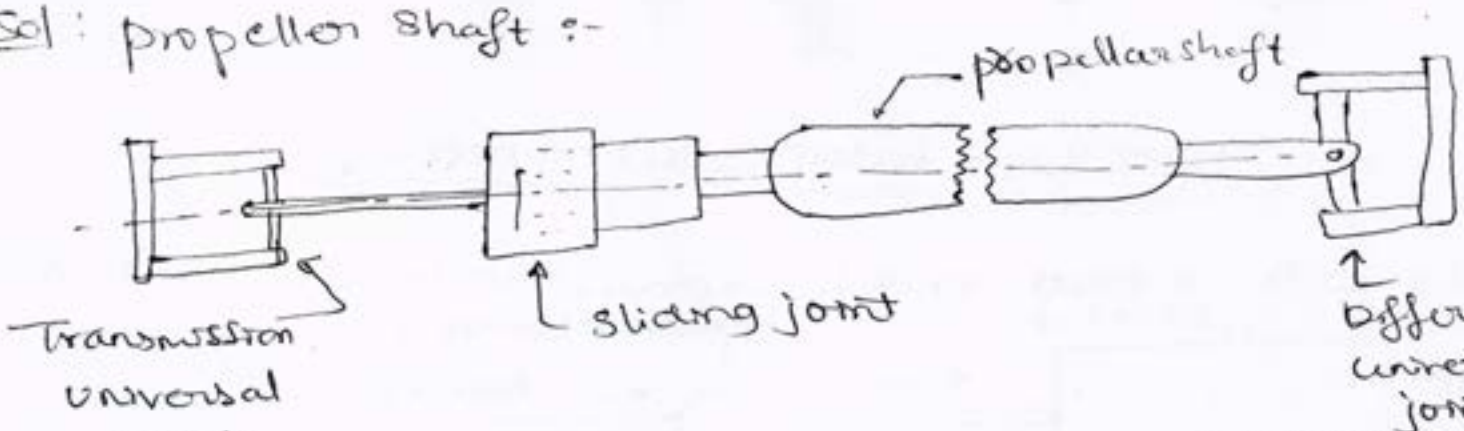
water.

a) Down - flow type - water passes top tank to bottom
- tank in a down ward direction

b) Cross - flow type - water passes from left to right
- across the radiator.

1b. With a neat Sketch Explain the function of a propeller shaft.

Sol: propellor shaft :-



propellar shaft is a driving shaft that connects the transmission main or output shaft of the gear box to the differential of the rear axle i.e it transmits power from gear box to rear axle with the help of universal joints.

→ Propeller shaft transmit rotary motion of the transmission output shaft to the differential causing rear-wheel to rotate

→ At high speeds, whirling of propellar shaft causes bending stresses in the material which is to be reduced.

→ propellar shaft has to operate at varied length and varied angles.

→ As the vehicles moves on the road irregularities there are jest & bumps which changes angle of driven b/w the propellar and transmission shaft this also changes the distance b/w transmission and differential.

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1C Explain briefly about Universal joint System.

Sol: Universal joint is the joints which enables the propellar shaft to transmits power at varied angles

i.e power is transmitted from gear box to the differ
-ential via the propellar shaft.

The gear box is connected to one end of the propellar
shaft by means of the universal joint of the prope
-ller shaft by means of another universal joints.

→ Universal joints are needs because the Rearen
of the propellar shaft is constantly rising &
falling due to surface irregularities.

→ Universal joint also allow the rear axle assembl
to Twist due to the drive & brake torque operat
-on.

→ universal joint. permits the torque transmissi
not only at angle and also while this angles
changing.

3a. Explain Briefly the requirement of good lubricant

Sol: i) viscosity: In simple language, the viscocity may be considered as the resistance of lubricant oil to flow. the viscosity of lubricating oil should be just sufficient to ensure hydrodynam lubrication. A higher value than this would be of no use since it will involve higher power losses due to the increased oil resistance.

ii) physical stability: The lubricating oil mu be stable physically at the lowest & the highest temperature encountered in practise there shall not be any separation of solids at the lower tem -rature & at higher temperatures should not vapourise beyound a certain limit.

iii) chemical stability:

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At higher temperature the oil should remain chem-
-cally stable. Their should not be any tendency for
Oxide formation many of oxidation products being
sticky substances clog the lines.

iv) Resistance against Corrosion:
The oil should be not have any tendency to corr
-de the pipe lines. Crank case and other Engine
parts with it comes into contact

v) Pour point:-
The minimum temperature at which the oil will
pour is called its pour point. obviously since the
oil will not be able to flow below the pour point, it
cannot be used below this temperature for
lubrication. Thus the pour point of the oil should
be less than the lowest temperatures encountered
in the Engine.

vi) Flash point: the flash point of the oil should b
sufficiently high so as to avoid flashing of oil
vapours at the temperture occuring in common use.
A flash point higher than the minimum desired
value will not serve any use for the purpose

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vii) Cleanliness: The oil should be sufficiently clean
and stable itself so that the Crank case and
oil lines core kept clean further, it must cont
agents called detergents, which remove the impu
-rties from the Engine parts during oil circulation.
These impurities may either be filtered out or remo
-d with the change of oil at periodic intervals.

viii) Resistance Against Extreme Pressure:

In modern automobile Engines. lubricating oil is subjected to very high pressure particularly in bearing and the value actuating mechanism. This would because the oil Cancling to the metal surface under high pressure better than the ~~off~~ other oils.

2b. Explain with neat sketch the working of Hotchkiss drive system.

→ The hotch kiss drive is most simple and widely used system. In this arrangement the springs besides taking weight of the body also takes the torque reaction driving thrust and side forces.

* It consists of an open propellar shaft secured to the transmission output shaft and differential pinion gear shaft.

* The propellar shaft is provide with two universal joints & sliding joint as shown in figure. The Springs are bolted to the axle casing.

* The front end of the spring is rigidly fixed to the frame, by shackle the rear end, is connected to the frame by swinging.

* Front half of the spring will transmit the driving thrust to the frame

* It is seen that, the axle casing cannot turn under the torque reaction without causing the spring to flex which is shown in figure

* The spring deflets as experences torques reaction and bevel pinion shaft changes its position

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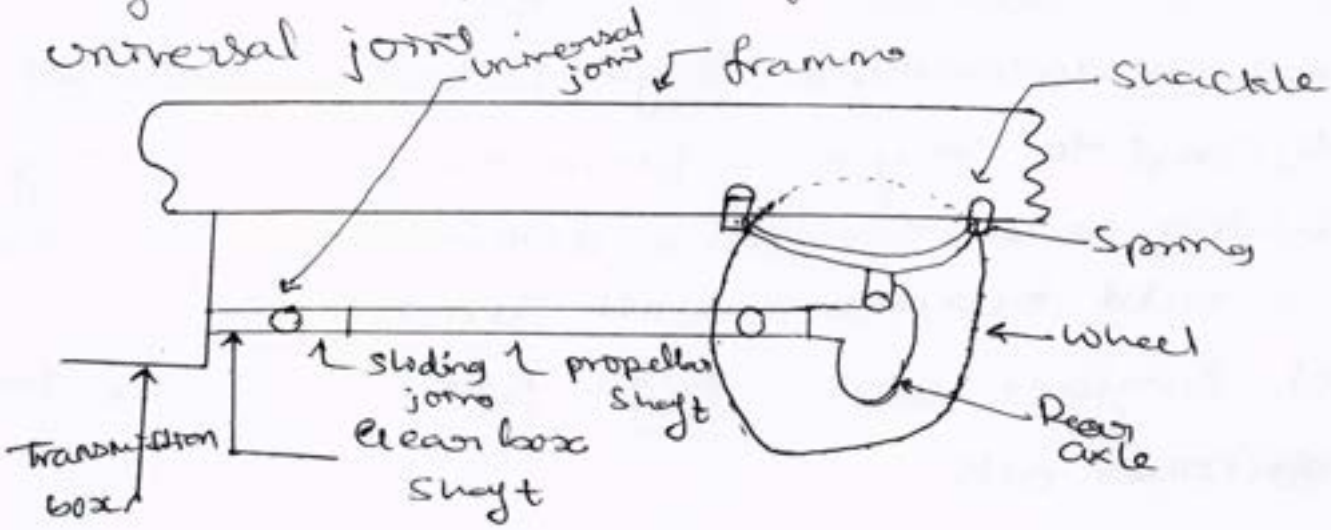
shaft will not pass through the centre of front universal joint



* Therefore, if there is no universal joint at the front & other at the rear end are used.
* again the rear axle moves up & down in a circle with the front spring support as the frame(O) as centre.
* since the two centres do not coincide

3a). with a neat sketch explain planetary transmission system.

Sol: planetary gear system.

This type of gear box uses no of sliding dog or gear to engage but different speeds are obtained by merely tighting brake bands on the gear drums.

* planetary gear set consist of a ring gear annular wheel, sun gear and planet gear with carriers.

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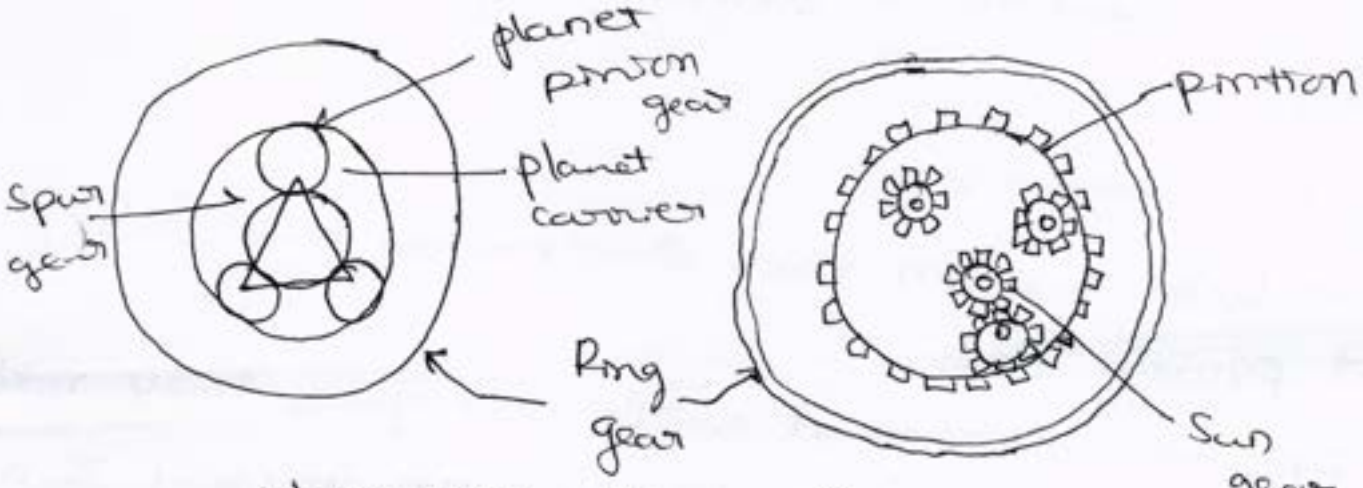
* In order to obtain different speeds any one of these unit can be held by means of brake bands

·Trapposite to direction.

* Reverse decreases :-

* hold the cage stationary and turn the sun gear to drive the ring gear in the reverse direction but slower than sungear



Planetary Gear System

3b. with a neat sketch explain the differential mechanism.

Sol: Differential Mechanism :-

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Differential is the mechanism by means of which outer wheel runs faster than inner wheel runs faster ~~than~~ as moving over upheaval road

* Differential is a part of the inner axle housing assembly which includes the differential road axles, wheel & bearing

* Differential consists of a system of gear arranged in such a way that connects the propller shaft with rear - axles

* the purpose of differential is to provide the relative movement to the two rear wheels when the vehicles taking a turn however torque

* The Sun gear is rotated by driving shaft from the Engine and moves along with Engine Crankshaft.
* Planet gear are in constant mesh with both the Sun gear and ring gear and free to rotate on their axes carried by coarier frame which in turn connected to the driven shaft.

working :-

* Speed increases :-
If we held the Sun gear stationary and turn the planet pinion cage.
* As pinions are meshed with sun gear they rotate on their shafts and walleround stationary Sun gear.
* Speed decreases :-
* Hold the ringgear stationary and turn the planet pinion cage to drive sungear.
* Speed decreases :-
* planet pinion cage rotates at lesser speed than the sun gear applied
* Assume ring gear stationary and turn sun gear to rotate planet pinion their shafts

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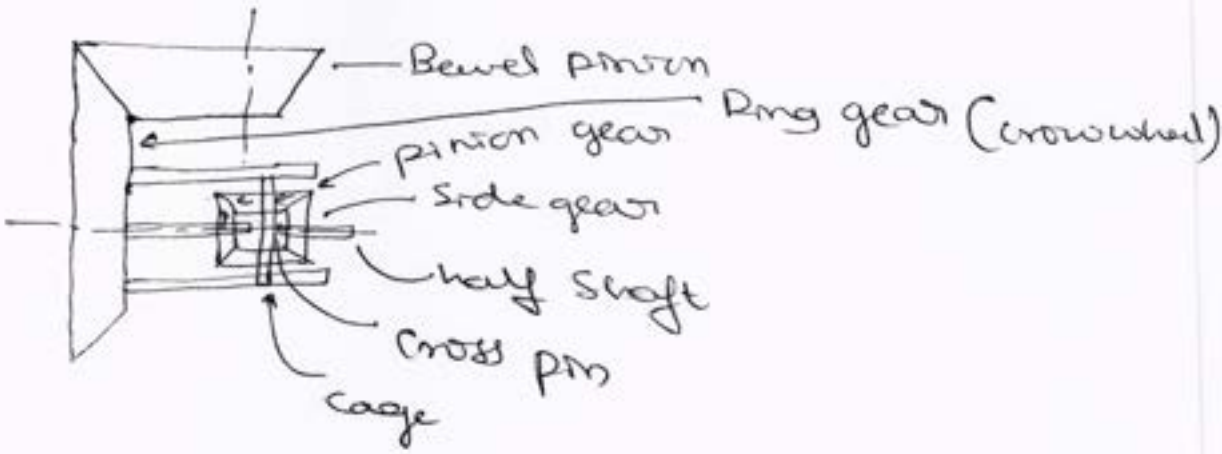
* Reverse Increases :-
* Keep the planet pinion cage stationary and turn the Ring gear.
* we get reverse rotation of the system, sun gear faster than ring-gear
* ie ring gear is driving & sungear is driven.

- transmitted to each wheel is always equal.

Construction :-



* It consist of a bevel pinion attached to the shaft which is coupled to the propellar shaft
* A crown wheel or ring gear which is bolted to the differential cage. is in mesh with the level pinion
* The cage coaver a cross pin or spider to support two differential pinion gear which are in mesh with two different side gear which are splined to the axle shaft.
* The ring-gear is free rotate on the half shaft

Working :

* when the propellar shaft turns it rotates the level pinion. it will turn the crown wheel.
* crown wheel in turn will relove the differential cage & cross-pin
* cross-pin will passes through two differential pinion gear meshes with the side gear.

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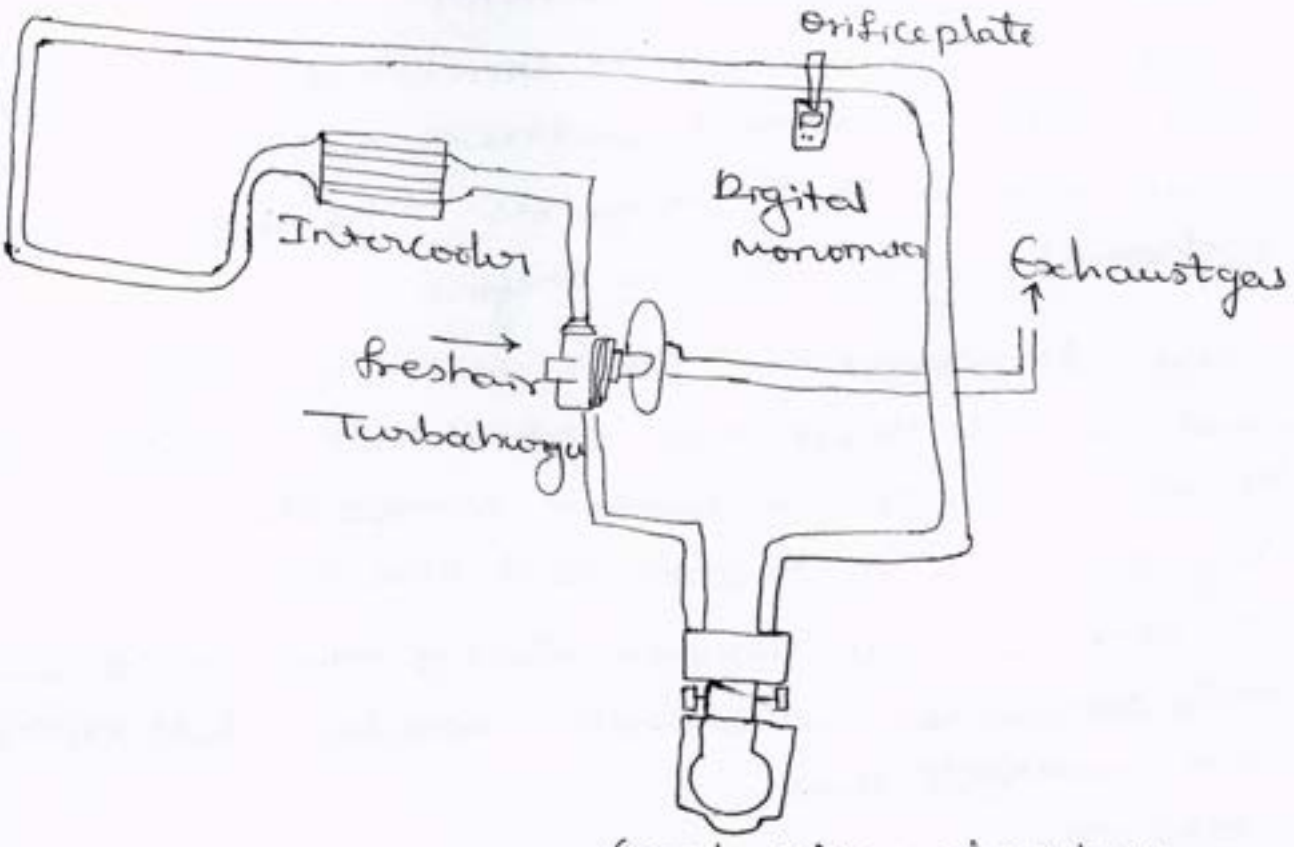
2a) with a neat sketch. Explain the exhaust gas recirculation System (EGR).

Sol:



working: The Exhaust gas, added to the fuel, Oxygen, and combustion products, increases the specific heat capacity of the cylinder contents, which lowers the adiabatic flame temperature In a typical automotive spark-Ignited (SI) Engine, 5% to 15% of the Exhaust gas is routed back to the intake as EGR. The maximum quantity is limited by the need of the mixture to sustain a continuous flame front during the combustion event; Excessive EGR in poorly set up applications can cause misfires and partial burns. Although EGR does measurably slow combustion, this can largely be compensated for by advancing Spark timing. The impact of EGR on Engine efficiency largely depends on the specific Engine design and Sometimes leads to a compromise between efficiency and NOx emissions.

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2(b) Explain the construction and working of catalytic converter.

Sol: Construction of the catalytic convertor includes a honey comb core that is converted with different metals like rodium & platinum. The main reason to use these metals is it responds very quickly with the exhaust gases of the engine.

They decreases the toxic contents within the gases and switch them into CO2 & H2O. In the beginning. It responds to the carbon monoxide which is produced by gasoline combustion and also through the hydrocarbons produced by unburned fuel & other NIO2 emissions. So this converter will convert these harmfull emission into less harmfull ones.

working:

Catalytic convertor needs 400°C of temperature or 752°F to function efficiently Thus. they are arranged near to the car engine other wise one or more tiny catalytic converter like precats are located instantly behind the exhaust manifold

3a) with a neat sketch explain the hotch kiss drive

Sol: The Hotch kiss drive is most simple and widely used system. In this arrangement the springs besides taking weight of the body, also takes the torque reaction driving thrust & side forecses.

* It consists of an open propellar shaft secured to the transmission output shaft and differential pinion gear shaft.
* The propellar shaft is provided with universal joints & slidings are bolted joint as shown in figure
The springs are bolted to the axle casing.
* The front end of the spring is rigidly fixed to the

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rich A/F mixture is required.

* Therefore when Engine is cold a thermostatic heated air quickly to carburettor.

* Thermostatic air-cleaner consists of temperature sensing spring which senses temperature of air entering air cleaner.

* when air is cold, bleed value is closed and applies intake manifold vaccum to the vaccum motor.

* The diaphragm & control damper assembly moves up an due to atmospheric pressure & blocks snorfet tube

* This allow air to enter through hot air pipe which is laid near Exhaust manifold.

* when the Engine starts the Exhaust manifold heats up quickly & hence allows heated air to enter into the air-cleaner.

* This heated air helps to vapourice the fuel delivered by carburetor or fuel injector which intern improves cold Engine performance.

The various pollutants are poller, dust, soot, aerosol spray, & liquid droplets the effects on human body are suffering from as thma attacks and etc.

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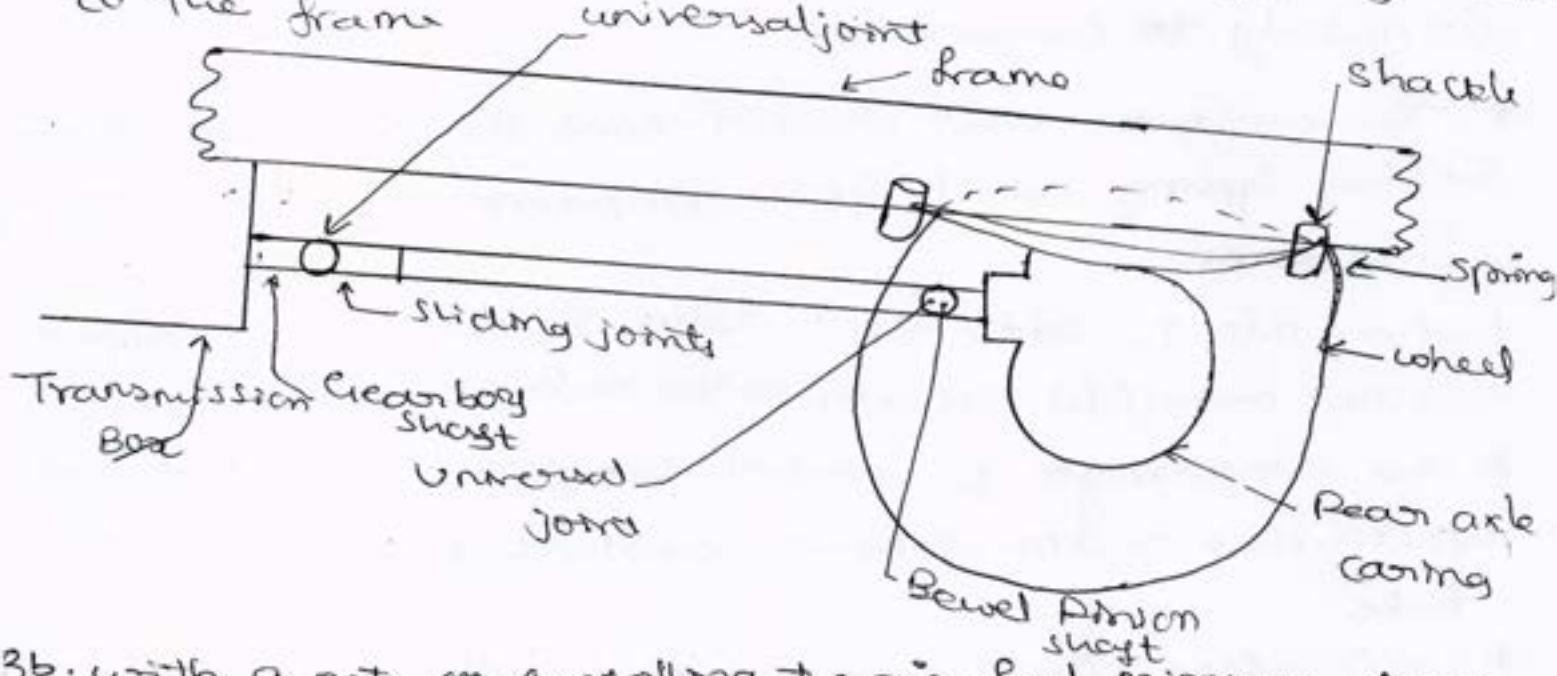
frame by swinging

* front half of the spring will transmit the driving thrust to the frame



3b. with a note on controlling the air fuel mixture, Name the various pollutants and discuss their ill effects on human body

Sol: Controlling the air fuel mixture is nothing but modifying the fuel system to deliver a leaner air-fuel mixture

* The ideal air-fuel ratio [14.7:1] required for complete combustion of the fuel is called as fuel ratio.
* If this air-fuel ratio is lower, say 14:1 it means there is excess fuel for available oxygens
* If it is higher, say 16:1, it means there is an excess of oxygen.
* During part throttling ECM maintain air-fuel ratio or stochiometric ratio ie 14:7.
* The amount of oxygen in the exhaust gas is indicated oxygen sensor which sends signals to ECM
* This shows leaness or richness of air-fuel mixture. then the ECM adjusts the richness of the mixture

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Faster warm up and quicker choke action

* During warm up period if the carburetor supplies cold AIR only a part of fuel will lean and extra

Shridevi Institute of Engineering and Technology, Tumkur – 06
VIII th Semester: I Internal Test: MARCH 2023
18ME81 – ENERGY ENGINEERING

Time: 90 Minutes] [Max Marks: 40

Note: Answer Any TWO Full Questions

Questions Nos		Descriptions of Questions	Max Marks
Q1	a.	What is pulverized coal? What are the advantages and limitations of pulverized coal?	04
	b	Explain hydraulic ash handling process with a neat sketch	08
	c	Explain the Central (or) Bin system of burning pulverized coal.	08
Q2.	a	What are the different types of cooling towers and cooling ponds?	04
	b	Explain the construction and working of Velox boiler	08
	c	Explain the functions of the following: (i) Super heaters (ii) De-super heaters (iii) Economizers (iv) Air- Preheaters	08
Q3.	a	What are the main advantages of solar-cell? Explain the conversion of solar energy to electricity through photovoltaic cell.	04
	b	Explain Pyranometer with neat sketch to measure beam and diffused radiations	08
	c	Explain Pyriliometer with neat sketch to measure direct beam radiations	08

Shridevi Institute of Engineering and Technology, Tumkur – 06
VIII th Semester: I Internal Test: MARCH 2023
18ME81 – ENERGY ENGINEERING

Time: 90 Minutes] [Max Marks: 40

Note: Answer Any TWO Full Questions

Questions Nos		Descriptions of Questions	Max Marks
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8th Sem. Subject:- Energy Engineering [18ME81]

I Internal

1. a) Defn of pulverized coal – 2M

Advantages – 1M

limitation – 1M

Total:- 4 Marks

b) Hydraulic ash handling process

Sketch – 4M

Explaination – 4M

Total:- 8 Marks

c) Central (or) Bin system of burning pulverized coal:-

Sketch – 4M

Explaination – 4M

Total:- 8 Marks

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2) a) Types of Cooling towers :- 2M

Types of Cooling ponds :- 2M

Total :- 4 Marks

b) The construction and working of Velox boiler :-

Sketch - 4M

Explaination - 4M

Total :- 8 Marks

c) The functions of,

i) Superheaters - 2M

ii) De-Superheaters - 2M.

iii) Economizers - 2M

iv) Air-preheaters - 2M

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Total :- 8 Marks

3. a) Advantages of Solar Cell - 1M

photovoltaic Cell - 3M
conversion

Total :- 4 Marks

b) pyranometer - To measure beam and diffused radiations.

Sketch - 4M

Explaination - 4M

Total :- 8 Marks

c) pyrilliometer - To measure direct and beam radiations.

Sketch - 4M

Explaination - 4M

Total :- 8 Marks

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Shridevi Institute of Engineering and Technology, Tumkur – 06

VIII th Semester: II Internal Test: April 2023

18ME81 – ENERGY ENGINEERING

Time: 90 Minutes] [Max Marks: 40

Note: Answer Any TWO Full Questions

Questions Nos		Descriptions of Questions	Max Marks
Q1	a.	Explain the construction and working of Benson boiler?	10
	b	With a neat sketch, Explain the working of space heating and cooling by using solar collectors	10
Q2	a	Explain the construction and working of Schmidt-Hartmann boiler	10
	b	With a schematic sketch explain working of solar to PV system.	10
Q3.	a	Explain the working principle of solar power for Generating power	10
	b	How solar Flat plate Collector works? Explain with a schematic sketch.	10

==========xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx==========

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8th Sem Subject:- Energy Engineering [18ME81]

II Internals

1. a) The construction and working of Benson boiler,

Sketch - 5M

Explaination - 5M

Total:- 10 Marks

b) The working of space heating and cooling by using Solar Collectors,

Sketch - 5M.

Explaination - 5M

Total:- 10 Marks

2. a) Schmidt - Hartmann boiler

Sketch - 5M.

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Explaination - 5M

Total:- 10 Marks

b) Working of Solar - PV System,

Sketch - 5M.

Explaination - 5M

Total:- 10 Marks

3. a) Solar power for Generating Electric power,

Sketch - 5M

Explaination - 5M

Total - 10 Marks

b) Solar flat plate Collector,

Sketch - 5M

Explaination - 5M

Total :- 10 Marks

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Shridevi Institute of Engineering and Technology, Tumkur – 06

VIII th Semester: III Internal Test: May2023

18ME81 – ENERGY ENGINEERING

Time: 90 Minutes] [Max Marks: 40

Note: Answer ALL Questions

Questions Nos		Descriptions of Questions	Max Marks
Q1	a.	Classify the hydroelectric power plants on the basis of head. Explain each type of plant in detail.	10
	b	What are the most contentious issues surrounding nuclear energy? Explain	10
	b	With a neat diagram, Explain ocean thermal energy plant.	10
Q2.	a	What are the major problems associated with Nuclear Power? Explain the working principle with a neat sketch.	10

Shridevi Institute of Engineering and Technology, Tumkur – 06

VIII th Semester: III Internal Test: May2023

18ME81 – ENERGY ENGINEERING

Time: 90 Minutes] [Max Marks: 40

Note: Answer ALL Questions

Questions Nos		Descriptions of Questions	Max Marks
Q	a.	Classify the hydroelectric power plants on the basis of head. Explain each type of plant in detail.	10
	b	What are the most contentious issues surrounding nuclear energy? Explain	10
	b	With a neat diagram, Explain ocean thermal energy plant.	10
Q2.	a	What are the major problems associated with Nuclear Power? Explain the working principle with a neat sketch.	10

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8th Sem Subject: Energy Engineering [18ME81]

III Internal

1. a) Classification of hydroElectric power plant — 2M.

Explaination - 4 * 2 = 8M

Total :- 10 Marks

b) The most contentious issues surrounding nuclear Energy,

Explaination - 5 * 2 = 10 Marks

2. a) Thermal power plant,

Sketch - 5M

Explaination - 5M

Total :- 10 Marks

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b) The major problems associated with nuclear plant — 2M

Sketch - 4M

Explaination – 4M

Total :- 10 Marks

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Shridevi Institute of Engineering and Technology, Tumkur – 06
Department of Mechanical Engineering
VII Semester: 1st Test 2022
18ME 734 – Total Quality Management

Time: 90 Min] [Max Marks: 40

Answer TWO full questions,

1. (a) Define Quality. Discuss how quality plays an important role in improving the productivity of the company **(10 Marks)**
   (b) Explain 14 points of Deming that helps to improving quality **(10Marks)**

OR

2. (a) List characteristics of quality leaders **(10 Marks)**
   (b) Explain briefly various ISO serious of standards **(10 Marks)**

3. (a) Explain the contribution of quality Gurus **(10Marks)**
   (b) Sketch and explain TQM frame work **(10 Marks)**

OR

4. (a) Explain with a neat diagram ISO 9001 Requirements **(10 Marks)**
   (b) What are the obstacles associated with implementation of TQM? . Explain any 5. **(10 Marks)**

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SCHEME AND SOLUTION.

Sub: 18ME734- TOTAL QUALITY MANAGEMENT-I^st TEST

Total Marks: 40. DATE: 25.10.2022

1

(a) Definition of Quality: 02

(b) Quality Role explanation of:, 01 Each

(a) Performance
(b) Features.
(c) Reliability
(d) Conformance
(e) Durability
(f) Serviceability
(g) Response
(h) Reputation

(b) Fourteen points of deming that helps Improving Quality

(1) Achieve
(2) Reduce
(3) Improve
(4) Market
(5) manage growth
(6) Improve documentation
(7) Correct Issues
(8) Grow market share
(9) Creates a Culture
(10) Embed vision

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11) Consistent Products
12) Measure performance
13) teams
14) Improve Compliance.

12 @

1. They give priority
2. They Empower,
3. They Emphasize Improvement
4. they Emphasize Prevention.
5. they Encourage Collaboration
6. they train & coach.
7. They learn from Problems
8. they Continually try to Improve Communication.
9. Leaders Continually demonstrate their Commitment
10. Leaders Choose Suppliers
11. they Establish organisation System
12. Leaders Encourage

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2. (b)

(a) ISO 9000 - Quality management.

(b) ISO 9001 :- Quality System.

(c) ISO 9002 :- Quality System

(d) ISO 9003 :- Quality System. model for Quality assurance..

(e) Quality management & Quality System Element Guidelines

3. (a)

Quality gurus :-

(b) Shewhart :-

(c) Deming :-

(d) Juran :-

(e) Felgenbaum :-

(f) Philip B. Crolby :-

(g) Genichi Taguchi

(h) Kaoru Ishikawa :-

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3. (6)

TQM Gurus → Tools & techniques

↓

1. Shewhari
2. Deming
3. Juran
4. Feigenbaum
5. Ishikawa
6. Crossby
7. Taguchi

↓

1. benchmarking
2. Quality
3. Quality Design
5. total - Production.
6. Statistical.

↓

Principles & Practices → Product / Service Realization → Customer

↓

1. People & Relationship
2. leadership
3. Customer Satisfaction
4. Employee Satisfaction

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4. (a)

*) ISO 9000 :- Quality management & Quality Assurance Standards

*) ISO 9001 :- model for Quality assurance in design,

*) ISO 9002 :- model for Quality assurance in Production.

*) ISO 9003 :- model for Quality assurance in final Inspection & test

*) Quality management & Quality System Element

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(b)

*) a Committed & Involved management

*) an unwavering focuses on Customers

*) Effective Involvement.

*) Continous Improvement.

*) Treating Suppliers as partners.

Shridevi Institute of Engineering and Technology, Tumkur – 06
Department of Mechanical Engineering
VII Semester: 2nd Test 2022
18ME 734 – Total Quality Management

Time: 90 Min] [Max Marks: 40

Answer TWO full questions,

1. (a) State and explain elements of customer service	CO3	**(10 Marks)**
(b) What is employee empowerment? How it is helpful for an organization	CO4	**(10Marks)**

OR

2. (a) Explain briefly the characteristics of successful teams	CO3	**(10 Marks)**
(b) Explain with neat sketch PDSA cycle	CO4	**(10 Marks)**
3. (a) Explain how six sigma helps an organization to improve quality of process	CO3	**(10Marks)**
(b) Explain Maslow's Hierarchy of Needs	CO3	**(10 Marks)**

OR

4. (a) Define the following terms: Motivation, Performance, Reward, Recognition, Gain sharing, Teams, Union	CO4	**(10 Marks)**
(b) What is Kano Model? Why it is used? Explain	CO5	**(10 Marks)**

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II Internals
Total Quality Management

1.

a)

State - Elements of Customer Service - 2 Marks

Explaination of Each - 8 Marks

Total:- 10 Marks

b) Employee Empowerment - Defn - 2 Marks

Helpful for an Organisation

Explaination - 8 Marks

Total:- 10 Marks

2. a) the characteristics of succesful teams

Explaination - Each character

- 2 × 5 Marks

Total:- 10 Marks

b) PDSA Cycle

Sketch - 5 Marks

Explaination - 5 Marks

10 Marks

3. a) Six Sigma helps an organization to improve quality of process,

Explaination - 2×5 Marks

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Total :- 10 Marks

b) Maslow's Hierarchy of needs

Explaination - 10 Marks

4. a)

Defn,

1) Motivation – 2M

2) performance – 2M

3) Reward – 2M

4) Recognition – 1M

5) Gain Sharing – 1M

6) Teams – 1M

7) Union – 1M

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Total :- 10 Marks

b) Defn – Kano Model – 2M

Used – 2M

Explanation – 6M

Total :- 10 Marks

Shridevi Institute of Engineering and Technology, Tumkur – 06
Department of Mechanical Engineering
VII Semester: 3rd Test
18ME734 – Total Quality Management

Time: 90min

Note: 1. Answer two full questions

Max marks: 40

		CO	Marks
1.a)	What is motivation? Explain Maslow's hierarchy of needs with a block diagram	04	10
b)	Briefly explain performance appraisal	04	10
	OR		
2.a)	Sketch and explain juran's triology	04	10
b)	Explain the following with neat diagram (i) Pareto diagram (ii) process flow diagram	05	10
3.a)	With a neat sketch explain bench marking concept	04	10
b)	Define QFD, With a neat sketch explain 4 phases of QFD process	05	10
	OR		
a)	Differentiate between sequential engineering and concurring engineering with proper block diagrams	05	10
b)	Define FMEA, List and briefly explain the stages of FMEA	05	10

****

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18ME734

Total Quality Management

7) a)

Def^n - Motivation - 2M

Explaination - Maslow's hierarchy - 5M

Block diagram - 3M

Total :- 10 Marks

b) performance appraisal,

Explaination - 10 Marks

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8) a) Juran's Trilogy

Sketch - 5 Marks

Explaination - 5 Marks

Total :- 10 Marks

b)

i) Pakeda diagram

Diagram – 3M

Explaination – 2M

ii) Procell flow diagram

Diagram – 3M

Explaination – 2M

Total :- 10 Marks

3) a) Bench Marking Concept

Sketch – 5M

Explaination – 5M

Total :- 10 Marks

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b) Defn - QFD - 2M

4 phases of QFD process

Each phase - 2M * 4 = 8 Marks

Total :- 10 Marks

4 a. Difference between Sequential Engg - 3M

&

Concurring Engg - 3M.

Sketch - 4M

Total :- 10 Marks

b. Defn FMEA - 2M

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List the stages of FMEA - 2M

Explaination - 6M

Total :- 10 Marks

Sridevi Institute of Engineering and Technology, Tumkur – 06

Vth Semester: I Internal Test: 2023

18ME53 – DYNAMICS OF MACHINES

Time: 90 Minutes] [Max Marks: 40

Note: Answer Any TWO Full Questions

Question Nos		Description of Questions	Max Marks
Q1	a.	State the condition for a link to be equilibrium i) When two forces act ii) When three forces act iii) When two forces and a torque act	06
	b	What is free body of a mechanism? How are they helpful in finding the various forces acting on the various members of the mechanism?	14
Q2	a	Draw the free body diagram of a slider crank mechanism subjected to gas pressure on the piston of area of cross section.	06
	b	A slider crank mechanism , the force applied to the piston is 1000N when the crank is at 60^{o} from IDC. Calculate the driving torque.	14
Q3	a	Calculate the required value of t2 and various forces on the links for the equilibrium.	06
	b	A four bar mechanism under the action of the two external forces. Determine the torque to be applied on the link.	14

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) State the conditions for a link to be equilibrium

i) When two forces act - 2M

ii) When three forces act - 2M

iii) When two forces & a torque act - 2M

i) A member under the action of any two forces will be in equilibrium if the forces act along the same line, equal in magnitude but opposite in direction

ii) A member under the action of any two forces will be in equilibrium if

i) the resultant force is zero

ii) the lines of action of the forces intersect at a point known as point of concurrency.

iii) A member under the action of an applied torque and two forces will be in equilibrium if

i) → the forces are equal in magnitude but parallel and opposite in direction.

ii) → The couple formed by the equal and opposite forces is in the opposite direction of the applied couple (torque) and equal in magnitude

6 Marks

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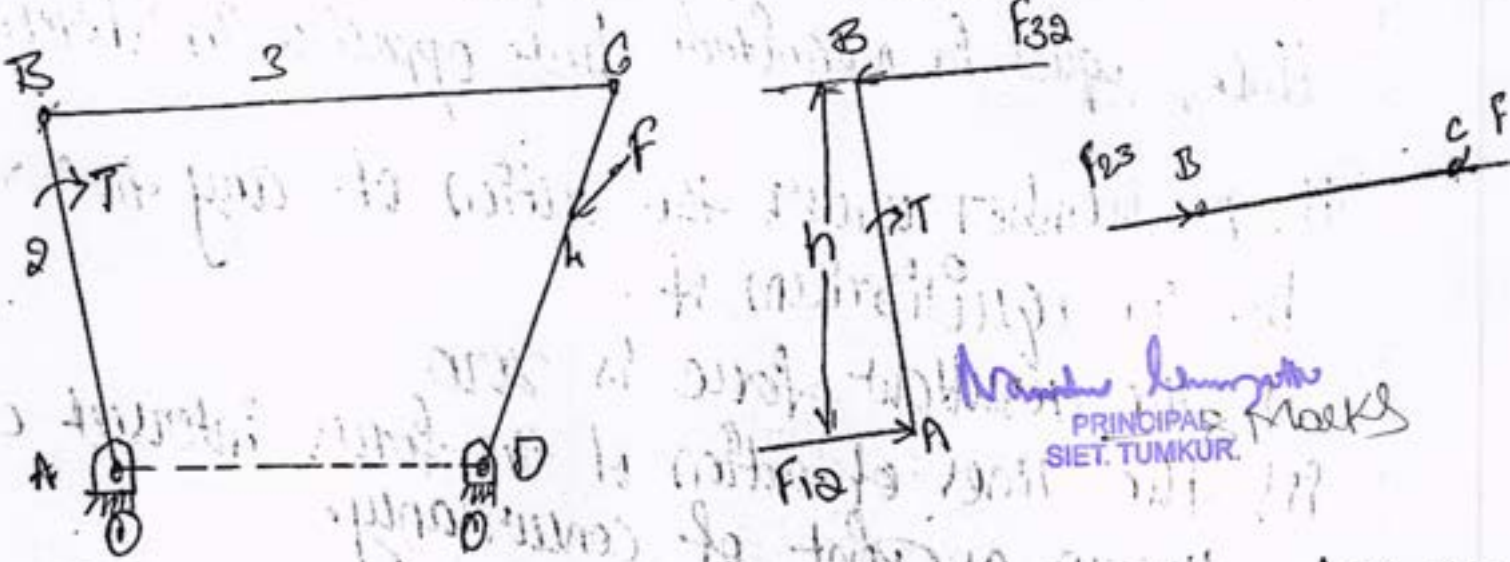
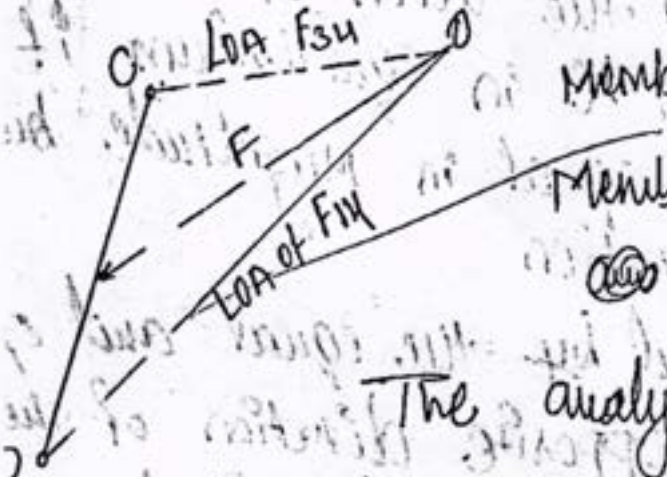
What are free body of a mechanism? How are they helpful in finding the various forces acting on the various members of the mechanism?

A Free body diagrams is a sketch of a part isolated from the mechanism in order to determine the nature of forces acting on it.



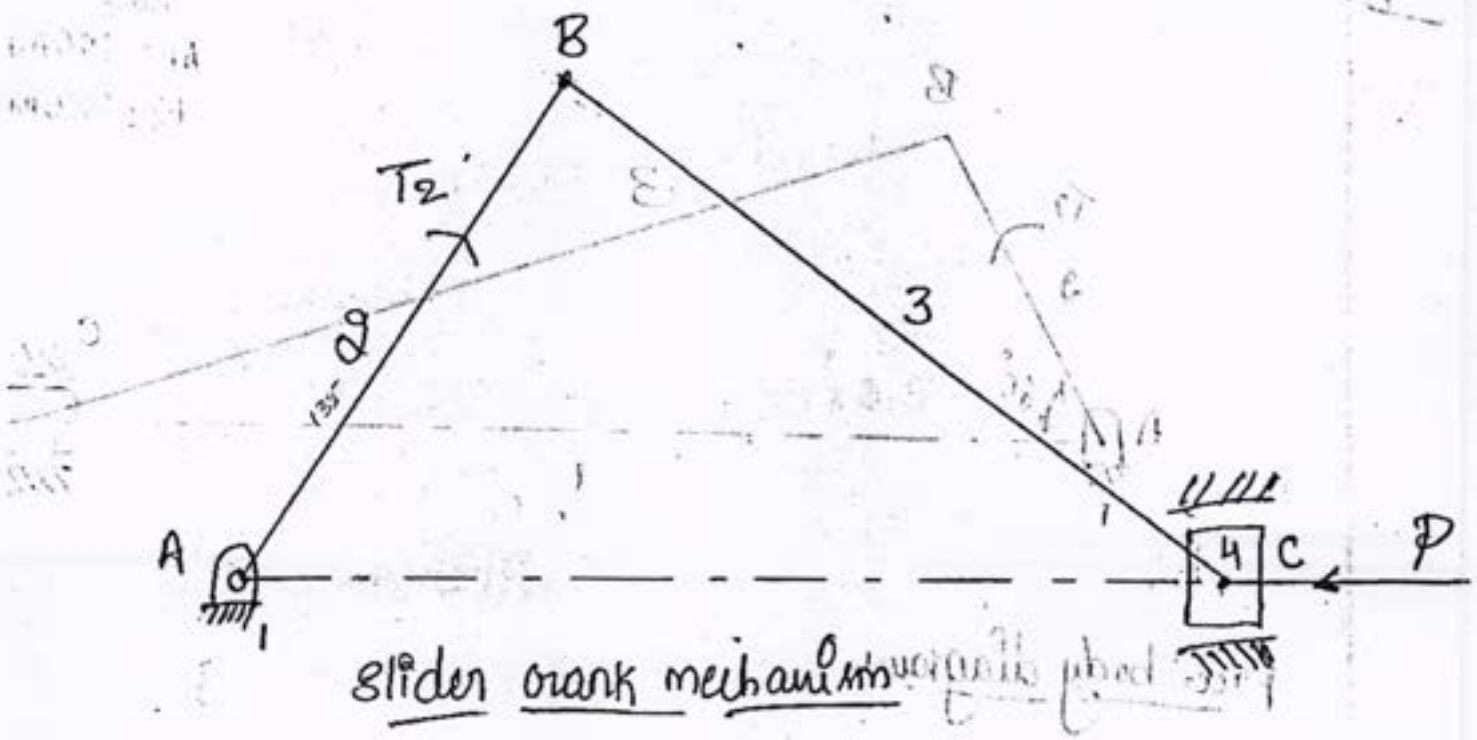
Member 4 is acted upon by 3 forces F1, F & Member 3 is acted upon by 2 forces F23 Member 2 is acted upon by 2 forces F & F12 & a torque T. - 6 Marks



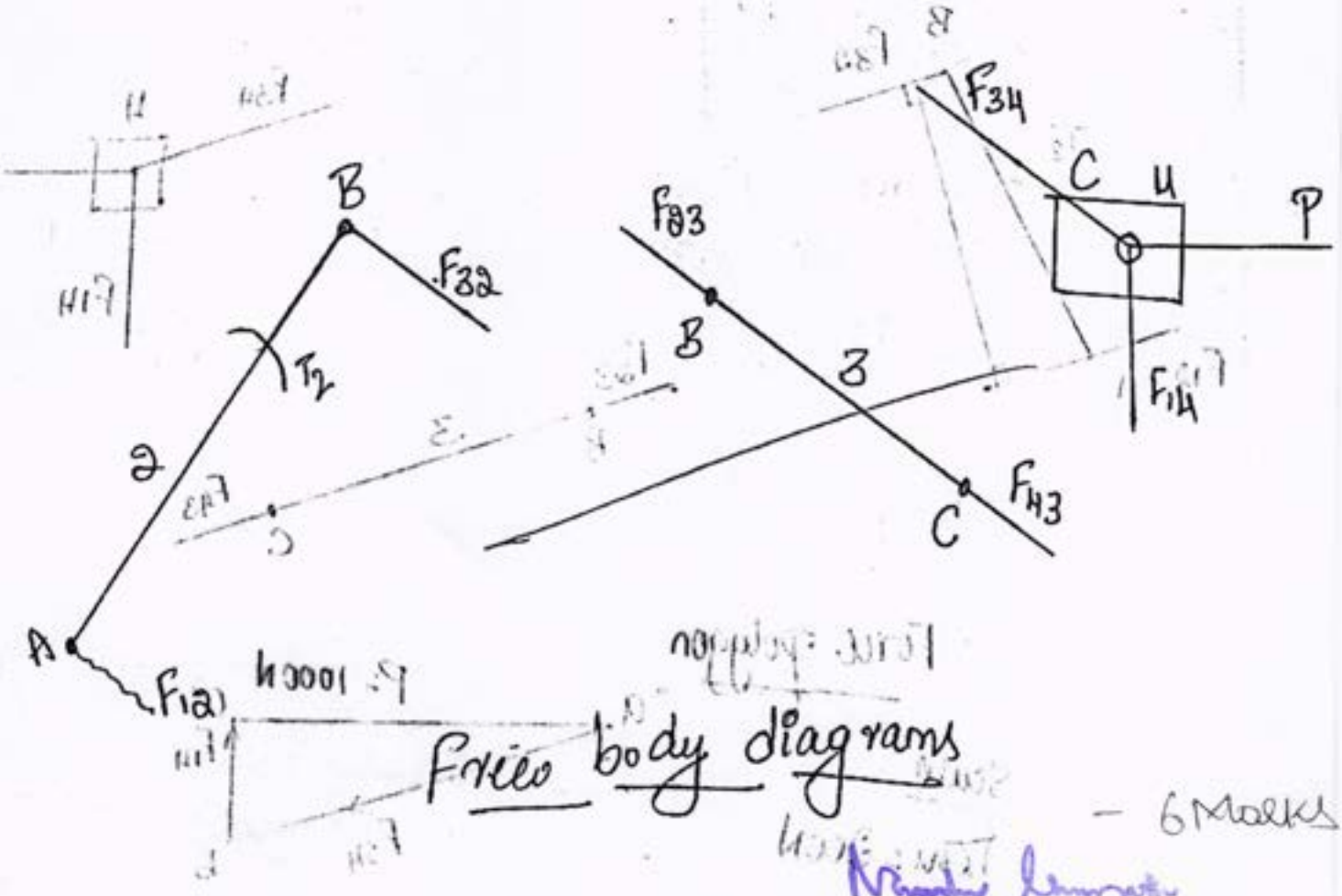
The analysis of the four-bar mechanism can be started from the link in which sufficient data is required for analysis. Through analysis all the other unknowns can be determined.

-) 4 Marks

Draw the free body diagram of a slider crank mechanism subjected to gas pressure P on the piston of area of cross section A.



slider crank mechanism



Free body diagrams

– 6 Marks

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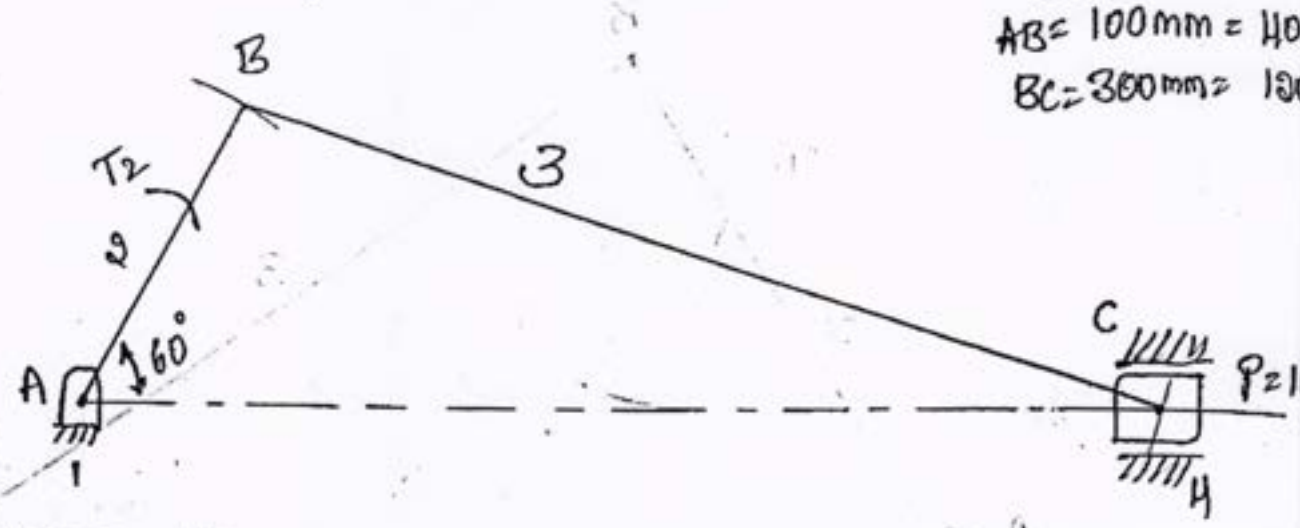
to the piston is 1000N when the crank is at 60° from I calculate the driving torque T_2. AB=100mm, BC=300mm

Scale 1:

Then

AB= 100mm = 40m

BC=300mm= 120m



Free body diagrams

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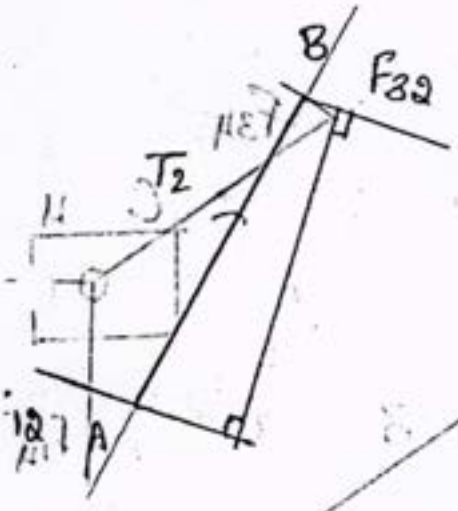
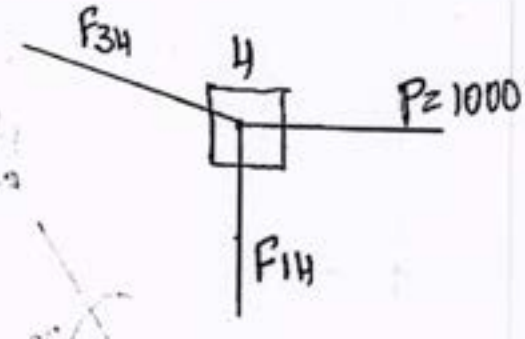
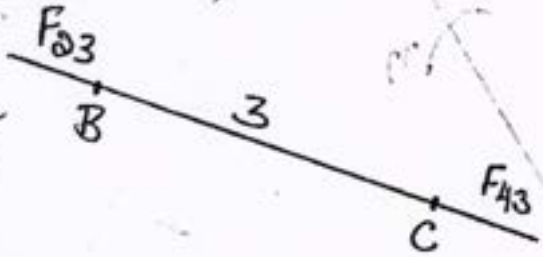


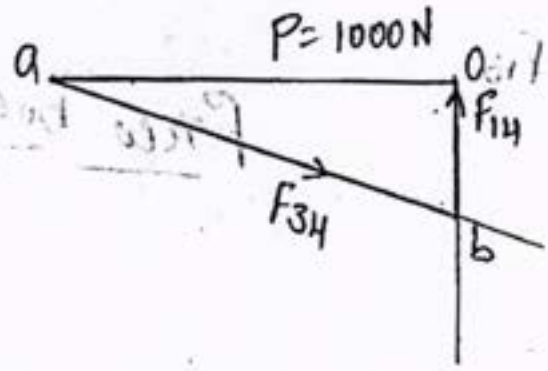




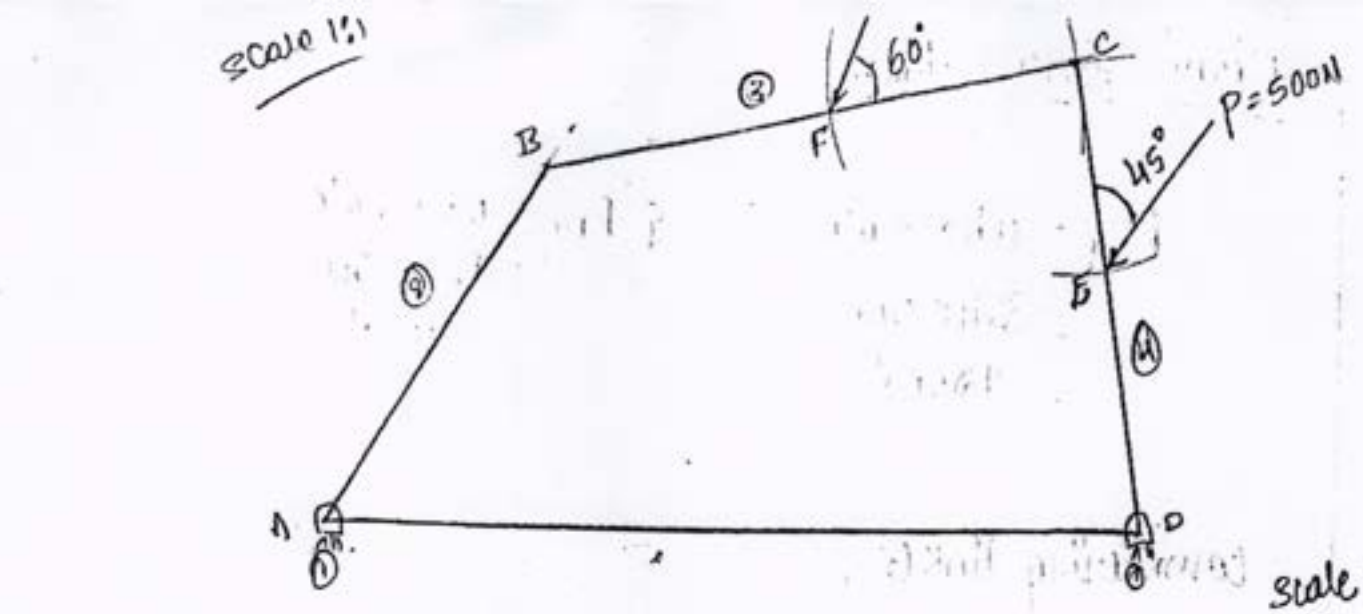
Force polygon

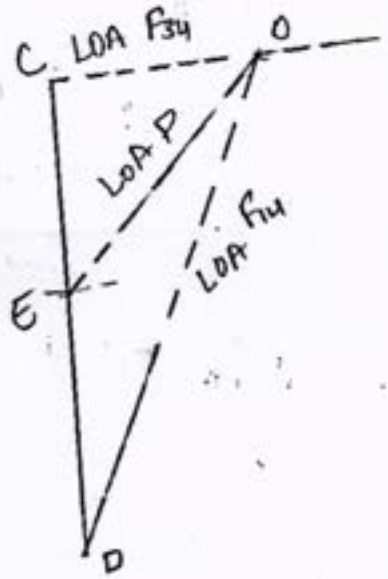
Scale

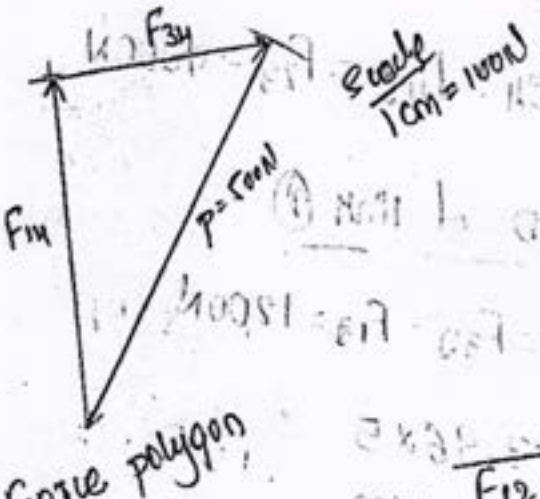
1cm = 200N

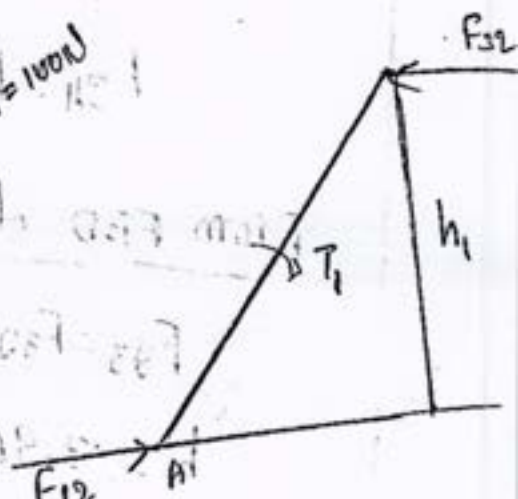


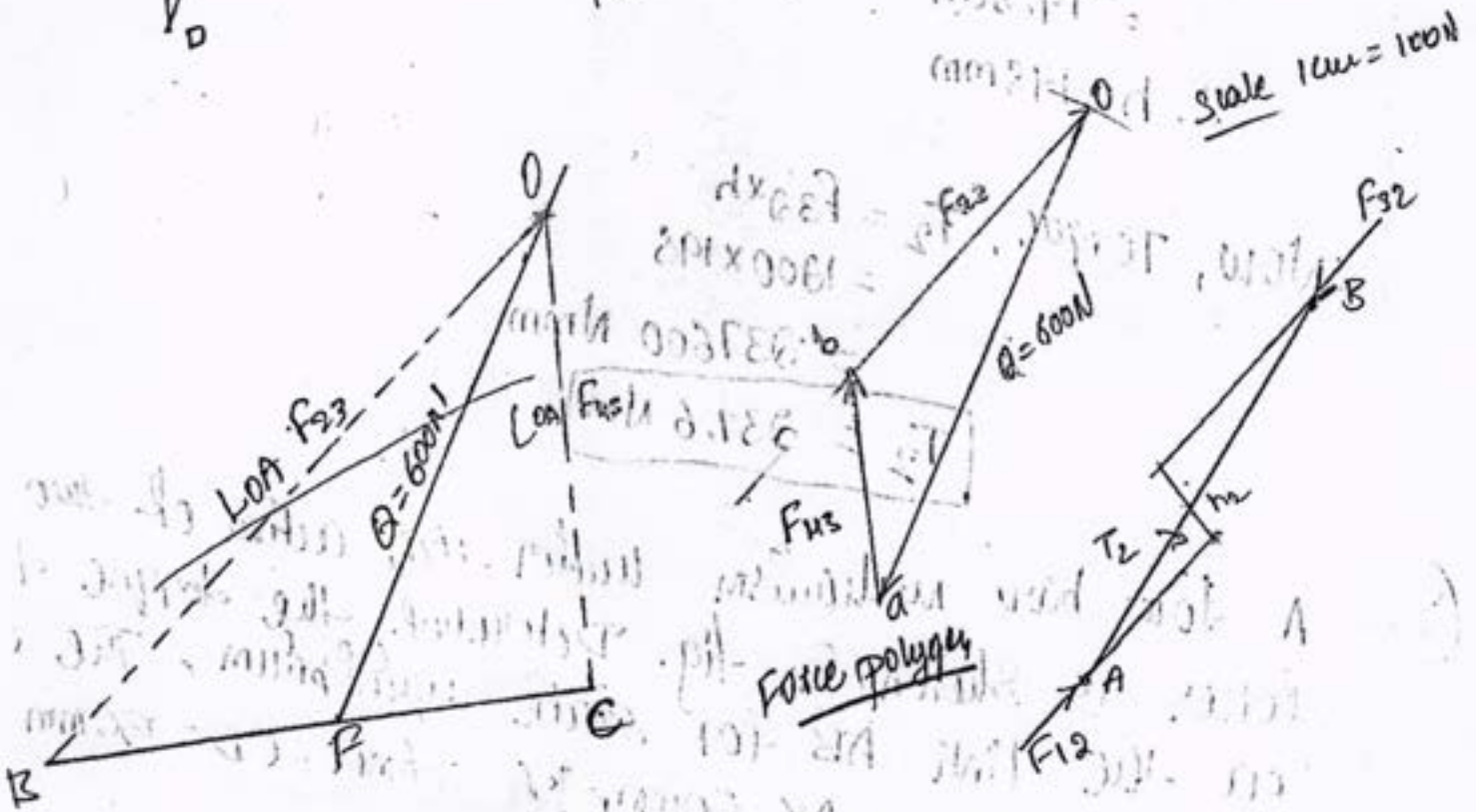
– 8 Mark











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F_{34} = Ob x scale

= 8 x 100

= 800N

$F_{34} = -F_{43} = F_{23} = -F_{32}$, $F_{32} = 800N$

$h_1 = 38.5 \times scale = 38.5 \times 1 = 38.5mm$

$T_1 = F_{32} \times h_1 = 200 \times 38.5 = 7700 \cdot Nmm = 7.7 Nm$

From link 3

$F_{23} = Ob \times scale = 3.8 \times 100 = 380N$

$F_{23} = -F_{32}$

$F_{32} = 380N$

$h_2 = 11 \times scale$

$= 11 \times 1 = 11mm$

$T_2 = F_{32} \times h_2$

$= 380 \times 11$

$= 4180 \cdot Nmm$

$T_2 = 4.18 Nm$

Total torque, $T = T_1 + T_2 = 7.7 + 4.18 = 11.88 Nm$.

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Sridevi Institute of Engineering and Technology, Tumkur – 06

Vth Semester: II Internal Test: 2023

18ME53 – DYNAMICS OF MACHINES

Time: 90 Minutes] [Max Marks: 40

Note: Answer Any TWO Full Questions

Question Nos		Description of Questions	Max Marks
Q1	a.	State and explain the Principle of Superposition.	06
	b	A four bar mechanism under the action of two external forces is shown in the Figure 8. Determinethe torque to be applied on the link AB for static equilibrium. The dimensions of the links are AB = 50 mm, BC = 66 mm, CD = 55 mm, CE = 25 mm, CF = 30 mm, AD = 100 mm and ∟BAD =60°.	14
Q2	a	In a four bar mechanism shown in the Figure 9, torques T_3 and T_4 have magnitudes of 30 N-m and 20 N-m respectively. The link lengths are AD = 800 mm. AB = 300 mm and BC = 700 mmand CD = 400 mm. For the static equilibrium of the mechanism, determine the required input torque T_2.	06
	b	For the static equilibrium of the mechanism shown in Figure 10 find the required input torque. The dimensions are AB = 150 mm, BC = AD = 500 mm, DC = 300 mm, CE = 100 mm and EF= 450 mm.	14
Q3	a	Calculate the required value of t2 and various forces on the links for the equilibrium.	06
	b	For the static equilibrium of the mechanism shown in Figure 10 find the required input torque. The dimensions are AB = 150 mm, BC = AD = 500 mm, DC = 300 mm, CE = 100 mm and EF= 450 mm.	14

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Define the following.

a) Sensitiveness: Ratio of the difference b/w the max & min equilibrium speed to the mean equilibrium spe

b) Governor effort: It is the mean force exerted on the sleeve to raise it or lower it for a given per age change of speed. - 2M

c) Governor power: It is the workdone on the sleeve fo a given percentage change of speed.

d) Hunting: If the speed of the engine controlled the governor fluctuates continuously above & be the mean speed, then the condition is said be hunting. - 2M

e) Stability: A governor is said to be stable i for each speed within the working range, the weights occupy a definite specified positio

f) Isochronous Governor: A governor is said to be Isochronous if the equilibrium speed is consta for all radii of rotation of the balls within working range. - 2M

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- 6 Marks

A Hartnell governor rover b/w 300rpm and 320 rpm has a sleeve lift of 20mm. The sleeve arms & ball arms are 80mm & 120mm respectively. The lower arm is pivoted at 120mm from governor axis. The mass of each ball is 25N. The ball arms are parallel to the governor axis at the lower equilibrium speed. Determine the stiffness of the spring.

Here $N_{max} = 320$ rpm

$N_{min} = 300$ rpm

$h = 20$ mm

$a = 120$ mm

$b = 80$ mm

$w = 25$ N

$r = 120$ mm

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At minimum speed $N_{min} = 300$ rpm

$\therefore r = r_2 = 120$ mm.

$$\therefore F_{C_2} = \left(\frac{w}{g}\right) \omega_{min}^2 r_2$$

$$= \left(\frac{25}{9.81}\right)\left(\frac{2\pi \times 300}{60}\right)^2 \times 0.12$$

$$= 301.82 \text{ N}$$

4 Marks

Lower radius, $r_1 = 120 + 20\left(\frac{120}{80}\right)$

$= 150\text{mm}$ or 0.15 m

$F_{C_1} = \left(\frac{25}{9.81}\right)\left(\frac{2\pi \times 320}{60}\right)^2 \times 0.15$

$= 429.26\text{ N}$ - 2M

For lowest, $W + S_2 = 2F_{C_2} \times \frac{a}{b}$

$0 + S_2 = 2 \times 301.89 \times \left(\frac{120}{80}\right)$

$S_2 = 905.46\text{ N}$ - 4 Marks

for highest, $W + S_1 = 2F_{C_1} \times \frac{a}{b}$

$0 + S_1 = 2 \times 429.26 \times \left(\frac{120}{80}\right)$

$S_1 = 1288.78\text{ N}$ - 2M

Now, Stiffness, $K = \left(\frac{S_1 - S_1}{b}\right)$

$= \left(\frac{1288.78 - 905.46}{20}\right)$

$= 19.116\text{ N/mm}$ - 2M - 4 Marks

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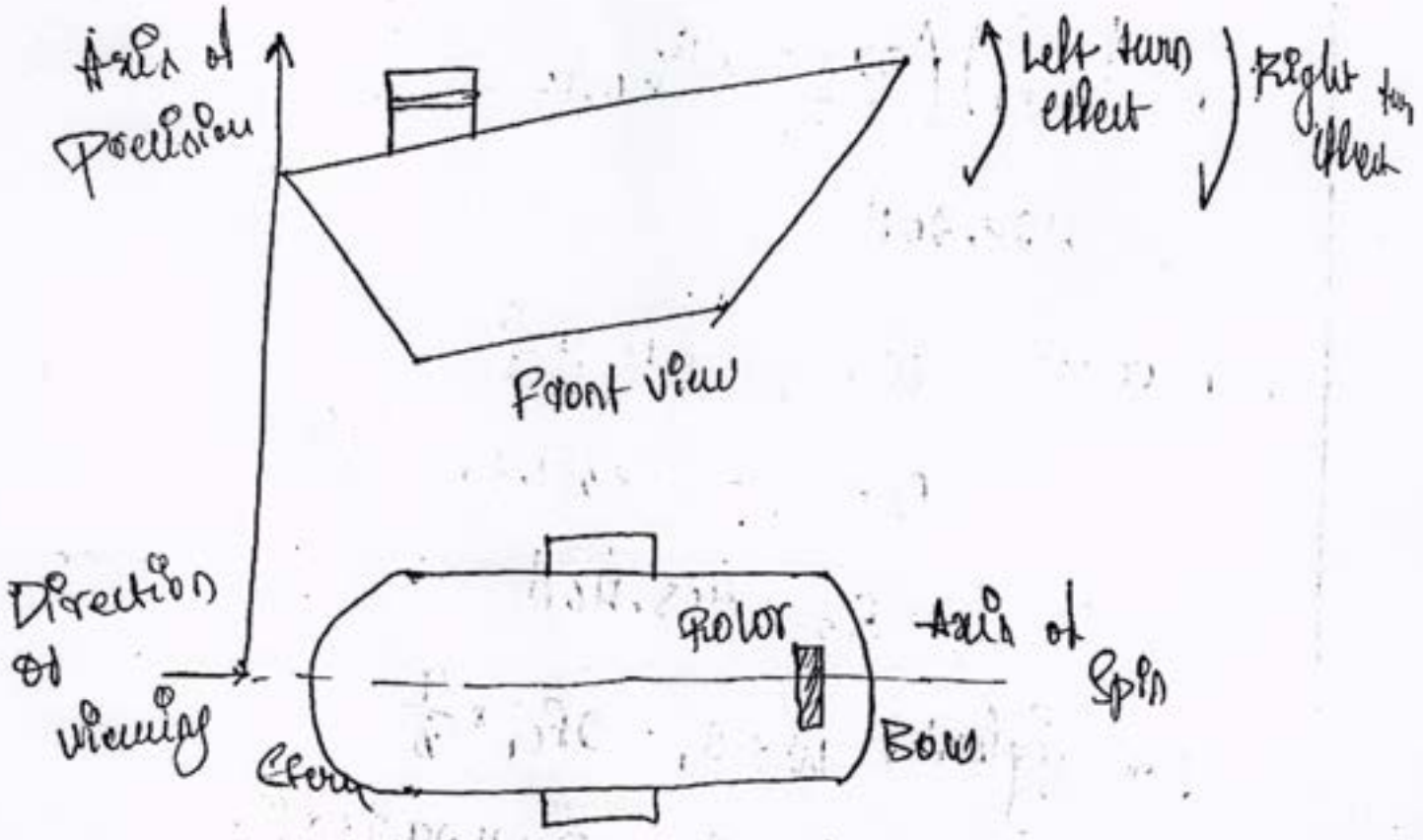
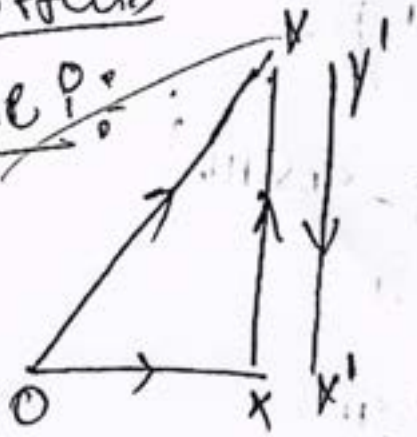
With neat sketch, explain the effects on the ship when the ship is steering, pitching and rolling.



:. Steering Effects

- 6 Marks

Case i:



Effect: Raise the Bow & dip the Stern

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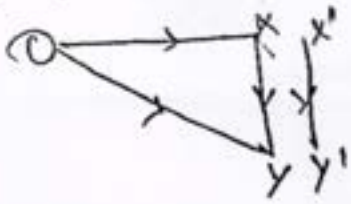
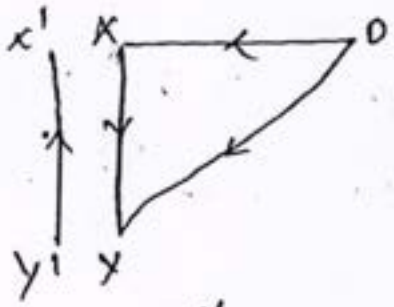
case (i):-



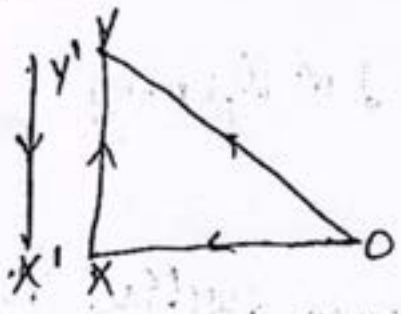
Effect:- Dip the bow & Raise the Stern

case (ii):



Effect:- Dip the bow & Raise the Ste

case (iii):-

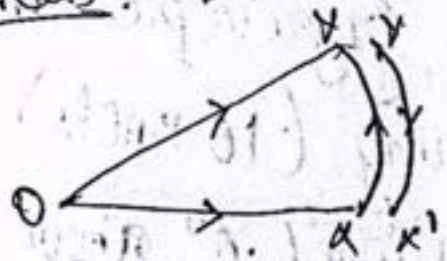


Effect:- Raise the bow & Dip th Ste

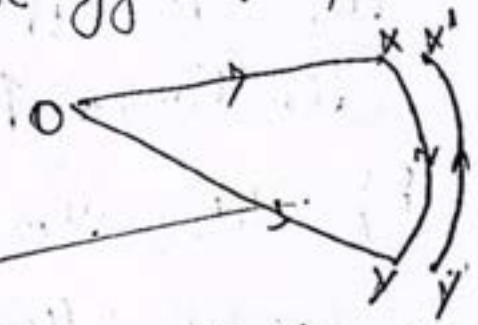
- 6 Marks

b) Pitching:-

Effects:- In terms of Reactive gyroscope position



Pitching upwards



Pitching dow

Pitching upwards:- when pitching is upward th of Reactive gyroscope will turn the ship Star-board side.

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- 14 Marks

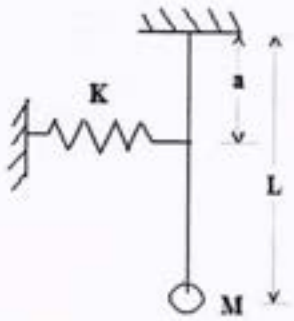
Sridevi Institute of Engineering and Technology, Tumkur – 06

Vth Semester: III Internal Test: Jan' 2023

18ME53 – DYNAMICS OF MACHINES

Time: 90 Minutes] [Max Marks: 40

Note: Answer Any TWO Full Questions

Question Nos		Description of Questions	Max Marks
Q1	a.	Define the following (a) Sensitiveness,(b) Governor effort,(c) Governor power, (d)Hunting,(e) Stability and (d) Isochronous governor	06
	b	A Hartnell governor moves between 300 rpm an 320 rpm for a sleeve lift of 20 mm. The sleeve arms and ball arms are 80 mm and 120 mm respectively. The levers are pivoted at 120 mm from governor axis. The weight of each ball is 25 N. The ball arms are parallelto the governor axis at the lowest equilibrium speed. Determine the stiffness of the spring.	14
Q2	a	With neat sketch, explain the effect of gyroscopic couple on the ship when the ship issteering, pitching and rolling.	06
	b	A ship is propelled by a turbine rotor which has a mass of 5000 Kg and has a speed of2100 rpm. The turbine rotor has a radius of gyration of 0.5 m and rotates in clockwise direction when viewed from stern. Find the gyroscopic effect in the following conditions. i) The ship runs at a speed of 16 Knots (1 Knot= 1.86 Km/hr), it steers to the left in a curve of 60 m radius. ii) The ship pitches 6^0 above and 6^0 below horizontal position. The bow descends with maximum velocity. The motion of pitching is SHM. and time period is 20 secs. iii) The ship rolls with a maximum angular velocity of 0.03 rad/sec clockwise when viewed from the stern.	14
Q3	a	Define SHM, amplitude, time period and natural frequency.	06
	b	Derive the differential equation of the pendulum as shown in Figure below and find timeperiod and natural frequency 	14

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1 a. State the neccessity of balancing of high speed machinery.

Soln: The high speed of engines & machines is common phenome now a days. It is therefore very essential that all the rotating and reciprocating parts should be completely bala as far as possible. If these parts are not properly ba dynamic forces are set up. These forces not only incre the load on the bearing & stresses in various Membe but also produce unpleasant and even dangerous vi

6M

b. Explain Static and dynamic balancing of machinery

Soln: → A system of rotating masses is said to be in static b if the combined mass centre of the system lies on th axis of rotation. i.e., A rotor is said to be Static balanced if the vector sum of centrifugal forces is

→ A system of rotating masses is in dynamic balance i there does not exist any resultant Centrifugal for as well as resultant couple.

For dynamic force is sum of the centrifugal forces be equal to zero and the sum of the couple must be to zero.

8M

c. A rotating shaft carries four masses 1, 2, 3 & 4 which are the mass centres are 30mm, 38, 40 & 35mm. from the rotation. The masses 1, 3 & 4 are 7.5, 5 & 4 kg respective axial distance b/w 1 & 2 is 400mm, 2 & 3 is 500mm. The masses 1

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iii) Axial distance b/w 3 & 4

Soln

Plane	Mass 'M' (kg)	Radius 'r' (m)	Force ÷ ω^2	Dist. from RP 'l'	Couple ÷ ω^2
1	7.5	0.03	0.225	-0.4	-0.09
2	M_2	0.038	$0.038M_2$	0	0
3	5	0.04	0.2	0.5	0.1
4	4	0.035	0.14	x	$0.14x$

-4M

Couple polygon

Ob × scale = $0.14x$

$6.7 \times \frac{1}{50} = 0.14x$ ∴ $x = 0.96$ m

$\theta_4 = 312°$ w.r.t M_1 - 2M

Force polygon

OC × Scale = $0.038M_2$

~~$OC \times \frac{1}{50} = 0.038M_2$~~ ∴ $M_2 = 8.74$ kg

~~$\theta_2 = 196.5°$~~ - 2M

Ans:

i) $\theta_2 = 196.5°$ & $\theta_4 = 312°$

ii) distance b/w 3 & 4 = $x - 0.5 = 0.46$ m

iii) $M_2 = 8.74$ kg

= 14 Marks

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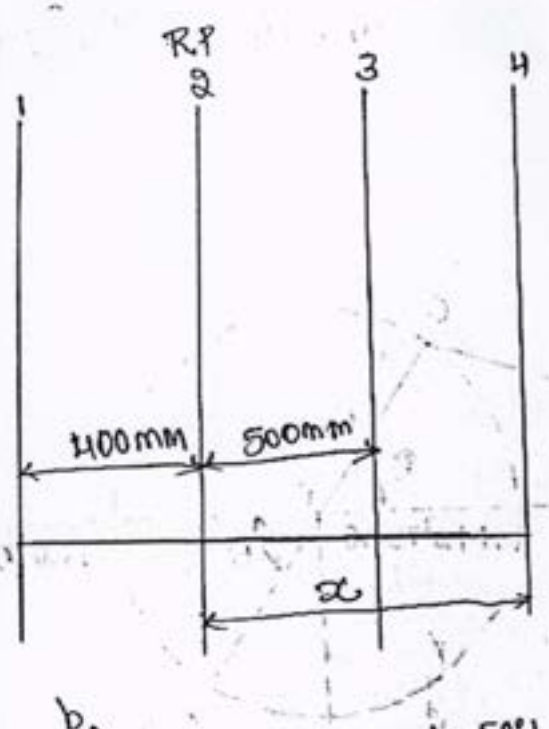
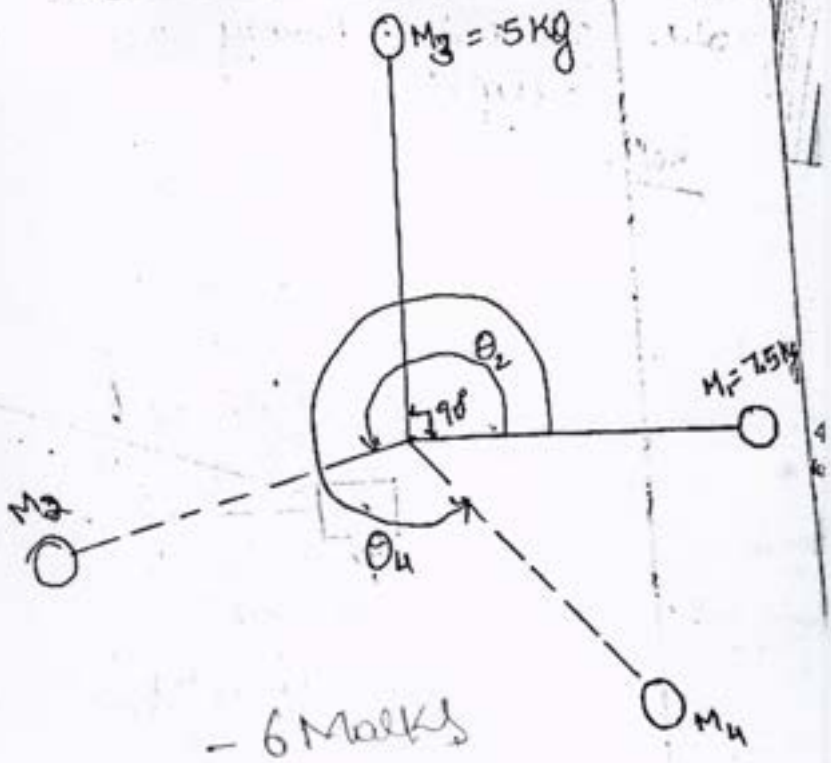
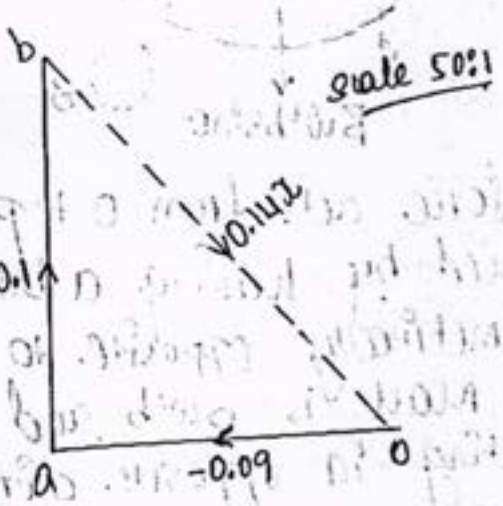
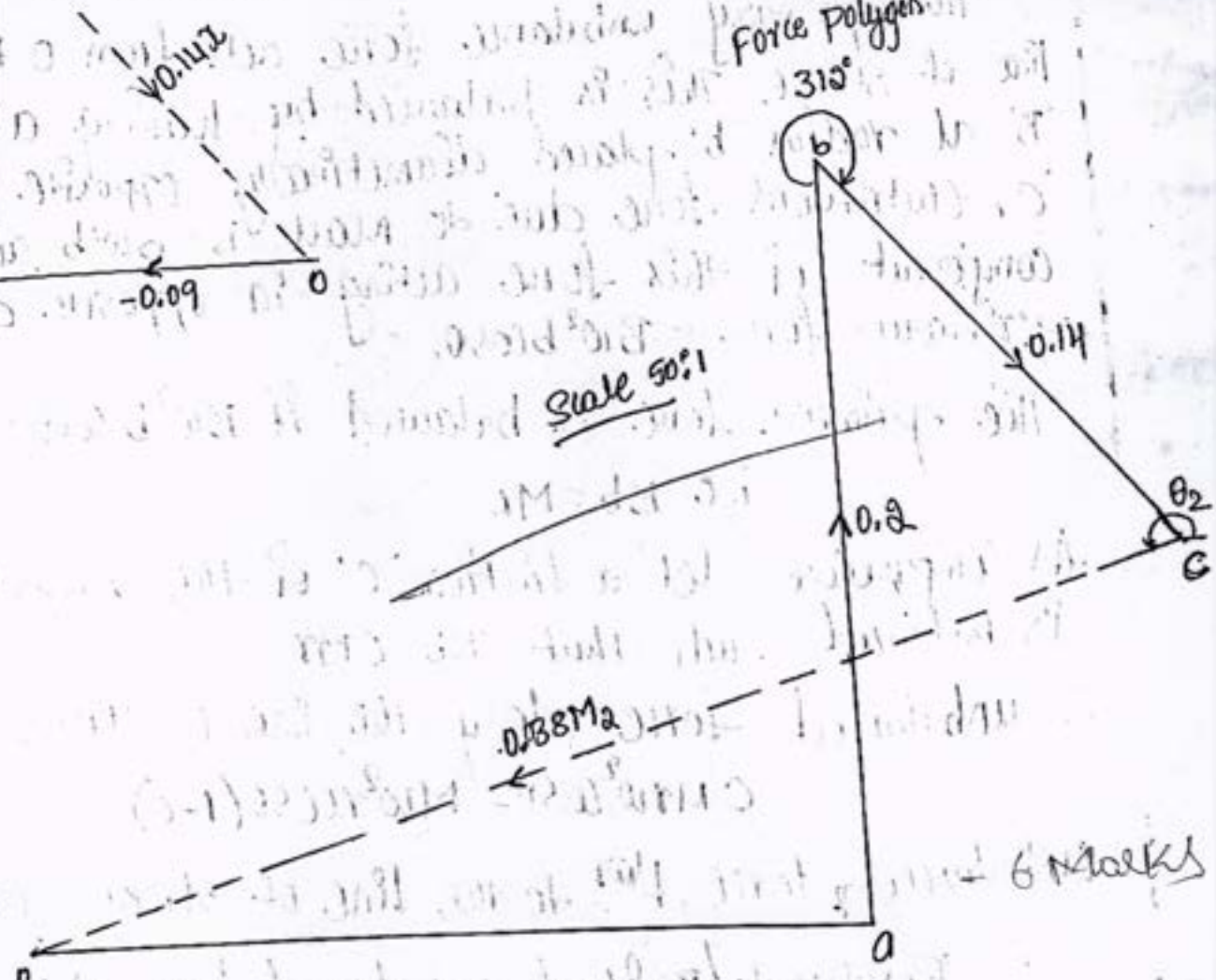




- 6 Marks





- 6 Marks

- 2 Marks

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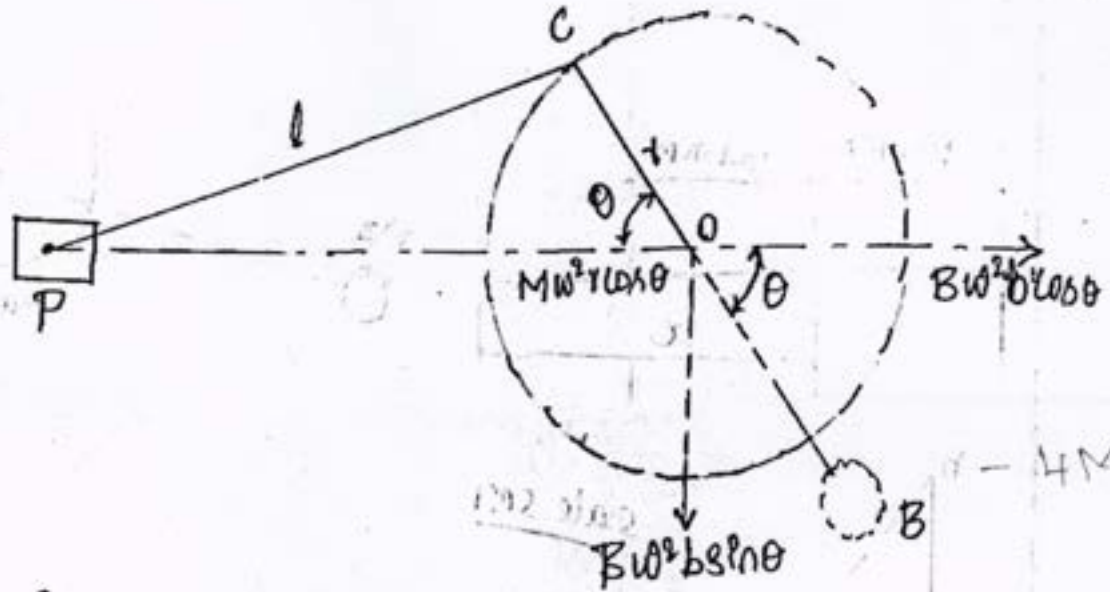
KPC

Discuss primary and secondary unbalance in reciprocating engines.



This primary unbalance force acts from O to P along the line of stroke. This is balanced by having a balancing mass 'B' at radius 'b' placed diametrically opposite to crank pin 'C'. Centrifugal force due to mass $B = B\omega^2 b$ and horizontal component of this force acting in opposite direction of primary force $= B\omega^2 b\cos\theta$.

The primary force is balanced if $B\omega^2 b\cos\theta = M\omega^2 r\cos\theta$

i.e $Bb = Mr$.

A compromise by a fraction 'C' of the reciprocating masses is balanced such that $Bb = CMr$

∴ unbalanced force along the line of stroke $= M\omega^2 r\cos\theta - CMr\omega^2\cos\theta = M\omega^2 r\cos\theta(1-C)$ — 4M

Unbalanced force ⊥ar to the line of stroke $= CMr\omega^2\sin\theta$

∴ Resultant/Residual unbalanced force at any instant

$$= \sqrt{\{M\omega^2 r\cos\theta(1-C)\}^2 + \{CM r\omega^2 \sin\theta\}^2}$$

$$\therefore R.U.F = M\omega^2 r\sqrt{(1-C)^2\cos^2\theta + C^2\sin^2\theta}$$

b. Define.

(i) **Hammer blow:-** Hammer blow is a vertical force which alternately adds to and subtracts from the locomotive weight on wheel.

(ii) **Tractive effort:-** Tractive force is a force that is used to produce motion b/w a body and a tangential surface by using dry friction.

(iii) **Swaying couple:-** The unbalanced force along the line of stroke for the two cylinders constitute a couple about the centerline b/w the cylinders.

C. A six cylinder two stroke single acting diesel engine cylinder centre lines are spaced at 650 mm. In the view the cranks are 60° apart and in order 1-4-2-3-6. The stroke of each piston is 400mm and crank to C.R ratio is 1:5. The mass of reciprocating parts is 100 kg per crank. The engine rotates at 240 rpm. Investigate the engine for out of balance primary and secondary forces and couples.

– 10 Marks

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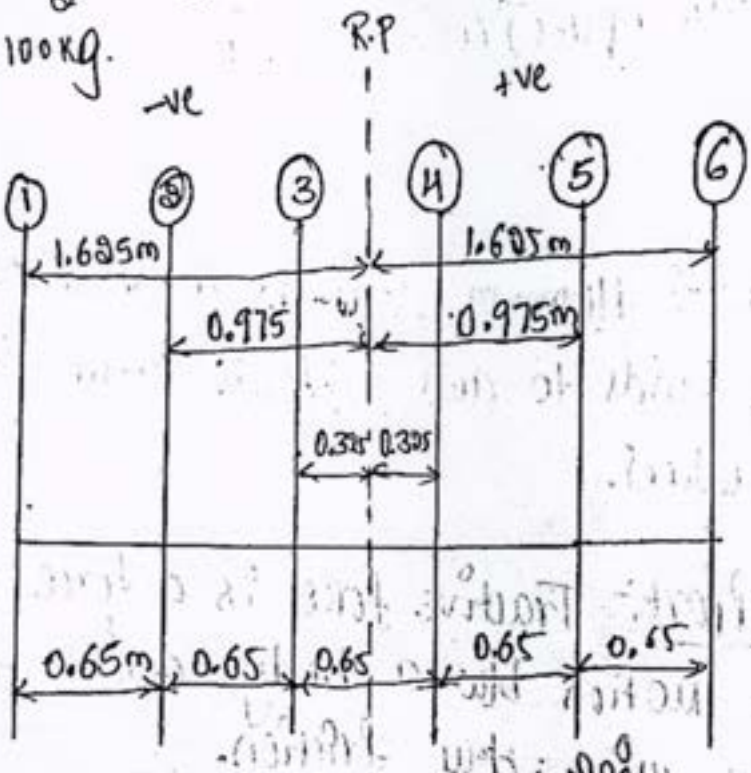
Given

$r = \frac{\text{Stroke}}{2} = \frac{.400}{2} = 200mm = 0.2m$; $n = \frac{}{r}$

$M_1 = 100kg$.



a) Unbalanced Primary forces & couples

Plane	Mass (M) (kg)	Radius (m)	Force $\div \omega^2$	Distance from RP	Couple $\div \omega^2$
1	350	0.2	70	-1.625	-113.75
2	350	0.2	70	-0.975	-68.25
3	350	0.2	70	-0.325	-22.75
4	350	0.2	70	+0.325	+22.75
5	350	0.2	70	+0.975	+68.25
6	350	0.2	70	+1.625	+113.75

= 5 Marks

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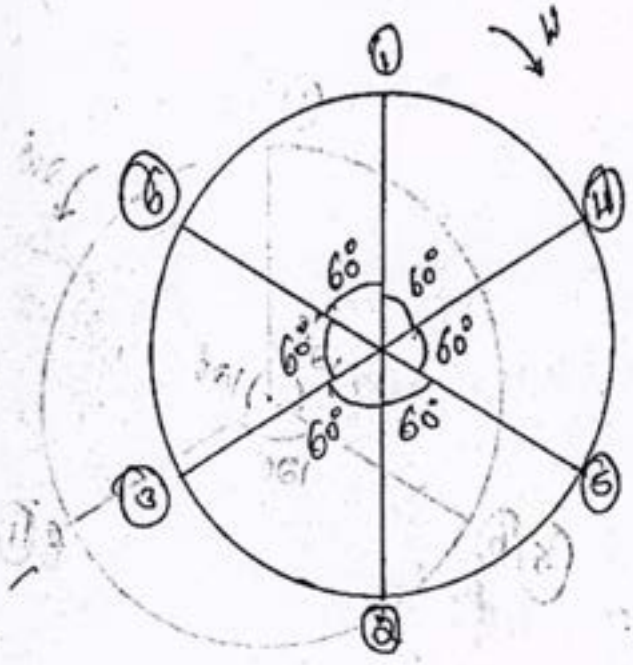
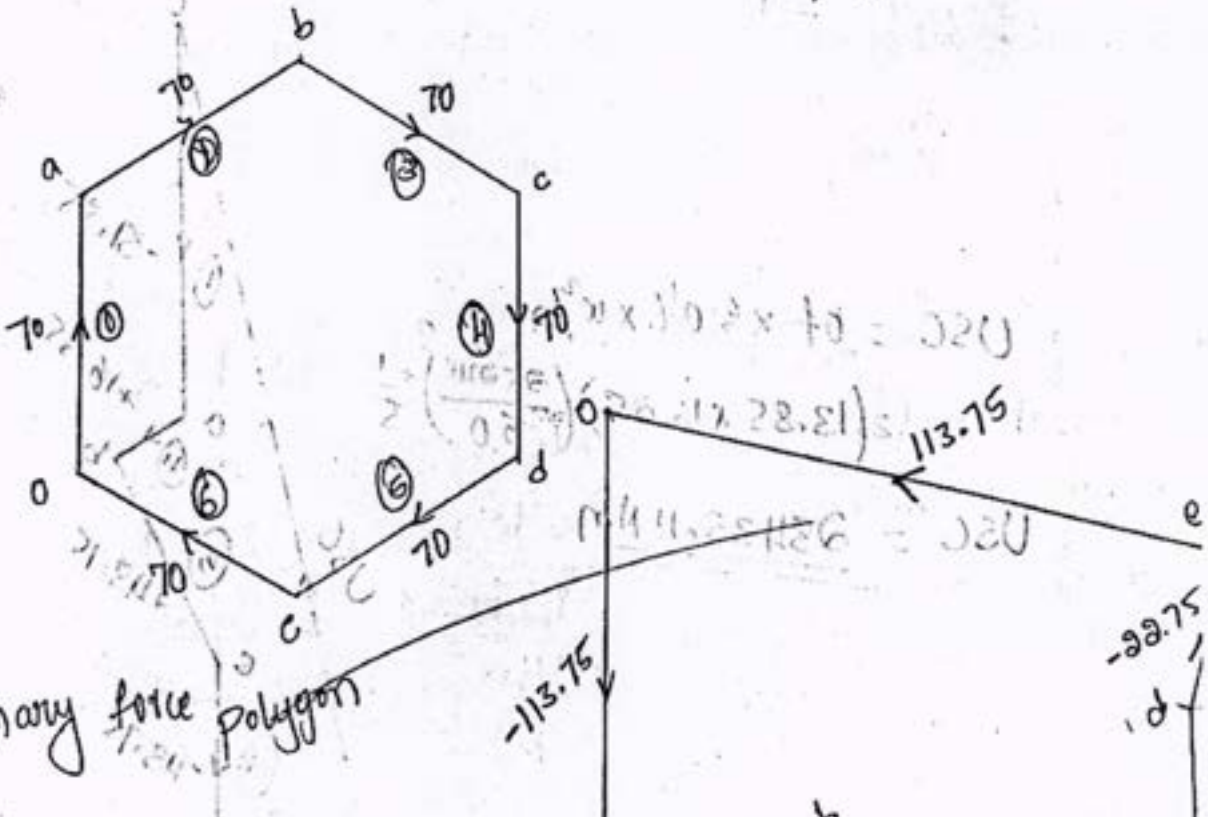


PCP



Primary force Polygon

Primary couple Polygon

The primary force & couple Polygons are closed figures. Hence there are no unbalanced Primary forces & couples.

Marks

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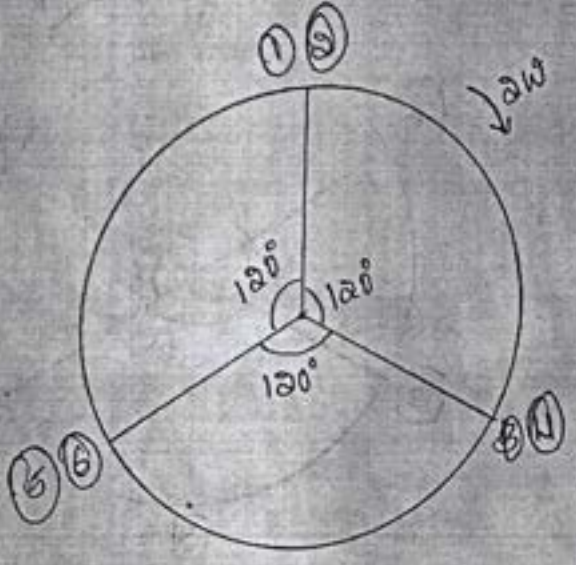
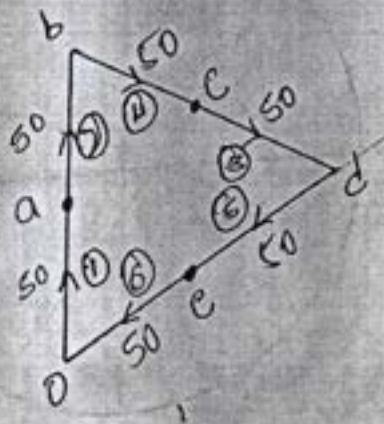
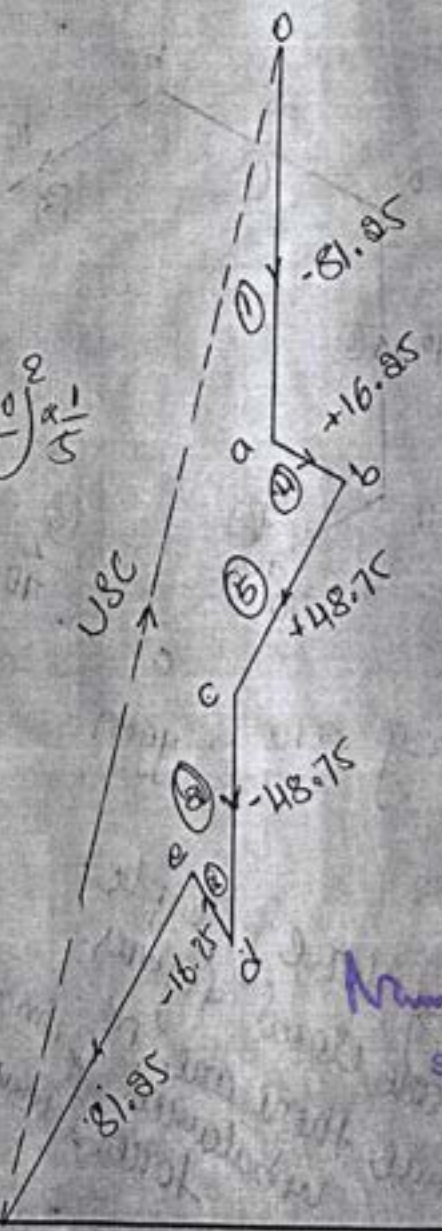
b) unbalanced secondary forces and couples



scp



Scale 1:25



Scale 1:16.25

$USC = \sigma t \times scale \times \omega^2/n$

$= 2(13.85 \times 16.25)\left(\frac{2\pi \times 240}{60}\right)^2 \times \frac{1}{5}$

$USC = 28432.4\ Nm$

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3

a. (i) Hammer blow :- It is a vertical force which alternately adds to and subtracts from the locomotives weight on wheel.

(ii) Tractive effort :- Tractive force is a force that is used to produce motion b/w a body and a tangential surface by using dry friction.

(iii) Swaying couple :- The unbalanced force along the line of stroke for the two cylinders constitute a couple about the centerline YY b/w the cylinde

b. Justify the need of balancing of rotating parts f High speed engines.

Soln The high speed of engines and other machines is common phenomenon now-a-days. It is, therefore, v essential that all the rotating and reciprocating pa should be completely balanced as far as possible. these parts are not properly balanced, the dynam forces are set up. These forces not only increase loads on bearings and stresses in the various memb also produce unpleasant and even dangerous vi The balancing of unbalanced forces is caused by masses, in order to minimize pressure on the mai when an engine is running. — 6 Marks

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY – TUMKUR

DEPARTMENT OF MATHEMATICS

IV-semester: I Internal Assessment Exam: JULY-2023 (22MAT41)

[Time: 90 min] Note: Answer any **2 full** questions choosing one from each part [Max marks:40]

Q.NO.	PART-A	Marks	BLT	
1a.	If P is the pull required to lift a load W by means of a pulley block, find a linear law of the form P=mW+c connecting P and W, using the following data P: 12, 15, 21, 25 W: 50, 70, 100, 120	06	L2	CO3
b.	Find the parabola of the form $y = a + bx + cx^2$ which fits most closely with the observations. x: -3, -2, -1, 0, 1, 2, 3 y: 4.63, 2.11, 0.67, 0.09, 0.63, 2.15, 4.58	07	L2	CO3
c.	Find the coefficient of correlation for the following data x: 92, 89, 87, 86, 83, 77, 70, 63, 53, 50 y: 86, 83, 91, 77, 68, 85, 54, 82, 37, 57	07	L3	CO3
	OR			
2a.	Fit a least square geometric curve $y = ax^b$ for the following data x: 1, 2, 3, 4, 5 y: 0.5, 2, 4.5, 8, 12.5	06	L2	CO3
b.	Find the coefficient of correlation for the following data x: 1, 2, 3, 4, 5 y: 2, 5, 3, 8, 7	07	L2	CO3
c.	If $8x - 10y + 66 = 0$ *and* $40x - 18y = 214$ are two regression lines. Find the mean of x's and y's and the correlation coefficient. Find σ_y *if* $\sigma_x = 3$.	07	L3	CO3

	PART-B			
3 a.	In a partially destroyed laboratory record, only the lines of regression y on x and x on y are available as $4x - 5y + 33 = 0$ *and* $20x - 9y - 107 = 0$ respectively. calculate $\bar{x}, \bar{y}$ and the coefficient correlation between x and y.	06	L2	CO3
b.	A random variable X takes the values -3,-2,-1,0,1,2,3 such that probability $P(x = 0) = P(x < 0)$ *and* $P(x = -3) = P(x = -2) = P(x = -1) = P(x = 1) = P(x = 2) = P(x = 3)$. Find the probability distrubtion.	07	L2	CO4
c.	Derive mean and standard deviation for binomial distrubtion.	07	L2	CO4
	OR			
4 a.	Show that if θ is the angle between the lines of regression $tan\theta = \frac{\sigma_x \sigma_y}{\sigma^2_x \sigma^2_y}\left(\frac{1-r^2}{r}\right)$	06	L2	CO3
b.	Find the mean value of X such that the following distribution represents a finite probability distribution. Hence find its mean and standard deviation. Also find $P(x \leq 1), P(x > 1)$ *and* $P(-1 \leq x \leq 2)$ x: -3, -2, -1, 0, 1, 2, 3 P(x): k, 2k, 3k, 4k, 3k, 2k, 3k	07	L2	CO4
c.	Derive mean and standard deviation for passion distrubtion.	07	L2	CO4

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS

SCHEME OF SOLUTION

ACADEMIC YEAR: 2022-23 IA- IV Sem/ I^st IA SUBJECT CODE:

QUESTION NO.	SOLUTION	MARKS
1. a	Let $P = mw + c \rightarrow (1)$ Normal equation are $\Sigma P = m\Sigma w + nc$ $\Sigma wP = m\Sigma w^2 + c\Sigma w$ $\} \rightarrow (2)$ $n = 4$	

P	w	wP	w^2
12	50	600	2500
15	70	1050	4900
21	100	2100	10000
25	120	3000	14400
$\Sigma P = 73$	$\Sigma w = 340$	$\Sigma = 6750$	$\Sigma = 31800$

→ 3 Marks

From eq^n (2) $73 = 340m + 4c$

$6750 = 31800m + 340c$

$m = 0.19$

$c = 2.28$

(1) $\Rightarrow P = 0.19w + 2.28$

→ 3 Marks

6 Marks

1. b. $y = a + bx + cx^2 \rightarrow (1)$

$\Sigma y = na + b\Sigma x + c\Sigma x^2$

$\Sigma xy = a\Sigma x + b\Sigma x^2 + c\Sigma x^3$ $\} \rightarrow (2)$

$\Sigma x^2 y = a\Sigma x^2 + b\Sigma x^3 + c\Sigma x^4$

$n = 7$

→ 2 Marks

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QUESTION NO.	SOLUTION	MARKS

x	y	x^2	x^3	x^4	xy	x^2y
-3	4.63	9	-27	81	-13.89	41.67
-2	2.11	4	-8	61	-4.29	8.44
-1	0.67	1	-1	1	-0.67	0.67
0	0.09	0	0	0	0	0
1	0.63	1	1	1	0.63	0.63
2	2.15	4	8	16	4.30	8.60
3	4.58	9	27	81	13.74	41.22
$\Sigma x=0$	$\Sigma y=14.86$	28	0	196	-0.11	101.23

→ 3Marks

From ② $\Rightarrow$ $14.86 = 7a + 28c$

$-0.11 = 28b$

$101.23 = 28a + 196c$

$a = 0.13$

$b = 0$

$c = 0.50$

① $\Rightarrow$ $y = 0.13 + 0.50x^2$ → 2Marks

7Marks

1.C We have $r = \dfrac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}}$ $x = x - 75$, $y = y - 72$ → 2Marks

x	y	$X = x-75$	$Y = y-72$	XY	X^2	Y^2
92	86	17	14	238	289	196
89	83	14	11	154	196	121
87	91	12	19	228	144	361
86	77	11	5	55	121	25
83	68	8	-4	-32	64	16
77	85	2	13	26	4	169
70	54	-5	-18	90	25	324
63	82	-12	10	-120	144	100
53	37	-22	-35	770	484	1225
50	57	-25	-15	375	625	225
				1784	2096	2762

→ 3Marks

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QUESTION NO.	SOLUTION	MARKS
	$r = \frac{1754}{\sqrt{2096 \times 2760}}$ $r = 0.74$	→ 2 Marks 7 Marks
2. a.	$y = ax^b$ $\log y = \log a + b \log x$ $Y = A + Bx$ normal eqn are $\Sigma Y = nA + B\Sigma x$ $\Sigma xY = A\Sigma x + B\Sigma x^2$, $n = 5$	→ 2 Marks

x	y	$X = \log x$	$Y = \log y$	XY	X^2
1	0.5	0	-0.69	-0	0
2	2	0.69	0.69	0.48	0.48
3	4.5	1.10	1.50	1.65	1.21
4	8	1.39	2.08	2.89	1.93
5	12.5	1.61	2.53	4.07	2.59
		$\Sigma X = 4.79$	$\Sigma Y = 6.11$	$\Sigma = 9.09$	$\Sigma = 6.21$

→ 3 Marks

$A = -0.69$ but $a = e^A$

$B = 2$ $a = 0.59$, $b = 2$

$y = 0.50x^2$

→ 1 Mark

6 Marks

2. b.	$r = \frac{\Sigma XY}{\sqrt{\Sigma x^2 \Sigma y^2}}$ $X = x - \bar{x}$ $\bar{x} = \frac{\Sigma x}{n} = \frac{15}{5} = 3$ $\bar{x} = x - 3$ $Y = y - \bar{y}$ $\bar{y} = \frac{\Sigma y}{n} = \frac{25}{5} = 5$ $y = y - 5$	→ 2 Marks

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QUESTION NO.	SOLUTION	MARKS

x	y	$X = x-3$	$Y = y-5$	XY	X^2	Y^2
1	2	-2	-3	6	4	9
2	5	-1	0	0	1	0
3	3	0	-2	0	0	4
4	8	1	3	3	1	9
5	7	2	2	4	4	4
				13	10	26

→ 3 Marks

$$r = \frac{10}{\sqrt{10 \times 26}} = \frac{13}{16.12}$$

$$r = 0.81$$

→ 2 Marks

7 Marks

2.c

Let $x = \bar{x}$

$y = \bar{y}$

$$8\bar{x} - 10\bar{y} = -66$$
$$40\bar{x} - 16\bar{y} = 214$$

→ 2 Marks

$\bar{x} = 13$

$\bar{y} = 17$

$r = \pm\sqrt{b_{xy} b_{yx}}$

$r = \pm 0.6$

$r = 0.6$ [∵ coefficient xy are the so $r = +0.6$]

→ 2 Marks

The co-efficient of $\frac{r\sigma_y}{\sigma_x} = 0.8$ & $\frac{r\sigma_x}{\sigma_y} = 0.45$

$\sigma_x = 3$, $\sigma_y = ?$

$\therefore \frac{r\sigma_y}{\sigma_x} = 0.8$

$\sigma_y = \frac{2.4}{0.6}$

$\sigma_y = 4$

→ 3 Marks

7 Marks

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QUESTION NO.	SOLUTION	MARKS
3 a.	$4\bar{x} - 5\bar{y} + 33 = 0$ $20\bar{x} - 9\bar{y} - 107 = 0$ $x = \bar{x}$ $y = \bar{y}$ $\bar{x} = 13$ $\bar{y} = 17$ the coefficient of correlation $r = \pm\sqrt{b_{yx} b_{xy}}$ $= \pm\sqrt{(0.8)(0.45)}$ $r = 0.6$	→ 3 Marks → 3 Marks 6 Marks
3 b.		

x_i	-3	-2	-1	0	1	2	3
$P(x_i)$	P_1	P_2	P_3	P_4	P_5	P_6	P_7

i) $P(x=0) = P(x<0)$

$\Rightarrow P(x=0) = P(x=-3) + P(x=-2) + P(x=-1)$ → 1 Mark

$P_4 = P_1 + P_2 + P_3$

ii) $P(x=-3) = P(-2) = P(-1) = P(1) = P(2) = P(3)$

$P_1 = P_2 = P_3 = P_5 = P_6 = P_7$

$\Rightarrow P_4 = P_1 + P_2 + P_3$

$P_4 = P_1 + P_1 + P_1$ → 2 Marks

$P_4 = 3P_1$ $\quad P_1 = 1/3\, P_4$

x_i	-3	-2	-1	0	1	2	3
$P(x_i)$	0.11	0.11	0.11	0.33	0.11	0.11	0.11

→ 2 Marks

i) $P(x_i) \geq 0$

ii) $\Sigma P(x_i) = 1$

$P_1 + P_1 + P_1 + 3P_1 + P_1 + P_1 + P_1 = 1$

$9P_1 = 1$ → 2 Marks

$P_1 = 1/9 = 0.11$ //

7 Marks

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QUESTION NO.	SOLUTION	MARKS
3.C	**Binomial Distribution :-**	

→ Mean $(\mu) = \sum_{x=0}^{\infty} x \cdot p(x)$

$= \sum_{x=0}^{\infty} x \, {}^nC_x \, p^x q^{n-x}$

$= \sum_{x=0}^{\infty} x \, \frac{n!}{(n-x)!\,x!} \, p^x q^{n-x}$

$= \sum_{x=0}^{\infty} x \, \frac{n(n-1)!}{(n-x)!\,x(x-1)!} \, p^{x-1} p \, q^{(n-1)-(x-1)}$

$= np \sum_{x=1}^{n} \frac{(n-1)!}{(x-1)!\,(n-x)!} \, p^{x-1} q^{(n-1)-(x-1)}$

$= np \, (p+q)^{n-1}$

$= np \, (p+1-p)^{n-1}$

$\boxed{\mu = np}$ → 3marks

Variance, $V = \sum x^2 p(x) - \mu^2 \rightarrow (1)$

Let Now,

$\sum x^2 p(x) = \sum [x(x-1) + x] \, p(x)$

$= \sum_{x=2}^{\infty} x(x-1) p(x) + \sum_{x=0}^{\infty} x \, p(x)$

$= \sum x(x-1) \, {}^nC_x \, p^x q^{n-x} + np$

$= \sum_{x=2}^{n} \frac{n(n-1)(n-2)!}{[(n-2)-(x-2)]!\,(x-2)!} \, p^{x-2} p^2 q^{(n-2)-(x-2)} + np$

$= p^2 n(n-1) \sum_{x=2}^{n} \frac{(n-2)!}{(x-2)![(n-2)-(x-2)]} + np$

$= n(n-1) p^2 \, (p+q)^{n-2} + np$

$\sum x^2 f(x) = n^2 p^2 - np^2 + np$

(1) ⇒ $\boxed{V = npq}$ → 4marks

7Marks

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QUESTION NO.	SOLUTION	MARKS
	S.D, $\sigma = \sqrt{V}$ $\sigma = \sqrt{npq}$	
4. a	y on x $y - \bar{y} = b_{yx}(x - \bar{x})$ $m_1 = b_{yx}$ $m_1 = r\frac{\sigma_y}{\sigma_x}$ x on y $x - \bar{x} = b_{xy}(y - \bar{y})$ $m_2 = \frac{1}{b_{xy}}$ $m_2 = \frac{1}{r}\frac{\sigma_y}{\sigma_y}$ Consider angle b/w straight line is, $\tan\theta = \frac{m_2 - m_1}{1 + m_1 m_2}$ $= \frac{\frac{1}{r}\frac{\sigma_y}{\sigma_x} - r\frac{\sigma_y}{\sigma_x}}{1 + \left(r\frac{\sigma_y}{\sigma_x}\right)\left(\frac{1}{r}\frac{\sigma_y}{\sigma_x}\right)}$ $= \frac{\frac{\sigma_y}{\sigma_x}\left(\frac{1}{r} - 1\right)}{1 + \frac{\sigma_y^2}{\sigma_x^2}}$ $= \frac{\frac{\sigma_y}{\sigma_x}\left(\frac{1 - r^2}{r}\right)}{\frac{\sigma_x^2 + \sigma_y^2}{\sigma_x^2}}$ $= \frac{\sigma_y}{\sigma_x}\left(\frac{1 - r^2}{r}\right) \times \frac{\sigma_x^2}{\sigma_x^2 + \sigma_y^2}$ $\tan\theta = \left(\frac{1 - r^2}{r}\right)\frac{\sigma_y \sigma_x}{\sigma_x^2 + \sigma_y^2}$ → 2 marks → 4 Marks	6 Marks

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QUESTION NO.	SOLUTION	MARKS

4. b

w.k.t i) $P(x_i) \geq 0$ if $k \geq 0$

ii) $\sum P(x_i) = 1$

$k + 2k + 3k + 4k + 2k + 3k + k = 1$

$k = 1/18$

x_i	-3	-2	-1	0	1	2	3
$P(x_i)$	1/18	2/18	3/18	4/18	3/18	2/18	1/18

→ 2 Marks

a) Mean $(\mu) = \sum x_i P(x_i)$

$\mu = 0$

b) Variance $(V) = \sum x_i^2 P(x_i) - \mu^2$

$V = 2.50$

c) S.D $(\sigma) = \sqrt{V}$

$= \sqrt{2.50}$

$= 1.58$

d) $P(x \leq 1) = P(-3) + P(-2) + P(-1) + P(0) + P(1)$

$= 13/16$

e) $P(x > 1) = P(2) + P(3)$

$= 3/16$

f) $P(-1 \leq x \leq 2) = P(-1) + P(0) + P(1) + P(2)$

$= 3/4$

→ 5 Marks

7 Marks

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QUESTION NO.	SOLUTION	MARKS
4. C.	Mean $(\mu) = \sum x\, p(x)$	

$$= \sum_{x=0}^{\infty} x \frac{m^x e^{-m}}{x!}$$

$$= \sum_{x=0}^{\infty} x \frac{m^x e^{-m}}{x(x-1)!}$$

$$= m e^{-m} \sum_{x=1}^{\infty} \frac{m^{x-1}}{(x-1)!}$$

$$= m e^{-m} \left[1 + m + \frac{m^2}{2!} + \cdots\right]$$

$$= m e^{-m} [e^m]$$

$$\boxed{\mu = m}$$

→ 3 Marks

Variance, $(V) = \sum x^2 p(x) - \mu^2 \longrightarrow (1)$

Now, $\sum x^2 p(x) = \sum_{x=0}^{\infty} [x(x-1) + x]\, p(x)$

$$= \sum_{x=0}^{\infty} x(x-1) p(x) + \sum_{x=0}^{\infty} x\, p(x)$$

$$= \sum_{x=0}^{\infty} x(x-1) \frac{m^x e^{-m}}{x!} + m$$

$$= \sum_{x=0}^{\infty} x(x-1) \frac{m^x e^{-m}}{x(x-1)(x-2)!} + m$$

$$= m^2 e^{-m} \sum_{x=2}^{\infty} \frac{m^{x-2}}{(x-2)!} + m$$

$$= m^2 e^{-m} \left[1 + \frac{m}{1!} + \frac{m^2}{2!} + \cdots\right] + m$$

$$\sum x^2 p(x) = m^2 e^{-m} (e^m) + m$$

$(1) \Rightarrow V = m^2 + m - m^2$

$$\boxed{V = m}$$

→ 4 Marks

7 Marks

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QUESTION NO.	SOLUTION	MARKS
	Standard deviation S.D (σ) = $\sqrt{V}$ = $\sqrt{m}$ Thus mean (μ) = m Variance (V) = m S.D = $\sqrt{m}$	

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Test Coordinator:-
Pramod

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SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY – TUMKUR

DEPARTMENT OF MATHEMATICS

IV-semester: II Internal Assessment Exam: AUGUST-2023

Mathematics-IV (**21MAT41**)

[Time: 90 min] **Note:** Answer any **2 full** questions choosing one from each part [Max marks:40]

Q. NO.	PART-A	Marks	BLT	
1a.	If the mean and standard deviation of the number of correctly answered question in a test given to 4096 students are 2.5 and $\sqrt{1.875}$. Find an estimate of the number of candidates answering correctly (i) 8 or more question (ii) 2 or less (iii) 5 questions.	06	L2	CO5
b.	A 4 coins are tossed 100 times and the following result were obtained. Fit a binomial distribution for the data and calculate the theoretical frequencies. Number of heads: 0 | 1 | 2 | 3 | 4 Frequency: 5 | 29 | 36 | 25 | 5	07	L2	CO5
c.	In a certain factory turning out razor blades there is a small probability of 1/500 for any blade to be defective. The blades are supplied in a packets of 10. Use poisson distrubtion to calculate the approximate number of packets containing (i) no defective (ii) one defective (iii) two defective blades in a consignment of 10,000 packets.	07	L1	CO2
	OR			
2a.	In 800 families with 5 children each how many families would be expected to have (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys (iv) atmost 2 girls by assuming probabilities for boys and girls to be equal.	06	L2	CO5
b.	The number of accidents per day(x) as recorded in a textile industry over a period of 400 days is given. Fit a poisson distribution for the data and calculate the theoretical frequencies. x: 0 | 1 | 2 | 3 | 4 | 5 f: 173 | 168 | 37 | 18 | 3 | 1	07	L2	CO5
c.	2% of the fuses manufactured by a firm are found to be defective. Find the probability that a box containing 200 fuses contains (i) no defective fuses (ii) 3 or more defective fuses.	07	L1	CO2

	PART-B			
3 a.	Find the constant k such that $f(x) = \begin{cases} kx^2, 0 < x < 3 \\ 0 \quad otherwise \end{cases}$ is a p.d.f Also compute (i) $P(1 < x < 2)$ (ii)$P(x \leq 1)$ (iii)$P(x > 1)$ (iv) Mean (v) Variance	06	L1	CO4
b.	The marks of 1000 student in an examination follows a normal distribution with mean 70 and standard deviation 5.Find the number of student whose marks will be(i)less than 65 (ii)more than 75 (iii) between 65 and 75 [given: $\emptyset(1) = 0.3413$]	07	L1	CO4
c.	The joint distribution of two random variable X and Y is as follow | | -4 | 2 | 7 | | 1 | 1/8 | 1/4 | 1/8 | | 5 | 1/4 | 1/8 | 1/8 | compute the following 1) E(x) & E(y) 2) E(XY) 3) σ_x & σ_y 4) Cov(X,Y) 5) $\rho(X,Y)$	07	L1	CO5
	OR			
4 a.	If x is a normal variate with mean 30 and standard deviation 5 find the probability that $(i)\ 26 \leq x \leq 40$ $(ii)x \geq 45$	06	L1	CO4
b.	In a normal distribution 31% of the items are under 45 and 8% of the items are over 64. Find the mean and S.D of the distribution. [Given: $\emptyset(0.5) = 0.19$, $\emptyset(1.4) = 0.42$]	07	L1	CO4
c.	The joint Probability distribution of two discrete random variable X & Y is given by $f(x,y) = k(2x + y)$ where x and y are integer such that $0 \leq x \leq 2$ *and* $0 \leq y \leq 3$ i) Find the value of constant k ii) marginal probability distribution of x & y iii) Show that the random variable X and Y are dependent iv) compute E(x), E(y), E(xy), $E(x^2)$, $E(y^2)$, σ_x, σ_y	07	L2	CO5

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SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS

II year - IV - Sem
SCHEME OF SOLUTION

ACADEMIC YEAR 2022-23 IA- II SUBJECT CODE: 21MAT41

14/08/2023

QUESTION NO.	SOLUTION	MARKS
1] a.	we have $\mu = np$ $\sigma = \sqrt{npq}$ By data $np = 2.5$ and $\sqrt{npq} = \sqrt{1.875}$ $npq = 1.875$ $2.5q = 1.875$ $\therefore q = 0.75$; $p = 1-q = 0.25$ Since $np = 2.5$ we have $(0.25)n = 2.5$ $\therefore n = 10$ Let x denote the number of correctly answered question $P(x) = {}^{n}C_x\, p^x q^{n-x}$ $= {}^{10}C_x\,(1/4)^x (3/4)^{10-x}$ $4096\, P(x) = {}^{10}C_x\,(1/4)^x (3/4)^{10-x}$ → 2 marks i) we have to find $f(8) + f(9) + f(10)$ $P(x) = {}^{10}C_8\,(1/4)^8 (3/4)^{10-8} + {}^{10}C_9\,(1/4)^9 (3/4)^{10-9} + {}^{10}C_{10}\,(1/4)^{10} (3/4)^{10-10}$ $= 436 \times 4096$ $= 1.703$ ≈ 2 → 2 marks ii) we have to find $f(2) + f(1) + f(0)$ $P(x) = {}^{10}C_2\,(1/4)^2 (3/4)^{10-2} + {}^{10}C_1\,(1/4)^1 (3/4)^{10-1} + {}^{10}C_1\,(1/4)^1 (3/4)^{10-0}$ $= 4096 \times 64$ $= 2152.9$ ≈ 2153 → 1 mark	

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QUESTION NO.	SOLUTION	MARKS
	iii) we have to find $f(5)$ $P(x) = {}^{10}C_5 (1/4)^5 (3/4)^{10-5}$ $= 239.3$ ≈ 239	→ 1 Marks 6 Marks
b	Let x denote the number of heads and f the corresponding frequency. $\text{Mean}(\mu) = \frac{\Sigma fx}{\Sigma f} = \frac{0+29+72+75+20}{100} = \frac{196}{100}$ $= 1.96$	→ 2 Marks
	But $\mu = np$, $n = 4$ $1.96 = 4P$ $P = 0.49$, $q = 1-P = 0.51$ Binomial distribution is given by, $P(x) = {}^nC_x\, p^x q^{n-x} = {}^4C_x (0.49)^x (0.51)^{4-x}$ $\therefore F(x) = 100\, P(x)$ $= 100\, {}^4C_x (0.49)^x (0.51)^{4-x}$	→ 2 Marks
	where $x = 0, 1, 2, 3, 4$ $F(0) = 100.(0.51)^4 = 6.765 \approx 7$ $F(1) = 100.{}^4C_1 (0.49)(0.51)^3 = 25.999 \approx 26$ $F(2) = 100.{}^4C_2 (0.49)^2 (0.51)^2 = 37.47 \approx 37$ $F(3) = 100.{}^4C_3 (0.49)^3 (0.51) = 24.0004 \approx 24$ $F(4) = 100.{}^4C_4 (0.49)^4 = 5.765 \approx 6$ Thus the required theoretical frequencies are 7, 26, 37, 24, 6	→ 3 marks 7 Marks

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QUESTION NO.	SOLUTION	MARKS
c.	p = probability of a defective blade $= 1/500 = 0.002$ $m = np = 10 \times 0.002 = 0.02$ Poisson distribution is $P(x) = \frac{m^x e^{-m}}{x!}$ $= \frac{e^{-0.02}(0.02)^x}{x!}$ $\therefore f(x) = \frac{9802(0.2)^x}{x!}$ → 3 marks i) Probability of no defective $= f(0) = 9802$ ii) Probability of one defective $= f(1) = 9802(0.02)$ ≈ 196 iii) Probability of two defective $= f(2) = \frac{9802(0.02)^2}{2!}$ ≈ 2 → 4 marks 7 marks	
2) a.	p = Probability of boys $= 1/2$ q = probability of girls $= 1/2$ Let x denote the number of boys in the family. $P(x) = {}^nC_x\, p^x q^{n-x}$ $\therefore n = 5$ $P(x) = {}^5C_x\, (1/2)^x (1/2)^{5-x}$ $\therefore 800\, P(x) = 800 \times \frac{{}^5C_x}{32} = 25 \cdot {}^5C_x$ i) we have to find $f(3)$ $f(3) = 25 \cdot {}^5C_3 = 25 \times 10 = 250$ → 3 marks ii) we have to find $f(0)$ $f(0) = 25\, {}^5C_0 = 25 \times 1 = 25$ → 1 mark	

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QUESTION NO.	SOLUTION	MARKS
	iii) we have to find $f(2)+f(3)$ $= 25 \cdot {}^5C_2 + 25\ {}^5C_3 = 50 \cdot {}^5C_2$ $= 50 \times 10$ $= 500$	→ 1 Mark
	iv) At most 2 girls means that, families can have 5 boys and 0 girls or 4 boys and 1 girls or 3 boys and 2 girls. to find $f(5)+f(4)+f(3)$ $= 25\ {}^5C_5 + 25\ {}^5C_4 + 25\ {}^5C_3$ $= 25 \times 16$ $= 400$	→ 1 Mark 6 Marks
b.	we have poisson distribution; Mean $(\mu) = m = \frac{\Sigma fx}{\Sigma f} = \frac{0+168+74+54+12+5}{400} = 0.7825$ $\therefore P(x) = \frac{m^x e^{-m}}{x!}$ $f(x) = 400\,P(x)$ $= 400\ \frac{(0.7825)^x e^{-0.7825}}{x!}$ $f(x) = 182.9\ \frac{(0.7825)^x}{x!}$ to find $x = 0,1,2,3,4,5$ in $f(x)$ $f(0) = (182.9)(1) \approx 183$; $f(1) \approx 143$ $f(2) = (182.9)\frac{(0.7825)^2}{2} \approx 56$; $f(3) \approx 15$ $f(4) \approx 3$, $f(5) \approx 0$ $\therefore$ 183, 143, 56, 15, 3, 0 are the frequency	→ 2 Marks → 2 Marks → 3 Marks 7 Marks

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QUESTION NO.	SOLUTION	MARKS
2. c	p = probability of a defective fuse $= \frac{2}{100} = 0.02$ $\mu = m = np = 200 \times 0.02$ $= 4$ $\therefore P(x) = \frac{m^x e^{-m}}{x!}$ i.e., $P(x) = \frac{4^x e^{-4}}{4x!}$ but $e^{-4} = 0.0183$ $P(x) = 0.0183 \cdot \frac{4^x}{x!}$	→ 4 marks
	i) probability of no defective fuse = $P(0) = 0.0183$	→ 1 mark
	ii) probability of 3 or more defective fuses $= 1 - [P(0) + P(1) + P(2)]$ $= 1 - 0.0163(1+4+8)$ ≈ 0.7621	→ 2 marks 7 Marks
3] a	$f(x) \geq 0$ if $K \geq 0$ we have $\int_{-\infty}^{\infty} f(x)\,dx = 1$ i.e., $\int_0^3 Kx^2\,dx = 1 \Rightarrow \left[\frac{Kx^3}{3}\right]_0^3 = 1$ $9K = 1$ $\therefore K = 1/9$	→ 2 marks
	i) $P(1<x<2) = \int_1^2 f(x)dx = \int_1^2 \frac{x^2}{9}\,dx = 7/27$	→ 1 mark
	ii) $P(x \leq 1) = \int_0^1 \frac{x^2}{9}\,dx = \left[\frac{x^3}{27}\right]_0^1 = 1/27$	

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QUESTION NO.	SOLUTION	MARKS
	iii) $P(x>1) = \int_1^3 \frac{x^2}{9}\,dx = \left[\frac{x^3}{27}\right]_1^3 = \frac{26}{27}$ iv) $\text{Mean} = \mu = \int_{-\infty}^{\infty} x \cdot f(x)\,dx = \int_0^3 x \cdot \frac{x^2}{9} = \frac{81}{36} = \frac{9}{4}$ v) $V = \int_{-\infty}^{\infty} x^2 f(x)\,dx - (\mu)^2$ $= \int_0^3 x^2 \cdot \frac{x^2}{9}\,dx - \left[9/4\right]^2$ $= \frac{27}{80}$	2 Marks → 1 Mark 6 Marks
3 b.	Let x represent the marks of student. By data, $\mu = 70$, $\sigma = 5$ $z = \frac{x-\mu}{\sigma} = \frac{x-70}{5}$ → 1 Mark i) if $x = 65$, $z = -1$ $P(z<-1) = P(z>1)$ $= P(z\geq 0) - P(0<z<1)$ $= 0.5 - \phi(1)$ $= 0.5 - 0.3413$ $= 0.1587$ $\therefore 1000 \times 0.1587$ $= 158.7 \approx 159$ → 2 Marks ii) if $x = 75$, $z = 1$ $P(z>1) = P(z\geq 0) - P(0<z<1)$ $= 0.5 - \phi(1)$ $= 0.5 - 0.3413 \Rightarrow 0.1587$ $\therefore 1000 \times 0.1587 = 158.7 \approx 159$ → 2 Marks	

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QUESTION NO.	SOLUTION	MARKS
	iii) We have to find $P(-1<z<1)$ $P(-1<z<1) = 2P(0<z<1)$ $= 2\phi(1)$ $= 2(0.3413) \Rightarrow 0.6826$ $\therefore 1000 \times 0.6826$ $= 682.6$ ≈ 683	→ 2 Marks 7 Marks
3 c.	a) $E(x) = \sum x_i f(x_i)$ $= 1(0.50) + 5(0.50)$ $E(x) = 3$	→ 1 Mark
	ii) $E(y) = \sum y_j g(y_j)$ $= -4(0.38) + 2(0.38) + 7(0.25)$ $= 0.99$	→ 1 Mark
	iii) $E[xy] = \sum x_i y_j J_{ij}$ $= \sum x_i y_j f(x_i) g(y_j)$ $= 1.50$	→ 1 Mark
	iv) $\sigma_x^2 = E(x^2) - \mu_x^2$ $[\because \mu_x = E(x)]$ $= \sum x_i^2 f(x_i) - 3^2$ $\sigma_x^2 = 4$ $\sigma_x = 2$ and $\sigma_y^2 = E(y^2) - \mu_y^2$ $= \sum y_j^2 g(y_j) - (0.99)^2$ $\sigma_y = 4.34$	→ 2 Marks

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QUESTION NO.	SOLUTION	MARKS
	v) $Cov(x,y) = E[xy] - \mu_x \mu_y$ $= 1.50 - (3)(0.99)$ $= -1.47$ vi) $\rho(x,y) = \frac{Cov(x,y)}{\sigma_x \sigma_y} = \frac{-1.47}{2 \times 4.34} = -0.17$	→ 2 Marks 7 Marks
4] a	We have standard normal variate $z = \frac{x-\mu}{\sigma} = \frac{x-30}{5}$ i) To find $P(26 \le x \le 40)$ if $x = 26$, $z = -0.8$ if $x = 40$, $z = 2$ $P(-0.8 \le z \le 2) = P(-0.8 \le z \le 0) + P(0 \le z \le 2)$ $= P(0 \le z \le 0.8) + P(0 \le z \le 2)$ $= \phi(0.8) + \phi(2)$ $= 0.7653$ ii) To find $P(x \ge 45)$ if $x = 45$, $z = 3$ $P(z \ge 3) = P(z \ge 0) - P(z \le 3)$ $= 0.5 - \phi(3)$ $= 0.0013$	→ 1 Mark → 3 Marks → 2 Marks 6 Marks
4. b	By data, $P(x < 45) = 0.31$ & $P(x > 64) = 0.08$ $z = \frac{x-\mu}{\sigma}$ when $x = 45$, $z = \frac{45-\mu}{\sigma} = z_1$ $x = 64$, $z = \frac{64-\mu}{\sigma} = z_2$	→ 2 Marks

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we have, $P(z < z_1) = 0.31$ & $P(z > z_2) = 0.08$

$\phi(z_1) = -0.19$ & $\phi(z_2) = 0.42$

$\phi(z_1) = -\phi(0.5)$ & $\phi(z_2) = \phi(1.4)$ → 2 marks

$z_1 = -0.5$ & $z_2 = 1.4$

$\frac{45-\mu}{\sigma} = -0.5$ & $\frac{64-\mu}{\sigma} = 1.4$

$\mu - 0.5\sigma = 45$ & $\mu + 1.4\sigma = 64$

By solving we get $\mu = 50$, $\sigma = 10$ → 3 marks

7 Marks

4.C

Let $X = \{0, 1, 2\}$ $\quad f(x, y) = K(2x + y)$

$Y = \{0, 1, 2, 3\}$

x \ y	0	1	2	3	f(xi)
0	0	K	2K	3K	6K
1	2K	3K	4K	5K	14K
2	4K	5K	6K	7K	22K
g(yj)	6K	9K	12K	15K	42K

w.k.t $42K = 1$

$K = 1/42$

$K = 0.02$

x \ y	0	1	2	3
0	0	0.02	0.04	0.06
1	0.04	0.06	0.08	0.10
2	0.08	0.10	0.12	0.14

f) marginal distribution of X

X = xi	0	1	2
f(xi)	0.12	0.26	0.44

marginal distribution of Y

Y = yj	0	1	2	3
g(yj)	0.12	0.18	0.24	0.30

→ 2 marks

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ii) $J_{ij} = f(x_i)g(y_j)$

$J_{12} = 0.02$

$f(x_1) = 0.12$

$g(y_2) = 0.16$

$\therefore 0.02 = 0.12 \times 0.16$

$0.02 = 0.02$

$\therefore$ It is independent variable. → 1 Marks

iii)

- $E(x) = \sum x_i f(x_i)$
  $= 1.16$

- $E(y) = \sum y_j g(y_j)$
  $= 1.56$

- $E(xy) = \sum x_i y_j J_{ij}$
  $= \sum x_i y_j f(x_i) g(y_j)$
  $= 2.04$

- $\sigma_x^2 = E(x^2) - [E(x)]^2$
  $= \sum x_i^2 f(x_i) - (E(x))^2$
  $= 0.67$

- $\sigma_y^2 = E(y^2) - (E(y))^2$
  $= \sum y_i^2 g(y_j) - (E(y))^2$
  $= 1.19$ → 3 marks

- $Cov(x,y) = E(xy) - E(x)E(y)$
  $= 0.23$

- $\rho(x,y) = \frac{Cov(x,y)}{\sigma_x \sigma_y} = 0.24$

→ 2 Marks

7 Marks

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ARTIFICIAL INTELLENGENCE AND DATA SCIENCE

INTERNAL ASSESMENT TEST: II

SUB: Operating System (21CS44)

SEM: 4th sem

MAX MARKS :40

TIME : 90 min

1	a	What is Critical section problem? What are the requirements to satisfy the critical section?	CO2	4
	b	Illustrate Peterson solution problem for critical section problem	CO2	6
	c	What is a Semaphore? State a Dining Philosophers problem give the solution using monitors	CO2	10
		OR		
2	a	Explain Multithreading model with Threading issues	CO2	06
	b	What is Dispatcher and Dispatch latency? Explain the criteria used to select the scheduling algorithm	CO2	04
	c	Calculate Average waiting time by drawing Gantt chart using FCFS,SRTF,RR(Tq=2ms),Priority Scheduling	CO2	10

Process	Arrival Time	Service Time	Priority
P1	0	9	3
P2	1	4	2
P3	2	9	1
P4	3	5	4

3	a	What is Deadlock? explain necessary condition for deadlock to occur	CO3	4
	b.	Explain in detail how to find deadlock detection and recover from the deadlock	CO3	6
	c	Determine whether the following system leads safe state by using Bankers algorithm for the snapshot given below	CO3	10

Process	Allocation			MAX			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	3	2	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

If a request from P1 arrives for 1 0 2 can the requested to be granted immediately

		OR		
4	a	Explain in detail about Readers writers problem and short notes about monitors	CO2	8
	b	Explain in detail how deadlock can be prevented	CO2	6
	c	Explain Producer Consumer Problem with short notes about Synchronization hardware	CO2	6

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ESTD: 2002
ESTD: 2002
20 YEARS Academic Excellence

ARTIFICIAL INTELLENGENCE AND DATA SCIENCE

INTERNAL ASSESMENT TEST:II
SUB: Operating System (21CS44) **MAX MARKS** :40
SEM: 4th sem **TIME** : 90 min

1	a	What is Critical section problem? What are the requirements to satisfy the critical section.	CO2	4
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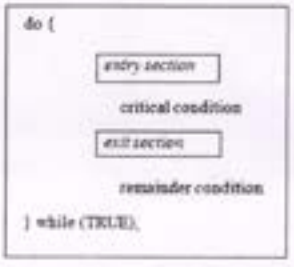
Process	Arrival Time	Service Time	Priority
P1	0	9	3
P2	1	4	2
P3	2	9	1
P4	3	5	4

Operating System(21CS44)-IA-1I SCHEME AND SOLUTIONS

1	a	What is Critical section problem? What are the requirements to satisfy the critical section.	CO2	4

- Each process must request permission to enter its critical section. The section of codeimplementing this request is the **entry section**.
- The critical section may be followed by an **exit section**. The remaining code is the **reminder section**.



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A solution to the critical-section problem must satisfy the following **three requirements**:

1. **Mutual exclusion:**If process Pi is executing in its critical section, then no other processes can be executing in their critical sections.
2. **Progress:**If no process is executing in its critical section and some processes wish to enter their critical sections, then only those processes that are not executing in their remainder sections can participate in deciding which will enter its critical section next, and this selection cannot be postponed indefinitely.
3. **Bounded waiting:** There exists a bound, or limit, on the number of times that other processes are allowed to enter their critical sections after a process has made a request to enter its critical section and before that request is granted

b	Illustrate Peterson solution problem for critical section problem	CO2	6

Peterson's solution provides a good algorithmic description of solving the critical-section problem

```
do {
        flag[i] = TRUE;
        turn = j;
        while (flag[j] && turn == j)
                ; // do
         nothingcritical section
        flag[i] = FALSE;

                remainder
                 section

    } while (TRUE);
```

and illustrates some of the complexities involved in designing software that addresses the requirements of mutual exclusion, progress, and bounded waiting

What is a Semaphore? State a Dining Philosophers problem give the solution using monitors	CO2	10

- A semaphore is a synchronization tool is used solve various synchronization problem and can be implemented efficiently.
- Semaphore do not require busy waiting.
- A semaphore S is an integer variable that, is accessed only through two standard atomic operations: wait () and signal (). The wait () operation was originallytermed P and signal() was called V.

```
monitor DP
{
        enum { THINKING; HUNGRY, EATING) state [5] ;
        condition self [5];
        void pickup (int i) {
        state[i] = HUNGRY;
        test(i);
        if (state[i] != EATING)
                self [i].wait;
}
void putdown (int i)
{
        state[i] = THINKING;
        // test left and right neighbors
        test((i + 4) % 5);
        test((i + 1) % 5);
}
void test (int i)
{
        if((state[(i+4)%5]!=EATING)&&(state[i]==HUNGRY)&&(state[(i+1)%5]!=EATING))
        {
                state[i] = EATING ;
                self[i].signal () ;
        }
}
```

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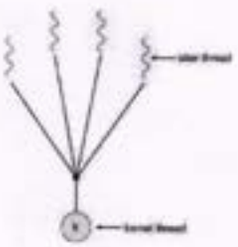
2	a	Explain Multithreading model with Threading issues	CO2	06

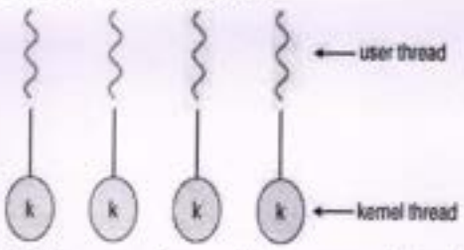
- Three ways of establishing relationship between user-threads &kernel-threads:
  1. Many-to-one model
  2. One-to-one model and
  3. Many-to-many model

Many-to-One Model

- Many user-level threads are mapped to one kernel thread.



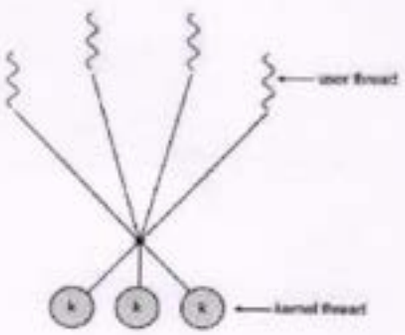
One-to-One Model

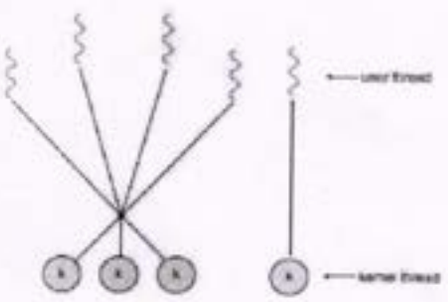


- Each user thread is mapped to a kernel thread.

Many-to-Many Model

Many user-level threads are multiplexed to a smaller number of kernel threads





THREADING ISSUES

- **fork() and exec() System-calls**
- **Thread Cancellation**
- **Signal Handling**

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b	What is Dispatcher and Dispatch latency? Explain the criteria used to select the scheduling algorithm	CO2	04

Dispatcher

- It gives control of the CPU to the process selected by the short-term scheduler.
- The function involves:
    1. Switching context
    2. Switching to user mode&
    3. Jumping to the proper location in the user program to restart that program
- It should be as fast as possible, since it is invoked during every process switch.
- ***Dispatch latency*** means the time taken by the dispatcher to
    - stop one process and
    - start another running.

SCHEDULING CRITERIA:

- **CPU utilization**
- **Throughput**
- **Turnaround time**
- **Waiting time**
- **Response time**

c	Calculate Average waiting time by drawing Gantt chart using FCFS,SRTF,RR(Tq=2ms),Priority Scheduling	CO2	10

Process	Arrival Time	Service Time	Priority
P1	0	9	3
P2	1	4	2
P3	2	9	1
P4	3	5	4

3	a	What is Deadlock? explain necessary condition for deadlock to occur	CO3	4

- A set of processes is deadlocked when every process in the set is waiting for a resource that is currently allocated to another process in the set (and which can only be released when that other waiting process makes progress.

Deadlock Characterization Necessary Conditions: There are four conditions that are necessary to achieve deadlock:

- Mutual Exclusion
- Hold and Wait
- Circular wait
- No Preamption

b.	Explain in detail how to find deadlock detection and recover from the deadlock	CO3	6

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Step 1:

Let Work and Finish be two vectors of length m and n respectively.
Initialize:
Work = Available
Finish[i] = false for i=1,2,3,.....n

Step 2:

Find an index(i) such that both
a) Finish[i] = false
b) Need i <= Work.
If no such i exist, then go to step 4

Step 3:

Set:
Work = Work + Allocation(i)
Finish[i] = true
Go to step 2

Step 4:

Recovery from deadlock

- Three approaches to recovery from deadlock:
  1) Inform the system-operator for manual intervention.
  2) Terminate one or more deadlocked-processes.
  3) Preempt(or Block) some resources.

c | Determine whether the following system leads safe state by using Bankers algorithm for the snapshot given below | CO3 | 10

Process	Allocation			MAX			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	3	2	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

If a request from P1 arrives for 1 0 2 can the requested to be granted immediately

Solution (i):

- The content of the matrix Need is given
  byNeed = Max - Allocation
- So, the content of Need Matrix is

	Need		
	A	B	C
P0	7	4	3
P1	1	2	2
P2	6	0	0
P3	0	1	1
P4	4	3	1

Solution (ii):

- Applying the Safety algorithm on the given system,Step 1: Initialization

Work = Available i.e. Work =3 3 2

	P0	P1	P2	P3	P4
Finish =	false	false	false	false	false

Step 2: For i=0

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Finish[P0] = false and Need[P0]<=Work i.e. (7 4 3)<=(3 3 2) → falseSo P0 must wait.

Step 2: For i=1
Finish[P1] = false and Need[P1]<=Work i.e. (1 2 2)<=(3 3 2) → trueSo P1 must be kept in safe sequence.
Step 3: Work = Work + Allocation[P1] =(3 3 2)+(2 0 0)=(5 3 2)

P0	P1	P2	P3	P4
false	true	false	false	false

Step 2: For i=2
Finish[P2] = false and Need[P2]<=Work i.e. (6 0 0)<=(5 3 2) → falseSo P2 must wait.

Step 2: For i=3
Finish[P3] = false and Need[P3]<=Work i.e. (0 1 1)<=(5 3 2) → trueSo P3 must be kept in safe sequence.
Step 3: Work = Work + Allocation[P3] = (5 3 2)+(2 1 1)=(7 4 3)

P0	P1	P2	P3	P4
false	true	false	true	false

A failure establishes only this, that our determination to succeed was not strong enough

Step 2: For i=4
Finish[P4] = false and Need[P4]<=Work i.e. (4 3 1)<=(7 4 3) → trueSo P4 must be kept in safe sequence.
Step 3: Work = Work + Allocation[P4] =(7 4 3)+(0 0 2)=(7 4 5)

P0	P1	P2	P3	P4
false	true	false	true	true

Step 2: For i=0
Finish[P0] = false and Need[P0]<=Work i.e. (7 4 3)<=(7 4 5) → trueSo P0 must be kept in safe sequence.
Step 3: Work = Work + Allocation[P0] =(7 4 5)+(0 1 0)=(7 5 5)

P0	P1	P2	P3	P4
true	true	false	true	true

Step 2: For i=2
Finish[P2] = false and Need[P2]<=Work i.e. (6 0 0) <=(7 5 5) → trueSo P2 must be kept in safe sequence.
Step 3: Work = Work + Allocation[P2] =(7 5 5)+(3 0 2)=(10 5 7)

P0	P1	P2	P3	P4
true	true	true	true	true

Step 4: Finish[Pi] = true for 0<=i<=4
Hence, the system is currently in a safe state.
The safe sequence is <P1, P3, P4, P0, P2>.

Conclusion: Yes, the system is currently in a safe state.

Solution (iii): P1 requests (1 0 2) i.e. Request[P1]=1 0 2

- To decide whether the request is granted, we use Resource Request algorithm.Step 1:
  Request[P1]<=Need[P1] i.e. (1 0 2)<=(1 2 2) → true.
  Step 2: Request[P1]<=Available i.e. (1 0 2)<=(3 3 2) → true.
  Step 3: Available = Available – Request[P1] = (3 3 2) - (1 0 2)= (2 3 0)
  Allocation[P1] = Allocation[P1] + Request[P1] = (2 0 0) + (1 0 2)= (3 0 2)
  Need[P1] = Need[P1] – Request[P1] = (1 2 2) - (1 0 2)= (0 2 0)

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We arrive at the following new system state:

	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	2	3	0
P1	3	0	2	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

	Need		
	A	B	C
P0	7	4	3
P1	0	2	0
P2	6	0	0
P3	0	1	1

Step 2: For i=0
Finish[P0] = false and Need[P0]<=Work i.e. (7 4 3)<=(2 3 0) → falseSo P0 must wait.

Step 2: For i=1
Finish[P1] = false and Need[P1]<=Work i.e. (0 2 0)<=(2 3 0) → trueSo P1 must be kept in safe sequence.
Step 3: Work = Work + Allocation[P1] =(2 3 0)+(3 0 2)=(5 3 2)
……P0……P1……P2……P3……P4……
Finish = | false | true | false | false | false |

Step 2: For i=2
Finish[P2] = false and Need[P2]<=Work i.e. (6 0 0) <=(5 3 2) → false
So P2 must wait.

Step 2: For i=3
Finish[P3] = false and Need[P3]<=Work i.e. (0 1 1)<=(5 3 2) → trueSo P3 must be kept in safe sequence.
Step 3: Work = Work + Allocation[P3] = (5 3 2)+(2 1 1)=(7 4 3)
…..P0……P1……P2……P3……P4…...
Finish = | false | true | false | true | false |

Step 2: For i=4
Finish[P4] = false and Need[P4]<=Work i.e. (4 3 1)<=(7 4 3) → trueSo P4 must be kept in safe sequence.
Step 3: Work = Work + Allocation[P4] =(7 4 3)+(0 0 2)=(7 4 5)
……P0……P1……P2……P3……P4….
Finish = | false | true | false | true | true |

Step 2: For i=0
Finish[P0] = false and Need[P0]<=Work i.e. (7 4 3)<=(7 4 5) → trueSo P0 must be kept in safe sequence.
Step 3: Work = Work + Allocation[P0] =(7 4 5)+(0 1 0)=(7 5 5)
……P0……P1……P2……P3 P4….
Finish = | true | true | false | true | true |

Step 2: For i=2
Finish[P2] = false and Need[P2]<=Work i.e. (6 0 0) <=(7 5 5) → trueSo P2 must be kept in safe sequence.
Step 3: Work = Work + Allocation[P2] =(7 5 5)+(3 0 2)=(10 5 7)
…..P0……P1……P2……P3……P4….
Finish= | true | true | true | true | true |

Step 4: Finish[Pi] = true for 0<=i<=4 Hence,
the system is in a safe state.
The safe sequence is <P1, P3, P4, P0, P2>.

Conclusion: Since the system is in safe sate, the request can be granted.

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4	a	Explain in detail about Readers writers problem and short notes about monitors	CO2	8

- A data set is shared among a number of concurrent processes
  - Readers – only read the data set; they do **not** perform any updates
  - Writers– can both read and write
- Problem – allow multiple readers to read at the same time
  - Only one single writer can access the shared data at the same time
- Several variations of how readers and writers are treated – all involve priorities.
  - *First* variation – no reader kept waiting unless writer has permission to useshared object
  - *Second* variation- Once writer is ready, it performs asap.
- Shared Data
- Data set
  - Semaphore mutex initialized to 1
  - Semaphore wrt initialized to 1
  - Integer readcount initialized to 0 The structure of

writer process:

```
do {
   wait(rw_mutex);
      . . .
   /* writing is performed */
      . . .
   signal(rw_mutex);
} while (true);
```

	b	Explain in detail how deadlock can be prevented	CO2	6

Deadlock Prevention Deadlocks can be prevented by preventing at least one of the four required conditions: Mutual Exclusion Shared resources such as read-only files do not lead to deadlocks. Unfortunately some resources, such as printers and tape drives, require exclusive access by a single process. Hold and Wait To prevent this condition processes must be prevented from holding one or more resources while simultaneously waiting for one or more others.

C		List and Explain Classical Synchronization? Explain in brief Producer Consumer Problem with example.	CO2	6

- A Producer process produces information that is consumed by consumer process.
- To allow producer and consumer process to run concurrently, A Bounded Buffer can be used where the items are filled in a buffer by the producer and emptied by the consumer.
- The original solution allowed at most **BUFFER_SIZE - 1** item in the buffer at the same time. To overcome this deficiency, an integer variable ***counter***, initialized to 0 isadded.
- ***counter*** is incremented every time when a new item is added to the buffer and is decremented every time when one item removed from the buffer

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The code for the ***producer process*** can be modified as follows

```
while (true) {

    /* produce an item and put in nextProduced*/
        while(counter == BUFFER_SIZE)

                ; // do
                nothing

            buffer [in] = nextProduced;
```

The code for the ***consumer process*** can be modified as follows:

```
while (true){

        while (counter ==0)

                ; // donothing
                nextConsumed
                =buffer[out];

                out = (out + 1) % BUFFER_SIZE;
```

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ESTD:2002

INTERNAL ASSESMENT TEST: I
DATE: 13/07/2023
SUB: MC & ES [21CS43]
SEM: IV

MAX MARKS: 40

Note: Answer Two full Questions

1	a	Write the Comparison between microprocessor and microcontroller.	06M	CO1
	b	Explain ARM core data flow model with neat diagram.	08M	CO2
	c	What is pipelining. Explain in detail schematically.	06M	CO2
		OR		
2	a	Explain the instruction set of Embedded systems.	06M	CO2
	b	Give the schematic representation of CPSR of ARM7 processor writing the individual bits.	08M	CO2
	c	Compare the difference between RISC and CISC design philosophy.	06M	CO2
3	a	Discuss the following with diagram. i) Von Neumann Architecture with cache. ii) Harvard architecture with TCM.	06M	CO2
	b	Explain 5 different shift operations that can be used with Barrel shifter.	06M	CO3
	c	Explain the MOV instruction set provided by ARM7 with the example for each.	08M	CO3
		OR		
4	a	Explain registers used under different processor modes.	6M	CO2
	b	Explain the Barrel Shifter operation in ARM processor, with neat diagram.	6M	CO3
	c	List the data processing instructions with one example each.	8M	CO3

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INTERNAL ASSESMENT TEST-I.

SUB: - MicroController & Embe-dded System

SUBCODE: 21CS43

1.(a)

Microprocessor	Micro Controller
1. Microprocessors gene-rally does not have RAM, ROM & I/O pins.	1. Micro Controller is 'all in one' processor, with RAM, I/O ports, all on the chip.
2. Built for General pur-pose applications.	2. used for more dedicated applications.
3. Generally do not have power saving s/m.	3. have power saving s/m. like idle mode or power saving.
4. Overall cost of s/m made is high.	4. Cheaper than micro-processors.
5. Speed is above 1GHz	5. allow 8MHz to 50MHz
6. Based on von-Neuman-n model.	6. Based on Harvard Architecture

any 6 point = 1×6 = 6m.

b.

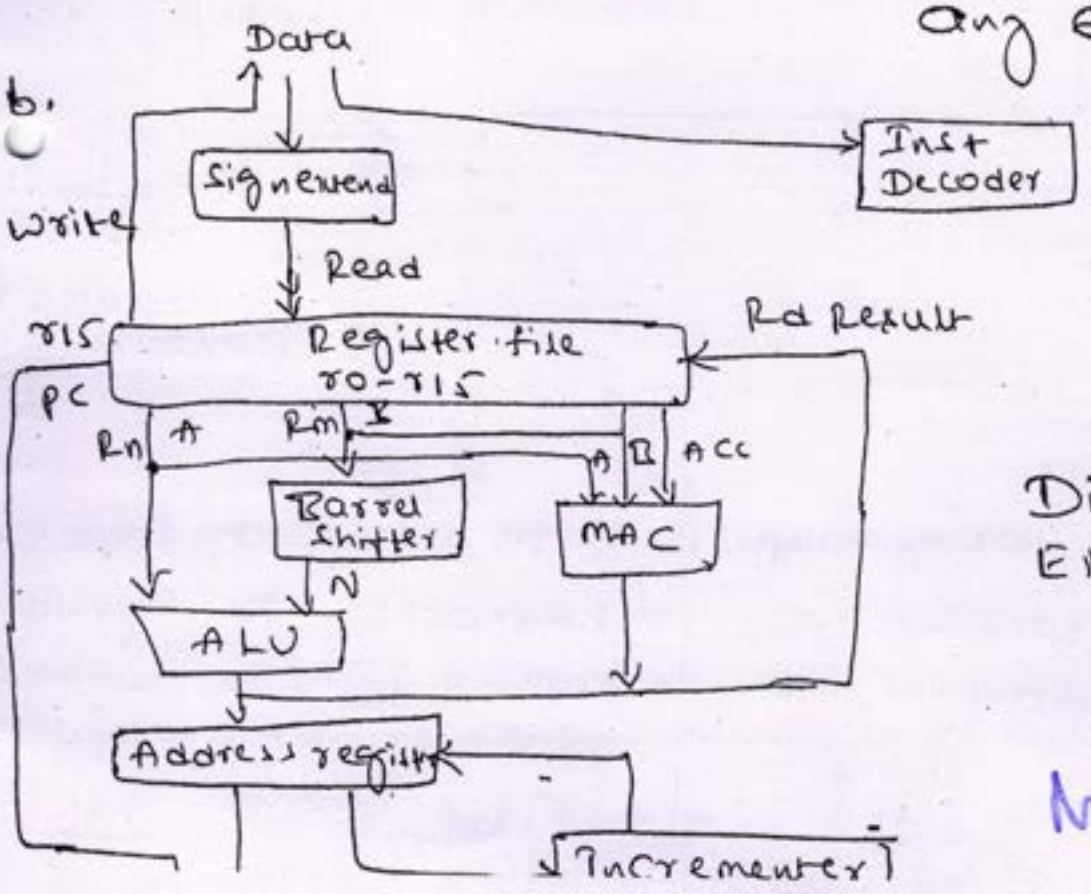

Diagram = 3
Explanation = 5
8m

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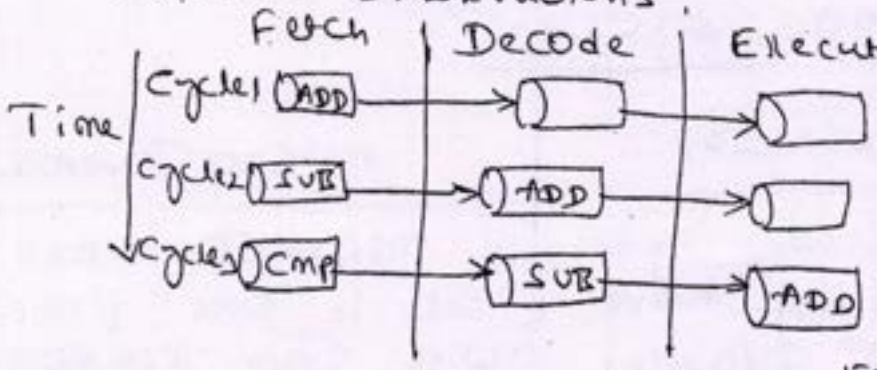
(b) * A pipeline is the mechanism in a RISC processor, which is used to Execute Instructions. — 01m.



— 02m

Explanation 01m
06m

2(a)(i) Variable Cycle Execution for certain Instr = 02m
(ii) Inline barrel Shifter leading to more complex Instructions = 1m
(iii) Thumb 16-bit Instruction set = 1m
(iv) Conditional Execution = 1m
(v) Enhanced Instructions = 1m
= 5m

(b) Fields: Flags | Status | Extension | Control

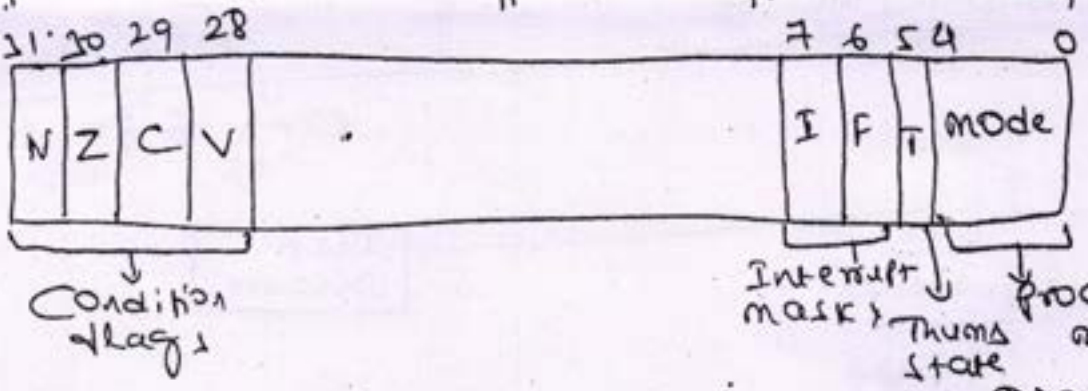


Diagram = 03
Explanation = 05
08

(c)

CISC	RISC
* Complex Instr, taking multiple clock.	* Simple Instr, taking single clock
* Emphasis on hardware,	* Emphasis on software.
* Complex Instructions, instructions executed by microprocessor	* Reduced Instr, Instructions executed by hardware
* variable format Instr,	* Fixed format Instr.
* many Instr & many addressing modes	* Fixed Instructions &

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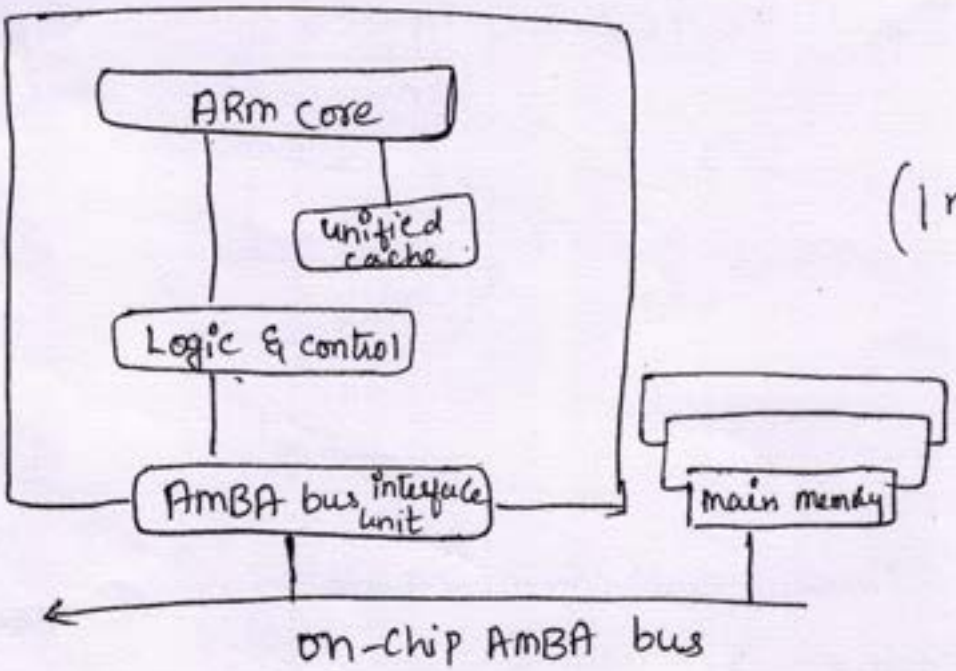
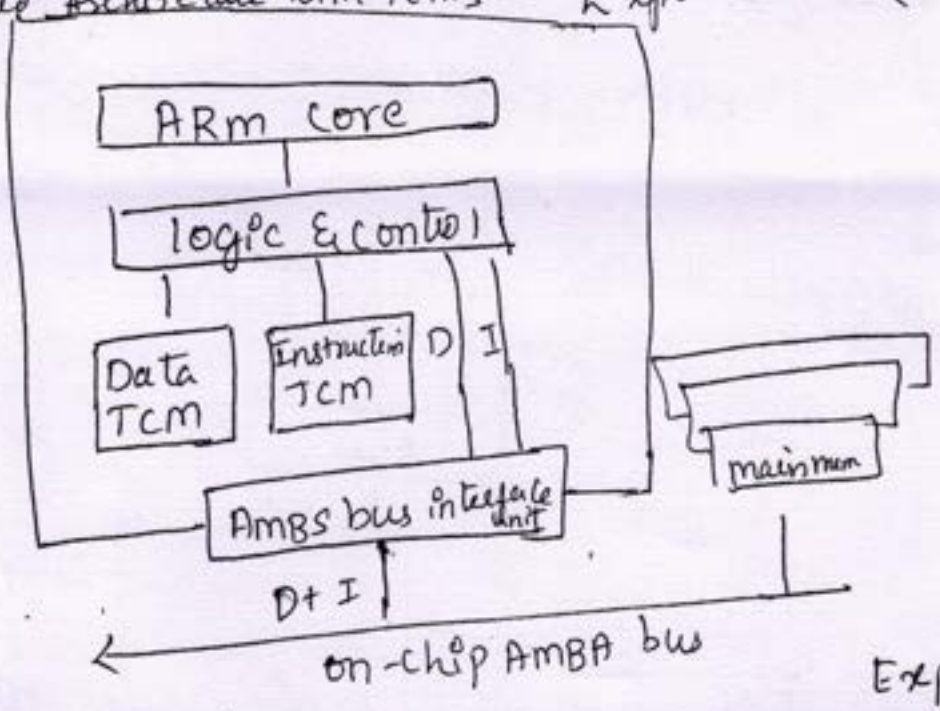
3) a) ARm has two form of cache.

i) von neumann Architecture with cache



(1m)

ii) Harvard Architecture with TCMs Explaination (2m)



(1m)

Explanation (2m)

b) i) LSL
ii) LSR
iii) ASR
iv) ROR
v) RRX

(1m)

Expl^n of each (5m)

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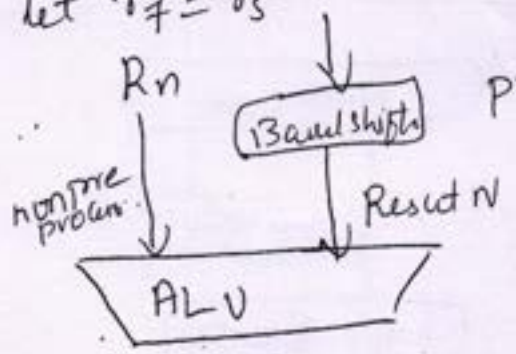
... IV is a

setting initial values & transfering data the registers

Eg $r5 = 5$
$r7 = 8$
MOV $r7, r5$; let $r7 = r5$ (3½ m)

Figure



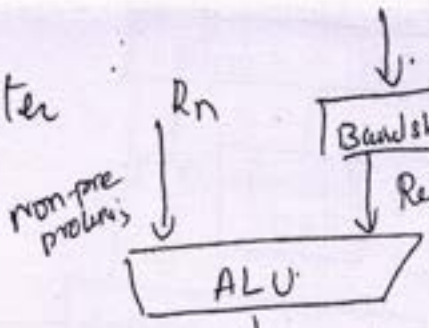
(2m)

Expln (2m)

4) a) There are 37 registers in the register file. Of these, 20 registers are hidden & these registers are called banked registers (2m)

with Figure (2m)

b) Barrel shifter



(2m)

Expln (4m)

c) The data processing instructions manipulate data within registers they are.

* MOVE
* ARITHMETIC
* LOGICAL
* COMPARISON
* MULTIPLY Instruction.

(2m)

(1½ x 8) = (6m)

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ESTD:2002

INTERNAL ASSESMENT TEST: II
DATE: 12/08/2023
SUB: MC & ES [21CS43]
SEM: IV

MAX MARKS: 40

Note: Answer Two full Questions

1	a	Explain CO- processor instructions of ARM processor.	06M	CO3
	b	Explain the different branch instructions of ARM processor.	06M	CO3
	c	Explain the classification of Embedded systems based on generation and based on complexity and performance requirement.	08M	CO4
		OR		
2	a	Explain the ARM SWP instructions with an example code.	06M	CO3
	b	Write an ALP using ARM instructions to find the factorial of a given number.	06M	CO3
	c	Mention the applications of Embedded system with example of each.	08M	CO4
3	a	Brief about the categories load store instructions used with ARM.	07M	CO3
	b	Explain little endian and big endian architecute.	06M	CO4
	c	Explain the role of different types of memories used in embedded system.	07M	CO4
		OR		
4	a	Explain the multiply instructions of ARM processor.	7M	CO3
	b	Differentiate b/w general purpose computing system and Embedded system.	6M	CO4
	c	With neat block diagram explain the elements of Embedded system.	7M	CO4

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II Internal ASSESMENT 12/08/2023

MicroController & Embedded S/m.

1.(a) Coprocessor instructions are used to extend the instruction set. — 1m.

Syntax: CDP{<cond>} CP, OPCode1, Cd, Cn, Cm{, opcode2}

<MRC | MCR>{<cond>} CP, OPcode1, Rd, Cn, Cm{, opcode2}

<LDC | STC>{<cond>} CP, Cd, addressing. → 2m.

explain CDP, MRC, MCR & LDC. STC.

Ex:- MRC P15, 0, R10, C0, C0, 0 → 2m. → 1m. 6m.

(b) A Branch instruction changes the flow of execution or is used to call a routine. — 1m.

Syntax: B{<cond>} label
BL{<cond>} label
BX{<cond>} Rm
BLX{<cond>} label | Rm → 2m.

explain each instruction B, BL, BX, BLX → 2m.

example → 1m. 6m.

(C) Classification Based Generation.

(i) 1st Generation:- eg:- Digital telephone keypads, stepper motor control unit, etc

(ii) 2nd Generation:- eg:- Data acquisition S/m, SCADA S/m, etc

(iii) 3rd Generation:- eg:- robotics, industrial process control, networking etc

(iv) 4th Generation:- eg:- Smart phone device, mobile Internet Device, etc

(v) Next Generation:- explanation of all Generation 4 marks

classification Based on Complexity & performance

(a) Small - Scale Embedded S/m — 4m
(b) Medium - Scale E.S — 8m
(c) Large - Scale E.S

2(a). The SWP instruction is a special case of a load - store instruction. It swaps the contents of memory with the contents of a register. - 1m.

Syntax: SWP{B}{<cond>} Rd, Rm, [Rn] — 1m.

explain SWP & SWPB. → 2m.

Ex:- mem32[0x9000] = 0x12345678
r0 = 0x00000000
r1 = 0x11112222
r2 = 0x00009000
SWP r0, r1, [r2].
post mem32[0x9000] = 0x11112222
r0 = 0x12345678
r1 = 0x11112222
r2 = 0x00009000

2m, 6m.

(b).
```
    MOV r0, #5
    MOV r1, r0
fact: SUBS R1, R1, #1
    CMP R1, #1
    BEQ STOP
    MUL R3, R0, R1;
    MOV R0, R3
    BNE fact
STOP NOP
Here B Here
```

6m = 2.

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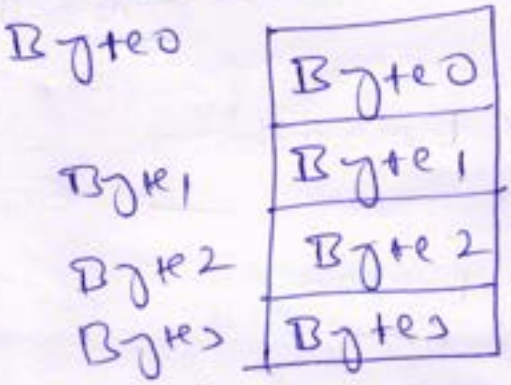
(c) Mention any 8 Applications along with examples each, carries 1m. 1×8 = 8m

3 (a) → Explain Single - Register Transfer Cycle, 3m.

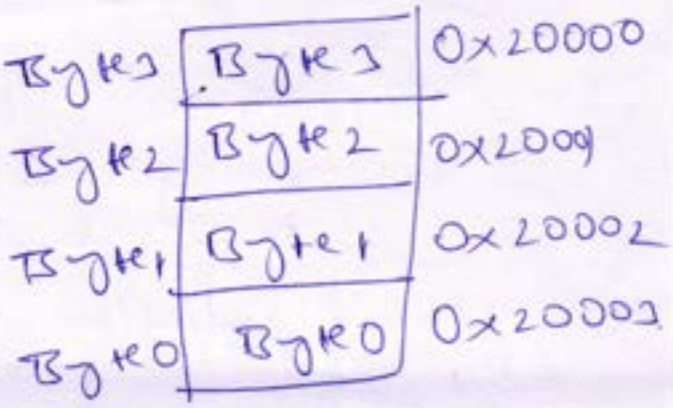
→ Explain multiple - Register Transfer Cycle — 3m.

→ Explain Swap instruction Cycle, 1m. 3+3+1 : 7m

(4) Big endian

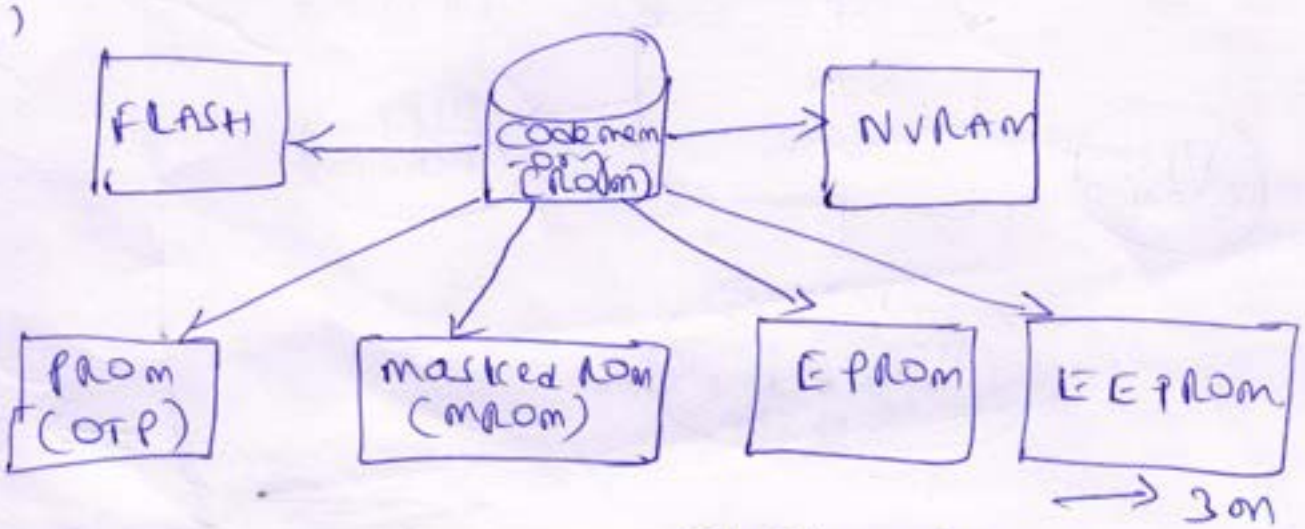


Little endian



Explain Big endian = 3m
little endian = 3m
6m

(c)



→ 3m

Explanation of each blocks → 4m
7m

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4(a). Multiply instructions multiply the contents of a pair of registers and, depending upon the instruction, accumulate the results in with another register. → 1m

Syntax:- MLA <cond>{S}, Rd, Rm, Rs, Rn
MUL <cond>{S}, Rd, Rm, Rs.
2m.

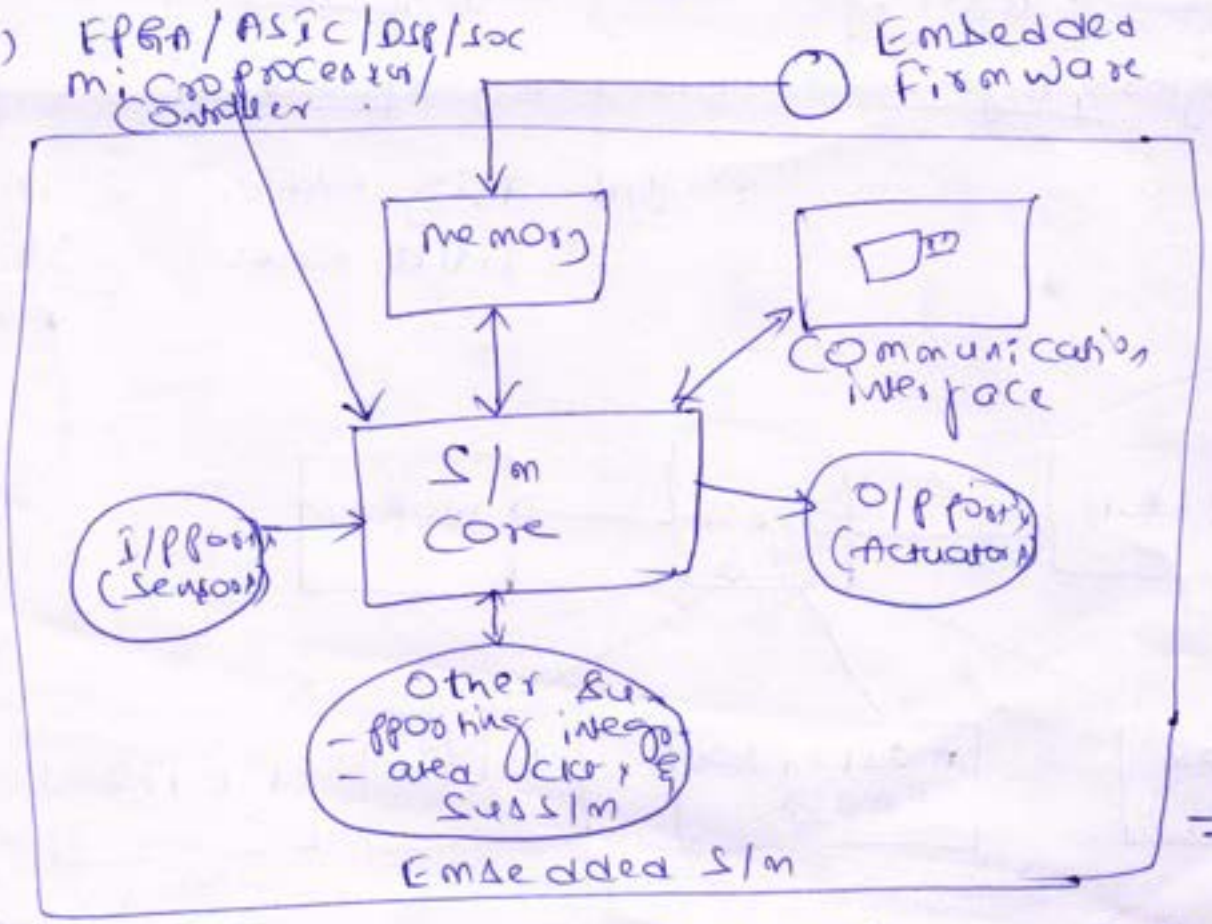
explanation of MLA, MUL, SMLAL, SMULL, UMLAL, UMULL → 2m

Ex:- → 2m

→ 7m

(b). Differentiate b/w General purpose Computing S/m & Embedded S/m with 6, 7 points. → 6m.

(c) FPGA/ASIC/DSP/SoC microprocessor/ controller.



→ 3m

Explanation of each block → 4m

→ 7m.

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INTERNAL ASSESMENT TEST: I

SUB: Internet of Things **MAX MARKS** :40
SEM: 8th sem **TIME** : 90 min

1. a) What does IOT and digitization mean? Explain with diagram the one M2M IoT standardized architecture. 10M(C01)
   b) Explain IoT Data Management and compute stack. What are the different challenges in IOT? 10M(CO1)

OR

2. a) Discus IOT World forum (IOTWF) standardized architecture. 10M(CO1)
   b) Define IoT. Explain the different evolutionary phases of Internet. 10M(CO1)

3. a) List and explain the characteristics and attributes concerned when selecting and dealing with connecting smart object. 10M(CO2)
   b) What is Zigbee? Explain 802.15.4 physical layer, MAC layer and security. 10M(CO2)

OR

4. a) Explain in detail wireless sensors network, communication protocol and its limitations 10M(CO2)
   b) List and explain different types of sensors. Write a note on Lora WARN security. 10M(CO2)

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INTERNET OF THINGS (18CS81)
INTERNAL ASSESSMENT I Scheme and Solution
VIII

1a) Definition---------2M
Explanation with examples------3M
Diagram------2M
Explanation----3M

IoT is a technology transition in which the devices will allow us to sense and control the physical world by making objects smarter and connecting them through an intelligent network.

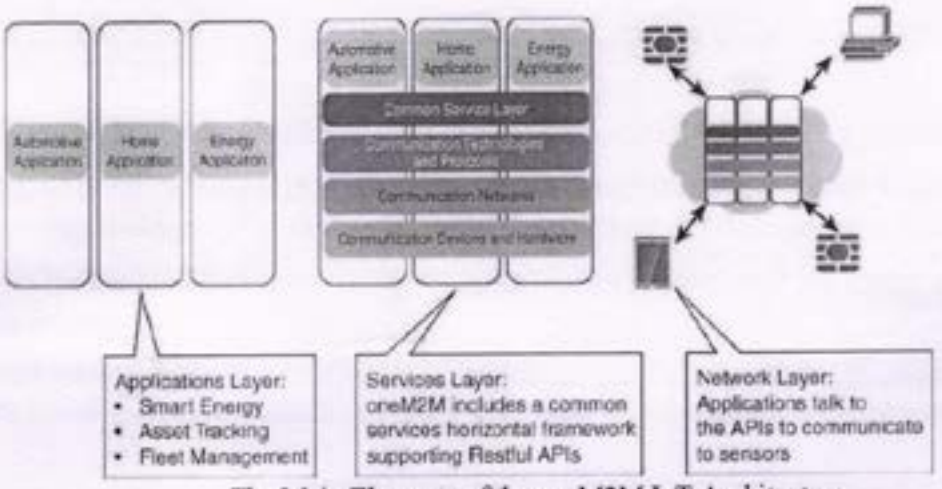
IoT and Digitization

- At a high level, IoT focuses on connecting "things" such as objects and machines, to a computer network, such as the Internet.
- Digitization encompasses the connection of "things" with the data they generate andthe business insights that result.

Example: Wi-Fi devices in Malls detecting customers, displaying offers, based on thespends, mall is segregated, changes to location of product displays and advertising.
Digitization: It is the conversion of information into a digital format.
Example:

1. Digital camera- No films used, mobile phones with camera.
   Digitization of photography changed experience of capturing images.
2. Video rental industry and transportation , no one purchases video tapes or DVDs.
   With digitization , everyone is streaming video content or purchasing the movies as downloadable files.
3. Transportation- Taxi Uber,Ola use digital technologies.
4. Home Automation – Popular product: Nest – sensors determine the climate and connects to other smart objects like smoke alarm, video camera and various third party devices.

The goal of the committee was to create a common architecture that would help accelerate the adoption of M2M application and devices and extended to IoT.



The Main Elements of the oneM2M IoT Architecture

- The goal of one M2M is to create a common services layer which can be readily embedded in the field devices to allow communication with application servers.
- OneM2M's framework focuses on IoT services, applications and platforms. These include smart metering applications, smart grid, smart city automation, -e-health and connected vehicles.
- One of the greatest challenges in designing an IoT architecture is dealing with the heterogeneity of devices, software and access methods.
- TheOneM2MIoTstandardizedArchitecture dividesIoTfunctionsinto3majordomains:

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1)ApplicationLayer 2)ServiceLayer 3)NetworkLayer

1. **Application Layer**
   - oneM2M architecture gives more attention to connectivity between devices and their applications.
   - This domain includes the application-layer protocols and attempts to standardize northbound API definitions for interactions with Business intelligent (BI) systems.
   - Application tend to be industry specific and have their own sets of data models, thus they are shown as vertical entity

2. **Service Layer**
   - Shown as horizontal framework across the vertical industry applications.
   - Horizontalmodules include the physical network that the IoT application run on, the underlying management protocols and the hardware.

   Example: Backhaul communications via cellular, MPLS networks, VPNs and so on.
   - Riding on To is the common service layer.
   - This conceptual layer adds APIs and middle ware supporting third party services and applications.

3. **Network Layer**
   - This is the communication domain for the IoT devices and endpoints.
   - It includes the devices themselves and the communication network that links them.
   - Includes Wireless mess technologies such as IEEE 802.15.4 and wireless point to multi point systems such as IEEE 801.1.11ah.
   - It also includes wired device connections such as IEEE 1901 power line communications.

1b) Definition---------2M
Explanation with examples------3M
IoT challenges-----2M
Explanations-----3M

The data generated by IoT sensors is one of the single biggest challenges in building an IoT system.

- In modern IT networks, the data sourced by a computer or server is typically generated by the client/server communications model, and it serves the needs of the application.
- In sensor networks, the vast majority of data generated is unstructured and of very little use on its own.
- For example, the majority of data generated by a smart meter is nothing more than polling data; the communications system simply determines whether a network connection to the meter is still active.
- This data on its own is of very little value.
- The real value of a smart meter is the metering data read by the meter management system (MMS)

As data volume, the variety of objects connecting to the network, and the need for more efficiency increase, new requirements appear, and those requirements tend to bring the need for data analysis closer to the IoT system.
These new requirements include the following:

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1. **Minimizing latency:**

- Milliseconds matter for many types of industrial systems, such as when we are trying to prevent manufacturing line shutdowns or restore electrical service.
- Analyzing data close to the device that collected the data can make a difference between averting disaster and a cascading system failure.

2. **Conserving network bandwidth:**

- Offshore oil rigs generate 500 GB of data weekly.
- Commercial jets generate 10 TB for every 30 minutes of flight.
- It is not practical to transport vast amounts of data from thousands or hundreds of thousands of edge devices to the cloud. Nor is it necessary because many critical analyses do not require cloud-scale processing and storage.

3. **Increasing local efficiency:**

- Collecting and securing data across a wide geographic area with different environmental conditions may not be useful.
- The environmental conditions in one area will trigger a local response independent from the conditions of another site hundreds of miles away.
- Analyzing both areas in the same cloud system may not be necessary for immediate efficiency

Scale: IT networks scale is larger, The scale of OT is several orders of magnitude larger.
Example: Electrical Company has deployed tons of millions meters in service area where they employed tens of thousands of employees for acting as IP Node using IP v6.

Security: With more "things" connected with other "things" and people security is an increasingly complex issue for IoT. Threat surface is greatly expanded and if device gets hacked, its connectivity is a major concern.

Privacy: A sensor become more prolific in everyday lives, the data what they gather will be specific to individuals and their activities.
Example: Health information , Shopping patterns, transactions at retail establishments.

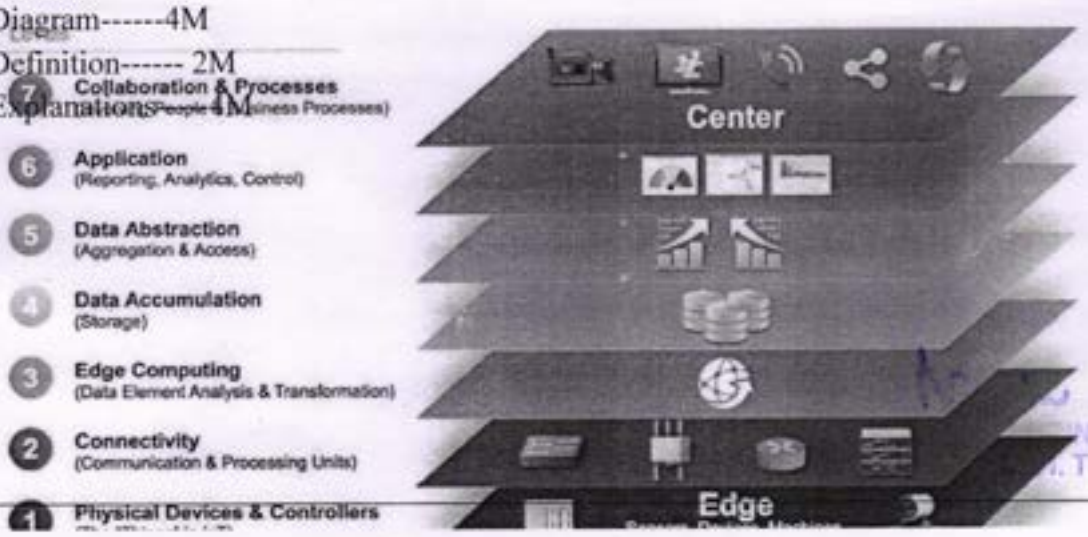
Big Data and Data Analytics: IoT and large number of sensors are going to trigger deluge of data that must be handled.

This data will provide critical information and insights if it can be processed in an efficient manner.

Interoperability : As with nascent technology, various protocols and architectures are jockeying for market share and standardizations within IoT.

Some of these protocols and architectures are based on proprietary elements and others are open.

2a) Diagram------4M
Definition------ 2M
Explanations------4M



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- IoT World Forum Model offers a clean, simplified perspective on IoT and includes edge computing, data storage, and access. It provides a succinct way of visualizing IoT from a technical perspective
- Each of the seven layers is broken down into specific functions, and security encompasses the entire model.

□ The IoT Reference Model defines a set of levels with control flowing from the center (this could be either a cloud service or a dedicated data center), to the edge, which includes sensors, devices, machines and other types of intelligent end nodes.

□ In general, data travels up the stack, originating from the edge, and goes northbound to the center.

□ Using this reference model, we are able to achieve the following:

□ Decompose the IoT problem into smaller parts

□ Identify different technologies at each layer and how they relate to one another

□ Define a system in which different parts can be provided by different vendors

□ Have a process of defining interfaces that leads to interoperability

□ Define a tiered security model that is enforced at the transition points between levels

---

2b) Definition---------2M

Phase Definition ----- 3M

Explanation with examples------5M

The Internet of Things (IoT) is the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment.

Internet Phase Definition:

Connectivity (Digitize Access): This phase connected people to email, web services and search, so that information is easily accessed.

Networked Economy (Digitize Business): This phase enabled e-commerce and supply chain enhancements along with collaborative engagement to drive increased efficiency in business.

Immersive Experiences (Digitize Interactions): This phase extended the Internet Experience to encompass widespread video and social media while always being connected through mobility. More and more applications are moved to Cloud.

Internet of Things (Digitize the World): This phase is adding connectivity to Objects and machines to the world around us to enable new services and experiences. It is connecting the unconnected.

3a) List of smart Objects---3M

Explanations----------7M

A smart object is a device that has, at a minimum, the following four defining characteristics:

1. Processing unit 2. Sensor(s) and/or actuator(s)

3. Communication device 4. Power source

1. **Processing unit:**

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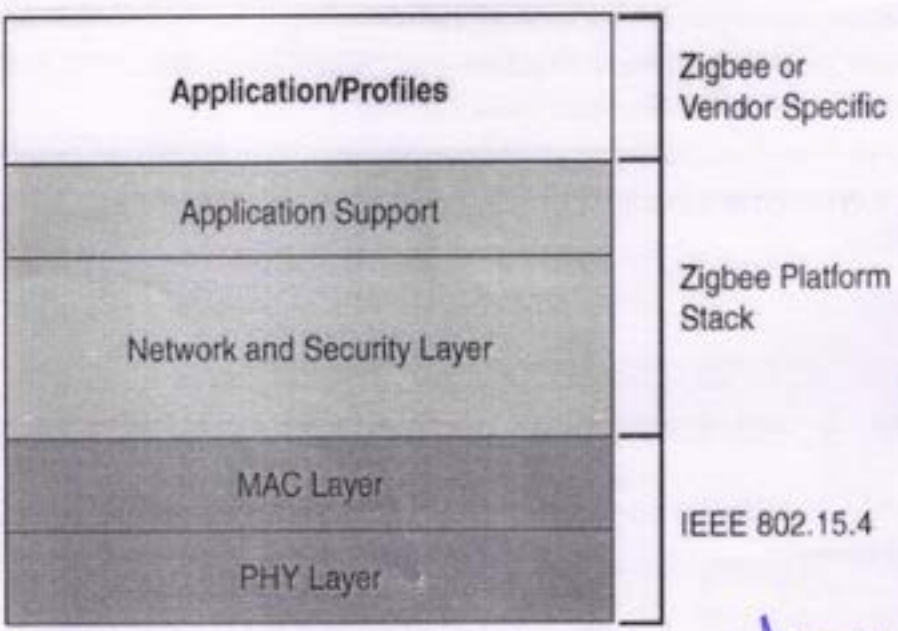
- A smart object has some type of processing unit for acquiring data, processing and analyzing sensing information received by the sensor(s), coordinating control signals to any actuators, and controlling a variety of functions on the smart object, including the communication and power systems.
- The most common is a microcontroller because of its small form factor, flexibility, programming simplicity, ubiquity, low power consumption, and low cost.

2. **Sensor(s) and/or actuator(s):**
   - A smart object is capable of interacting with the physical world through sensors and actuators.
   - A sensor learns and measures its environment, whereas an actuator is able to produce some change in the physical world.
   - A smart object does not need to contain both sensors and actuators.
   - In fact, a smart object can contain one or multiple sensors and/or actuators, depending upon the application.
3. **Communication device:**
   - The communication unit is responsible for connecting a smart object with other smart objects and the outside world (via the network).
   - Communication devices for smart objects can be either wired or wireless.
   - In IoT networks smart objects are wirelessly interconnected for a number of reasons, including cost, limited infrastructure availability, and ease of deployment.
   - There are myriad different communication protocols for smart objects.
4. **Power source:**
   - Smart objects have components that need to be powered.
   - Most significant power consumption comes from the communication unit of a smart object.
   - The power requirements vary greatly from application to application.
   - Smart objects are limited in power, are deployed for a very long time, and are not easily accessible.
   - This combination, when the smart object relies on battery power, implies that power efficiency, judicious power management, sleep modes, ultra-low power consumption.

3b) Diagram------2M

Explanations of Physical, Mac, Security----8M



High-Level ZigBee Protocol Stack

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- They provide for low-bandwidth, low-power, and cost-effective communications when connecting smart objects.

Physical Layer:

- The 802.15.4 standard supports an extensive number of PHY options that range from 2.4 GHz to sub-GHz frequencies in ISM bands.
- The original IEEE 802.15.4-2003 standard specified only three PHY options based on direct sequence spread spectrum (DSSS) modulation.
- DSSS is a modulation technique in which a signal is intentionally spread in the frequency domain, resulting in greater bandwidth.

- The original physical layer transmission options were as follows:
- 2.4 GHz, 16 channels, with a data rate of 250 kbps
- 915 MHz, 10 channels, with a data rate of 40 kbps
- 868 MHz, 1 channel, with a data rate of 20 kbps
- only the 2.4 GHz band operates worldwide.

MAC Layer:

The IEEE 802.15.4 MAC layer manages access to the PHY channel by defining how devices in the same area will share the frequencies allocated.

The 802.15.4 MAC layer performs the following tasks:

- Network beaconing for devices acting as coordinators (New devices use beacons to join an 802.15.4 network)
- PAN association and disassociation by a device
- Device security
- Reliable link communications between two peer MAC entities

The MAC layer achieves these tasks by using our types of MAC frames are specified in 802.15.4:

1. Data frame: Handles all transfers of data
2. Beacon frame: Used in the transmission of beacons from a PAN coordinator
3. Acknowledgement frame: Confirms the successful reception of a frame
4. MAC command frame: Responsible for control communication between devices

Security:

- The IEEE 802.15.4 specification uses Advanced Encryption Standard (AES) with a 128-bit key length as the base encryption algorithm for securing its data.
- Established by the US National Institute of Standards and Technology in 2001, AES is a block cipher, which means it operates on fixed-size blocks of data.
- The use of AES by the US government and its widespread adoption in the private sector has helped it become one of the most popular algorithms used in symmetric key cryptography.

4a) Definitions -----2M
Explanations------8M

Wireless sensor networks are made up of wirelessly connected smart objects, which are referred to as motes.

The following are some of the most significant limitations of the smart objects in WSNs:

1. Limited processing power
2. Limited memory
3. Lossy communication
4. Limited transmission speeds
5. Limited power

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Wirelessly connected smart objects generally have one of the following two communication patterns:

- **Event-driven:** Transmission of sensory information is triggered only when a smart object detects a particular event or predetermined threshold.
- **Periodic:** Transmission of sensory information occurs only at periodic intervals.

Communications Criteria," describes the characteristics and attributes should be considered when selecting and dealing with connecting smart objects.

- The various technologies used for connecting sensors can differ greatly depending on the criteria used to analyze them.
- 1. Range 2. Frequency Bands
- 3. Power Consumption 4. Topology
- 5. Constrained Devices 6. Constrained-Node Networks

4b) Types of Sensors----2M
Explanations--------4M
Lora WARN Security---4M

1.Active or passive:
Sensors can be categorized based on whether they produce an energy output and typically require an external power supply (active) or whether they simply receive energy and typically require no external power supply (passive).

2.Invasive or non-invasive:
Sensors can be categorized based on whether a sensor is part of the environment it is measuring (invasive) or external to it (non-invasive).

3.Contact or no-contact:
Sensors can be categorized based on whether they require physical contact with what they are measuring (contact) or not (no-contact).

4.Absolute or relative:
Sensors can be categorized based on whether they measure on an absolute scale (absolute) or based on a difference with a fixed or variable reference value (relative).

Sensor Types	Description	Examples
Position	A position sensor measures the position of an object: the position measurement can be either in absolute terms (absolute position sensor) or in relative terms (displacement sensor). Position sensors can be linear, angular, or multi-axis.	Potentiometer, inclinometer, proximity sensor
Occupancy and motion	Occupancy sensors detect the presence of people and animals in a surveillance area, while motion sensors detect movement of people and objects.	Electric eye, radar

Sensor Types	Description	Examples
Force	Force sensors detect whether a physical force is applied and whether the magnitude of force is beyond a threshold.	Force gauge, viscometer, tactile sensor (touch sensor)
Pressure	Pressure sensors are related to force sensors, measuring force applied by liquids or gases. Pressure is measured in terms of force per unit area.	Barometer, Bourdon gauge, piezometer
Flow	Flow sensors detect the rate of fluid flow. They measure the volume (mass flow) or rate (flow velocity) of fluid that has passed through a system in a given period of time	Anemometer, mass flow sensor, water meter

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Sensor Types	Description	Examples
Acoustic	Acoustic sensors measure sound levels and convert that information into digital or analog data signals.	Microphone, geophone, hydrophone
Humidity	Humidity sensors detect humidity (amount of water vapor) in the air or a mass. Humidity levels can be measured in various ways: absolute humidity, relative humidity, mass ratio, and so on.	Hygrometer, humistor, soil moisture sensor
Light	Light sensors detect the presence of light (visible or invisible).	Infrared sensor, photodetector, flame detector

Sensor Types	Description	Examples
Radiation	Radiation sensors detect radiation in the environment. Radiation can be sensed by scintillating or ionization detection.	Geiger-Müller counter, scintillator, neutron detector
Temperature	Temperature sensors measure the amount of heat or cold that is present in a system. They can be broadly of two types: contact and non-contact. Contact temperature sensors need to be in physical contact with the object being sensed. Non-contact sensors do not need physical contact, as they measure temperature through convection and radiation.	Thermometer, calorimeter, temperature gauge

LoRaWAN:

- It is a new set of wireless technologies known as Low-Power Wide-Area (LPWA).
- Particularly well adapted for long-range and battery-powered endpoints, LPWA technologies open new business opportunities to both services providers and enterprises considering IoT solutions.

Security:

- Security in a LoRaWAN deployment applies to different components of the architecture.
- LoRaWAN endpoints must implement two layers of security, protecting communications and data privacy across the network.
- The first layer, called "network security" but applied at the MAC layer, guarantees the authentication of the endpoints by the LoRaWAN network server.
- Also, it protects LoRaWAN packets by performing encryption based on AES.

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INTERNAL ASSESMENT TEST: I
COURSE: System Software and Compiler (18CS61) **DATE: 27/04/2023**
TIME: 90 min **MAX MARKS: 40**
SEM: VI

NOTE: Answer any TWO full questions

1. a. Give the SIC machine architecture with all options? **10M–CO1**
   b. Give the format of: Header record, Text record, Modification record **6M-CO1**
   c. Write an algorithm for an Absolute loader? **4M-CO1**

OR

2. a. Give the machine architecture SIC/XE? **10M-CO1**
   b. Explain the following: Literals, Symbol defining statements, Expressions **6M-CO1**
   c. Write an algorithm for a Bootstrap loader. **4M-CO1**

3. a. What are the cousins of the compiler? Explain language processing system **7M-CO2**
   b. Discuss the analysis of source program with respect to compilation process **7M-CO2**
   c. What are the different phases of the compiler? Explain the block diagram of the compiler construction method. **6M-CO2**

OR

4. a. What is the difference between a phase and pass? What is multi-pass compiler? Explain the need for multiple passes in compiler? **7M-CO2**
   b. What is the disadvantage of input buffering with buffer pairs? Explain the use of sentinels in recognizing the tokens. **7M-CO2**
   c. Design a lexical analyser to identify the relation operators such as <,<=,>,>=,== and != **6M-CO2**

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1.a) Give the SIC machine architecture with all options.

Solution:

- **Memory:-**
There are 2^{15} bytes in the computer memory, that is 32,768 bytes. It uses Little Endian format to store the numbers. 3 consecutive bytes form a word, each location in memory contains 8-bit bytes.

- **Register:-**

Mnemonic	Number	Use
A	0	Accumulator; used for arithmetic operations
X	1	Index register; used for addressing
L	2	Linkage register; JSUB
PC	8	Program counter
SW	9	Status word, including CC.

- **Data Formats:-**
Integers are stored as 24-bit binary numbers. 2's complement representation is used for negative values, characters are stored using their 8-bit ASCII codes.

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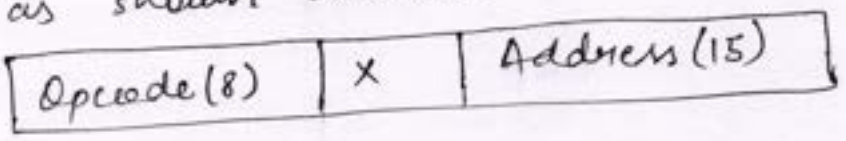
- **Instruction Formats :-**

All machine instructions on SIC have 24-bit format as shown below :-



- **Addressing Mode :-**

Mode	Indication	Target address
Direct	X = 0	TA = address
Indexed	X = 1	TA = address + (X)

- **Instruction set :-**

→ SIC provides, load and store instructions (LDA, LDX, STA, STX etc)

→ Integer arithemetic operations : (ADD, SUB, MUL, DIV)

→ COMP compares the value of register A with word in memory.

- **Input & Output :-**

Input and output are performed by transferring 1 byte at a time to or from the rightmost 8 bits of register A (accumulator).

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15) Give the format of Header record, Text record, Modification record.

Solution:

Header record

- Col. 1 H
- Col. 2~7 Program name
- Col. 8~13 Starting address of object program (hex)
- Col. 14~19 Length of object program in bytes (hex)

Text record.

- Col. 1 H
- Col. 2~7 Starting address for object code in this record (hex)
- Col. 8~9 Length of object code in this record in bytes (hex)
- Col. 10~69 Object code, represented in hex (2 col. per byte)

Modification record.

- Col. 1 M
- Col. 2-7 Starting location of the address field to be modified, relative to the beginning of the program (Hex)
- Col. 8-9 Length of the address field to be modified, in half-bytes (Hex)

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1.c) Write an algorithm for an Absolute loader?

Solution:

```
Begin
read Header record
verify program name and length
read first Text record
while record type is <> 'E' do
    begin
        { if object code is in character form,
          convert into internal representation }
        move object code to specified location in
        memory.
        read next object program record.
    end
jump to address specified in End record
end
```

2. a) Give the machine architecture SIC/XE

Solution:

- Memory:
  Maximum memory available on a SIC/XE system is 1 Megabyte (2^{20} bytes).

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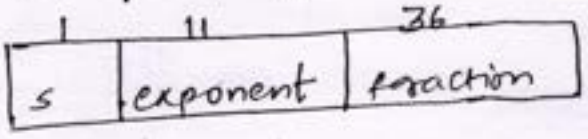
- Register:

Mnemonic	Number	Special use
B	3	Base register
S	4	General working register
T	5	General working register
F	6	Floating-point accumulator (48 bits).

- Floating-point data type:

→ There is a 48-bit floating-point data type

→ $F * 2^{(e-1024)}$



- Instruction Formats:

→ Format 1 (1 byte): contains only operation code

→ Format 2 (2 bytes): first eight bits for operation code, next four for register 1 and following four for register 2.

→ Format 3 (3 bytes): First 6 bits contain operation code, next 6 bits contain flags, last 12 bits contain displacement for the address of the operand.

→ Format 4 (4 bytes): Same as format 3 with an extra 2 hex digits (8 bits) for addresses that require more than 12 bits to be represented.

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2. b) Explain the literals, Symbol defining statements.

Solution:

• Literals.

A literal is defined with a prefix = followed by a specification of the literal value.
A literal table is created for the literals which are used in the program. The literal table contains the literal name, operand value and length. The literal table are a hash table on the literal name.

• Symbol defining statements

→ EQU statement:

Most assemblers provide an assembler directive that allows the programmer to define symbol and specify their values. The directive used for this EQU (Equate). The general form of the statement is

Symbol EQU value

2. c) Write an algorithm for a Bootstrap loader.

Solution:

Begin
X = 0X80
loop
A ← GETC (and convert it from the ASCII character code to the value of hexidecimal digit)

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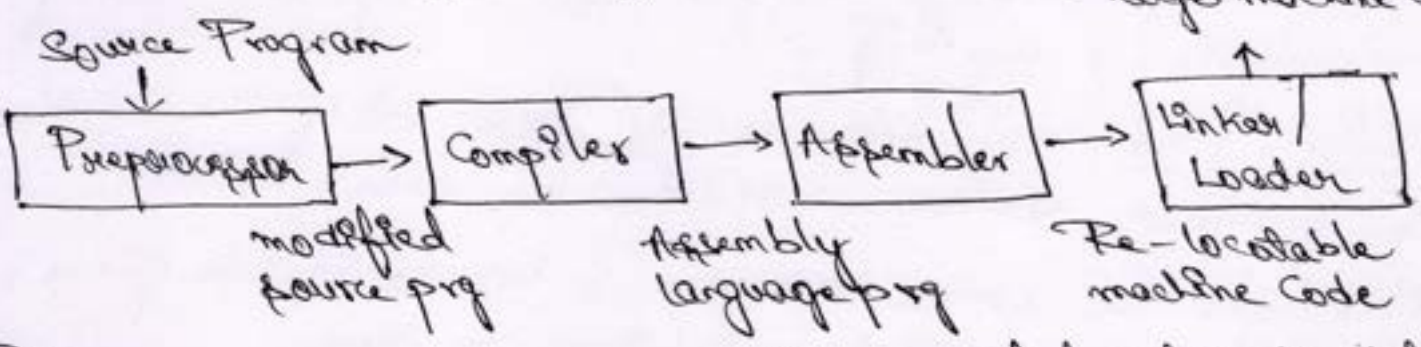
3a) What are the Compilers of the Compiler? Explain language Processing System

All the programs that are helpful in generating the required executable target program are called Compilers of the Compiler



Preprocessor:- the preprocessor is executed before the actual compilation of code begins. a source program may be divided into modules & can be stored in separate files

1) Macro processing which is identified using # define
2) file inclusion which is identified using # include directive

Compiler:- The Compiler is a translator that accepts the expanded & modified source program as the input from Preprocessor & converts it into assembly language program

1) The syntax errors are identified & appropriate error message are displayed along with the numbers

Assembler:- An assembler is a translator which converts assembly language program into equivalent code

1) Convert assembly language instr to their machine language
2) Convert the data constants into equivalent machine representation
or
3) Build the machine instruction using the appropriate instr format

Linker:- Large programs are often compiled in pieces & generate object prg & stored in files. the linker or linkage editor accepts one or more object prg generated by a compiler & links the library files & creates an executable file

Loader:- A Loader is the part of an OS that is responsible for loading programs into main memory for execution

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b) Discuss the analysis of source program with respect to Compilation process

The process of converting from high level language to target language is called Compilation. The entire Compilation process is mapped into two parts namely analysis & synthesis

Analysis part: It acts as the front end of the Compiler & performs various activities as shown below:

* Accepts the source program & breaks it into pieces & imposes a grammatical structure on them
* It then uses the above structure to create an intermediate representation of the source program
* It also displays appropriate error messages whenever a syntax error or semantic error is encountered during Compilation. This helps the programmer to correct the program
* It also gathers the information about the source prog & stores the variables & data in a data structure called symbol table along with type of data like no etc
* The symbol table thus obtained along with intermediate representation of the source prog is fed to synthesis part

Synthesis part:- This is the backend of the Compilation process & performs the following activities

* It accepts the intermediate representation of source prog along with symbol table from the analysis part
* It generates the target program or object program as the output

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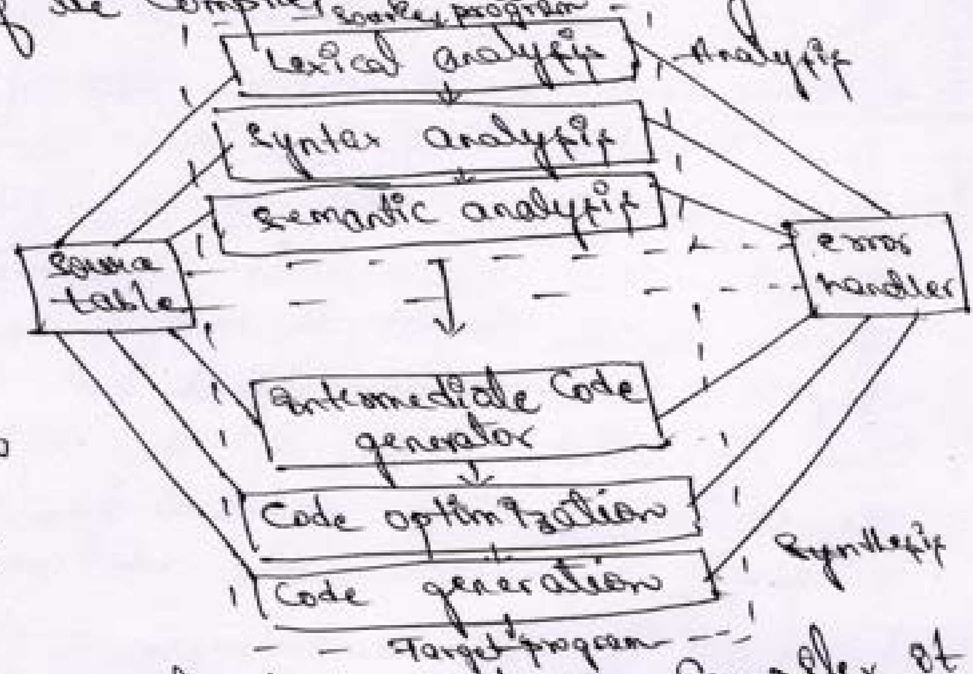
c) What are the different phases of the compiler? explain the block diagram of the Compiler Construction method

The various phases of the compiler; block diagram

- Lexical analysis
- Syntax analysis
- Semantic analysis
- Intermediate Code generation
- Code optimization
- Code generation



Lexical analysis :- It is a first phase of the Compiler it accepts the source program as the input & produces tokens as the output

* Removes white spaces (tabs, spaces & newline characters)
* Removes Comments from the program

Syntax analysis:- It is second phase of the Compiler it accepts the tokens from the lexical analyzer and imposes a grammatical structure on them & check whether the prg is correct or not

* Detects syntax errors (such as undefined symbol, semicolon)
* Interacts with symbol table & the undefined error handler to display appropriate error message

Semantic analysis:- It is the third phase of the Compiler type checking & type Conversion is done

* collects type information of all variables & constants for subsequent Code generation phase
* checks the type of each operand in an arithmetic expression & report error if any

Intermediate Code generation :- It is the fourth phase of the Compiler. The syntax tree which is the output of the semantic analyzer input to this phase it generates intermediate code which is suitable for generating the code

* high level loop statements such as while, if, switch etc, are translated into low level conditional statements

Code optimization :- This is the fifth phase of the compiler the intermediate code generated in the previous phase is the input. The output is another intermediate code but the same job as original but save time & space

Code generation :- This is the last phase of the compiler the optimized code obtained from the previous phase as input it converts intermediate code into equivalent assembly language etc.

4) a) what is difference between a phase & pass ? what is multi-pass Compiler ? explain the need for multiple passes in Compiler

-> Since Compiler is a very complex program to understood the design of compiler, it is logically divided into various sub programs called modules. these subprogram or modules are also called phases

-> A group of one or more phases of a Compiler that perform analysis or synthesis of the source program is called a pass of the Compiler

-> A multi pass Compiler is a type of Compiler Compiler that process the source code two or more times

• multi pass Compilers are used for the following

* By changing the front end of the Compiler and retaining the backend of the Compiler for a particular target machine it is possible to write Compilers for different language

* on similar lines, by retaining the front end & changing the back-end of the Compiler, it is possible to produce a Compiler for different target machines

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* If there is feature of a lang that requires a compiler to perform more than one pass over the source, then multipass compiler is used
* Splitting a compiler up into small prog is a technique used by researchers & designers interested in producing provably correct compilers

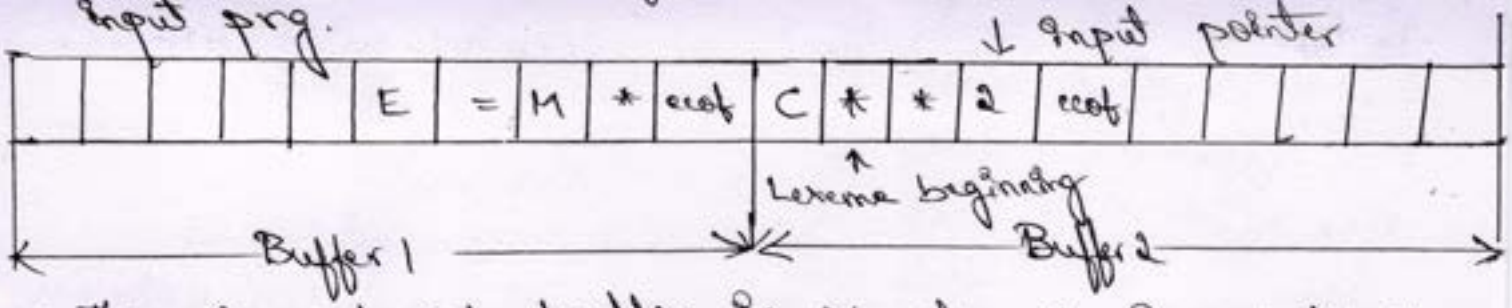
b) What are the disadvantages of input buffering with buffer pairs? Explain the use of sentinels in recognizing the tokens

An input buffering with buffer pairs technique each time we move the input pointer towards right, it indicates that we have not moved off the buffer

* The first test is to determine the end of the buffer
* second test is to determine what character is read

It is possible to combine the buffer-end test with the test for the current character, if we extend the each buffer to hold a sentinel character at the end

Sentinels:- A sentinel is a special character that cannot be the part of the source prg so, the natural choice is to use a character eof which acts as sentinel as well as input prg.



* The size of each buffer is N when N is usually the size of the disk block of size of disk block is 4K in one record read operation 4096 characters can be read into the buffer using one system command
* Irrespective of no of characters stored in the buffer last character of each buffer is eof
* Note that eof retains its use as a marker for the end of the entire input
* The use of Two pointers lexeme beginning & input pointer & the method of accessing lexeme remains same as in buffer pairs

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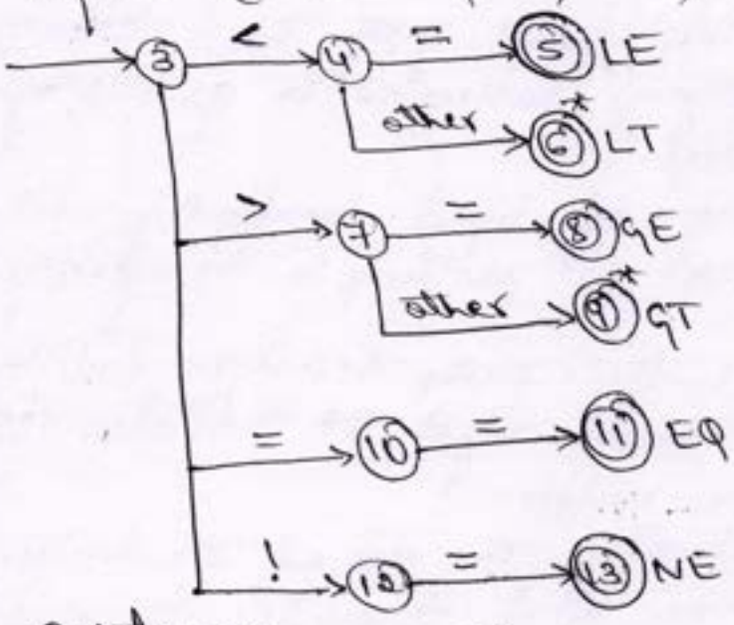
c) Design a lexical analyzer to identify the relational operators such as <, <=, >, >=, == and !=



In the above transition diagram observe that there are no transitions defined for 3, 10 & 12 for symbols other than specified at labels. So, from state 3, 10 & 12 on any other symbol, we enter into state 14 which is used to identify some other token. The lexical analyzer for identify relational operators are given below

```
state = 0;
for(;;)
{
switch (state)
{
case 3:
   ch = getchar()
if (ch == '<')  state = 4;
else if (ch == '>')  state = 7;
else if (ch == '=')  state = 10;
else if (ch == '!')  state = 12;
else                 state = 14;
break;
case 4:
   ch = getchar()
if (ch == '=')  state = 5;
else            state = 6;
break;
case 5: return LE;
case 6: retract();
        return LT;
case 7:
   ch = getchar()
if (ch == '=')  state = 8;
else            state = 9;
break;
case 8: return GE;
case 9: retract();
        return GT;
case 10:
   ch = getchar()
if (ch == '=')  state = 11;
else            state = 14;
break;
case 11: return EQ;
case 12:
   ch = getchar()
if (ch == '=')  state = 13;
else            state = 14;
break;
case 13: return NE;
case 14:
```

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ESTD:2002

INTERNAL ASSESMENT TEST: III
SUB : CG&V [18CS62]
SEM : VI

DATE: 05/07/2023
MAX MARKS :40
TIME : 75 min

Note: Answer Two full Questions

1	a	Explain briefly the transformation from world to viewing coordinates?	10M	CO3
	b	Explain briefly projection transformation, orthogonal transformation and perspective projections?	10M	CO3
		OR		
2	a	Explain briefly OpenGL 3D viewing functions and OpenGL visibility detection functions?	10M	CO3
	b	Briefly explain classification of visible surface detection algorithms and depth buffer method (z buffer algorithm)?	10M	CO3
3	a	Briefly explain programming event driven input, menus picking and building interactive models?	10M	CO4
	b	Explain briefly animating interactive programs, design of interactive program and logic operations?	10M	CO4
		OR		
	a	Briefly explain OpenGL quadric surface and cubic surface functions?	10M	CO4
	b	Explain briefly Bezier spline curves, Bezier surfaces, and OpenGL Curve functions?	10M	CO4

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	b	Explain briefly animating interactive programs, design of interactive program and logic operations?	10M	CO4
		OR		
4	a	Briefly explain OpenGL quadric surface and cubic surface functions?	10M	CO4
	b	Explain briefly Bezier spline curves, Bezier surfaces, and OpenGL Curve functions?	10M	CO4

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INTERNAL ASSESMENT TEST: III | **DATE:** 05/07/2023
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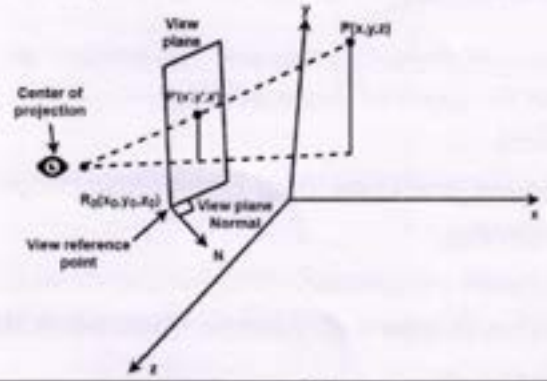
SCHEME AND SOLUTIONS

1	a	The transformation from world to viewing coordinates In the three-dimensional viewing pipeline, the first step after a scene has been constructed is to transfer object descriptions to the viewing-coordinate reference frame. This conversion of object descriptions is equivalent to a sequence of transformations that superimposes the viewing reference frame onto the world frame 1. Translate the viewing-coordinate origin to the origin of the worldcoordinate system. 2. Apply rotations to align the xview, yview, and zview axes with the world xw, yw, and zw axes, respectively. **-5M** **Matrices--5M**	10M	CO3
	b	**projection transformation, orthogonal transformation and perspective projections** Graphics packages generally support both parallel and perspective projections. In a parallel projection, coordinate positions are transferred to the view plane along parallel lines. A parallel projection preserves relative proportions of objects, and this is the method used in computeraided drafting and design to produce scale drawings of three-dimensional objects. All parallel lines in a scene are displayed as parallel when viewed with a parallel projection. There are two general methods for obtaining a parallel-projection view of an object: We can project along lines that are perpendicular to the view plane, or we can project at an oblique angle to the view plane-**4M** A transformation of object descriptions to a view plane along lines that are all parallel to the view-plane normal vector N is called an orthogonal projection also termed as orthographic projection. This produces a parallel-projection transformation in which the projection lines are perpendicular to the view plane. Orthogonal projections are most often used to produce the front, side, and top views of an object-**3M** We can approximate this geometric-optics effect by projecting objects to the view plane along converging paths to a position called the projection reference point (or center of projection). Objects are then displayed with foreshortening effects, and projections of distant objects are smaller than the projections of objects of the same size that are closer to the view plane-**3M**  	10M	CO3
		OR		
2	a	**OpenGL 3D viewing functions** glMatrixMode (GL_MODELVIEW); gluLookAt (x0, y0, z0, xref, yref, zref, Vx, Vy, Vz); glOrtho (xwmin, xwmax, ywmin, ywmax, dnear, dfar); glFrustum (xwmin, xwmax, ywmin, ywmax, dnear, dfar);	10M	CO3

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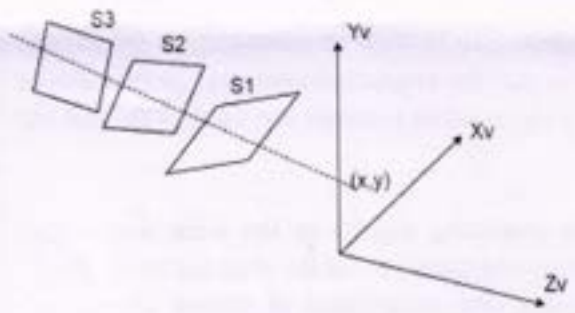
		glViewport (xvmin, yvmin, vpWidth, vpHeight);--- **-5M** **OpenGL visibility detection functions** glEnable (GL_CULL_FACE); glCullFace (mode); glutInitDisplayMode (GLUT_SINGLE | GLUT_RGB | GLUT_DEPTH); glClear (GL_DEPTH_BUFFER_BIT); glEnable (GL_DEPTH_TEST); --- **-5M**		
	b	**classification of visible surface detection algorithms** We can broadly classify visible-surface detection algorithms according to whether they deal with the object definitions or with their projected images. Object-space methods: compares objects and parts of objects to each other within the¬ scene definition to determine which surfaces, as a whole, we should label as visible. Image-space methods: visibility is decided point by point at each pixel position on the¬ projection plane);--- **-5M** depth buffer method (z buffer algorithm);--- **-5M** A commonly used image-space approach for detecting visible surfaces is the depth-buffer method, which compares surface depth values throughout a scene for each pixel position on the projection plane. The algorithm is usually applied to scenes containing only polygon surfaces, because depth values can be computed very quickly and the method is easy to implement. This visibility-detectionapproach is also frequently alluded to as the z-buffer method, because object depth is usually measured along the z axis of a viewing system  	10M	CO3
3	a	**programming event driven input, menus picking and building interactive models** The various events can be recognized by the window system and call back function can be called for each of these events. ***USING POINTING DEVICES*** · Pointing devices like mouse, trackball, data tablet allow programmer to indicate a position on the display. · There are two types of event associated with pointing device, which is conventionally assumed to be mouse but could be trackball or data tablet also. **1. MOVE EVENT** – is generated when the mouse is move with one of the button being pressed. If the mouse is moved without a button being pressed, this event is called as "***passive move event***". **2. MOUSE EVENT** – is generated when one of the mouse buttons is either pressed or released.	10M	CO4

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KEYBOARD EVENTS

· Keyboard devices are input devices which return the ASCII value to the user program. *Keyboard events are generated when the mouse is in the window and one of the keys is pressed or released.*

· GLUT supports following two functions:

· glutKeyboardFunc() is the callback for events generated by pressing a key·

· glutKeyboardUpFunc() is the callback for events generated by releasing a· key.

WINDOW EVENTS

· *A window event is occurred when the corner of the window is dragged to new position or size of window is minimized or maximized by using mouse.*

· The information returned to the program includes the height and width of newly—***4M***

Menus are an important feature of any application program. OpenGL provides a feature called ***"Pop-up-menus"*** using which sophisticated interactive applications can be created.

· Menu creation involves the following steps:

1. Define the actions corresponding to each entry in the menu.
2. Link the menu to a corresponding mouse button.
*3. Register a callback function for each entry in the menu.—**3M***

***Picking** is the logical input operation that allows the user to identify an object on the display.·*

· The action of picking uses pointing device but the information returned to the application program is the identifier of an object not a position—***3M***

b **animating interactive programs** — 10M — CO4

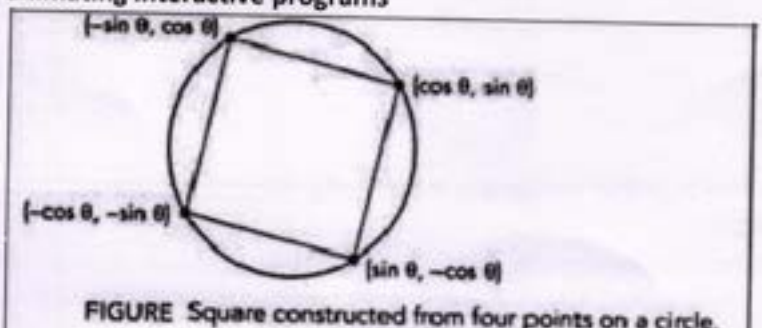

FIGURE Square constructed from four points on a circle.

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```
void display()
{
  glClear(GL_COLOR_BUFFER_BIT);
  glBegin(GL_POLYGON);
    thetar = theta/(3.14159/180.0); /* convert degrees to radians */
    glVertex2f(cos(thetar), sin(thetar));
    glVertex2f(-sin(thetar), cos(thetar));
    glVertex2f(-cos(thetar), -sin(thetar));
    glVertex2f(sin(thetar), -cos(thetar));
  glEnd();
}
```

-5M

--

design of interactive program and logic operations-5M

A smooth display, showing neither flicker nor any artifacts of the refresh process. A variety of interactive devices on the display⌋ A variety of methods for entering and displaying information⌋ An easy to use interface that does not require substantial effort to learn⌋ Feedback to the user⌋ Tolerance for user errors⌋ A design that incorporates consideration of both the visual and motor⌋ properties of the human

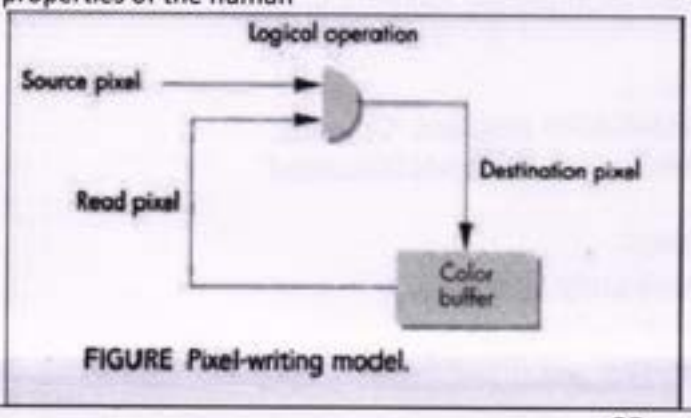
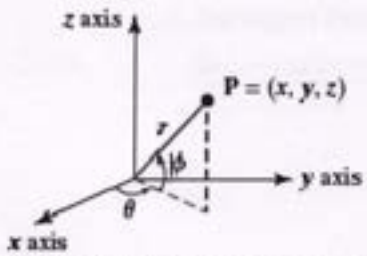


FIGURE Pixel-writing model.

OR

4	a	<u>OpenGL quadric surface -5M</u>	10M	CO4



A frequently used class of objects is the quadric surfaces, which are described with second - degree equations (quadratics).

✓ They include spheres, ellipsoids, tori, paraboloids, and hyperboloids.

<u>cubic surface functions-5M</u>

glutWireSphere (r, nLongitudes, nLatitudes);

or

glutSolidSphere (r, nLongitudes, nLatitudes);

glutWireCone (rBase, height, nLongitudes, nLatitudes);

or

glutSolidCone (rBase, height, nLongitudes, nLatitudes);

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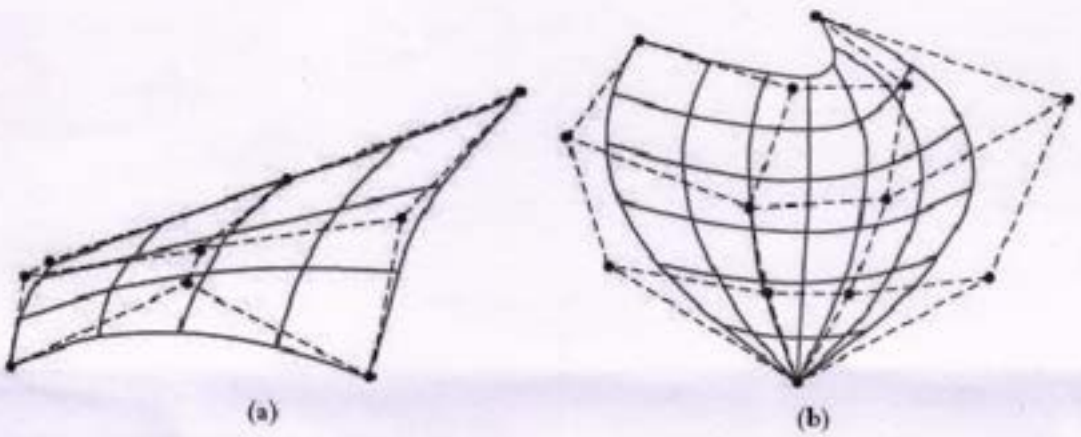
	b	**Bezier spline curves, -3M** ➢ It was developed by the French engineer Pierre Bézier for use in the design of Renault automobile bodies. ➢ **Bézier splines** have a number of properties that make them highly useful and convenient for curve and surface design. They are also easy to implement. ➢ In general, a Bézier curve section can be fitted to any number of control points, although some graphic packages limit the number of control points to four. **Bezier surfaces, -4M** The parametric vector function for the Bézier surface is formed as the tensor product of Bézier blending functions: $$P(u, v) = \sum_{j=0}^{m} \sum_{k=0}^{n} p_{j,k} BEZ_{j,m}(v) BEZ_{k,n}(u)$$  (a) (b) **OpenGL Curve functions-3M** **glMap1* (GL_MAP1_VERTEX_3, uMin, uMax, stride, nPts, *ctrlPts);** **glEnable (GL_MAP1_VERTEX_3);** **glDisable (GL_MAP1_VERTEX_3);** **glEvalCoord1* (uValue);**	10M	CO4

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INTERNAL ASSESMENT TEST: I — **DATE:** 27/04/2023
SUB : CG&V [18CS62] — **MAX MARKS :**40
SEM : VI — **TIME :** 75 min

Note: Answer Two full Questions

1	a	List and explain any 6 applications of computer graphics	10M	CO1
	b	Write the differences between random scan and raster scan displays	10M	CO1
		OR		
2	a	With a neat diagram explain the color CRT monitors and flat panel displays	10M	CO1
	b	Briefly explain the Bresenham's line drawing algorithm. Derive the expression for decision parameter?	10M	CO1
3	a	Briefly explain the DDA line drawing algorithm?	10M	CO1
	b	Explain the Bresenham's midpoint circle drawing algorithm and derive the equation for decision parameter ?	10M	CO1
		OR		
4	a	For the given endpoints (5,10) and (10,20) Find all the (x,y) points using DDA algorithm ?	10M	CO2
	b	What are vertex arrays? Write an Open GL program to draw a color cube and spin it using OpenGL transformation matrices?	10M	CO2

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	b	Explain the Bresenham's midpoint circle drawing algorithm and derive the equation for decision parameter ?	10M	CO1
		OR		
4	a	For the given endpoints (5,10) and (10,20) Find all the (x,y) points using DDA algorithm ?	10M	CO2
	b	What are vertex arrays? Write an Open GL program to draw a color cube and spin it using OpenGL transformation matrices?	10M	CO2

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INTERNAL ASSESMENT TEST: I
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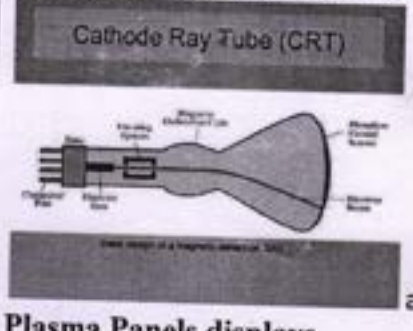
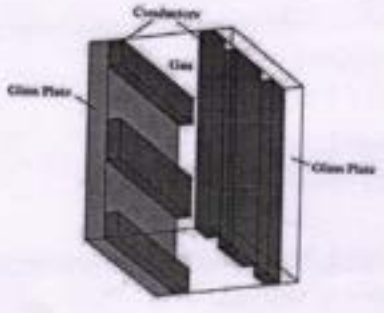
DATE: 27/04/2023
MAX MARKS :40
TIME : 75 min

SCHEME AND SOLUTIONS

1	a	Explanation of Any 6 applications of computer graphics ➢ Display of information ➢ Design ➢ Simulation and animation ➢ User interfaces ➢ *Education and Training* ➢ *Computer Art* and more... 10M	10M	CO1
	b	Any 5 differences between random scan and raster scan displays=5X2M=10M **random scan** When operated as a random-scan display unit, a CRT has the electron beam directed only to those parts of the screen where a picture is to be displayed. ✓ Pictures are generated as line drawings, with the electron beam tracing out the component lines one after the other. ✓ For this reason, random-scan monitors are also referred to as vector displays (or strokewriting displays or calligraphic displays). ✓ The component lines of a picture can be drawn and refreshed by a random-scan system in any specified order **Raster scan:** The electron beam is swept across the screen one row at a time from top to bottom. ❖ As it moves across each row, the beam intensity is turned on and off to create a pattern of illuminated spots. ❖ This scanning process is called refreshing. Each complete scanning of a screen is normally called a frame. ❖ The refreshing rate, called the frame rate, is normally 60 to 80 frames per second, or described as 60 Hz to 80 Hz. ❖ Picture definition is stored in a memory area called the frame buffer. ❖ This frame buffer stores the intensity values for all the screen points. Each screen point is called a pixel (picture element).	10M	CO1
		OR		
2	a	Neat diagram CRT monitors---2M  and flat panel displays--2M  **Plasma Panels displays** Explanation-------6M	10M	CO1
	b	Explanation of Bresenham's line drawing algorithm----5M	10M	CO1

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		1 Input the two line endpoints and store the left endpoint in (x0, y0). 2. Set the color for frame-buffer position (x0, y0); i.e., plot the first point. 3. Calculate the constants Δx, Δy, $2\Delta y$, and $2\Delta y - 2\Delta x$, and obtain the starting value for the decision parameter as **$p0 = 2\Delta y - \Delta x$** 4. At each xk along the line, starting at k = 0, perform the following test: If $pk < 0$, the next point to plot is $(xk + 1, yk)$ and **$p_{k+1} = p_k + 2\Delta y$** Otherwise, the next point to plot is $(xk + 1, yk + 1)$ and **$p_{k+1} = p_k + 2\Delta y - 2\Delta x$** 5. Repeat step 4 $\Delta x - 1$ more times. Note: If $\|m\| > 1.0$ Then **$p0 = 2\Delta x - \Delta y$** **and** If $pk < 0$, the next point to plot is $(xk, yk + 1)$ and **$p_{k+1} = p_k + 2\Delta x$** Otherwise, the next point to plot is $(xk + 1, yk + 1)$ and **$p_{k+1} = p_k + 2\Delta x - 2\Delta y$** Derive the expression for decision parameter------5M		
3	a	DDA line drawing algorithm-------5M The DDA is a scan-conversion line algorithm based on calculating either δy or δx. A line is sampled at unit intervals in one coordinate and the corresponding integer values nearest the line path are determined for the other coordinate ➔ DDA Algorithm has three cases so from equation i.e.., $m=(y_{k+1} - y_k)/(x_{k+1} - x_k)$ **Case1:**if $m<1$,x increment in unit intervals i.e..,$x_{k+1}=x_k+1$ then, $m=(y_{k+1} - y_k)/(x_{k+1} - x_k)$ **$m= y_{k+1} - y_k$** **$y_{k+1} = y_k + m$----------->(1)** ➔ where k takes integer values starting from 0,for the first point and increases by 1 until final endpoint is reached. Since m can be any real number between 0.0 and 1.0, **case2:**if $m>1$, y increment in unit intervals i.e.., $y_{k+1} = y_k + 1$ then, $m= (y_k + 1- y_k)/(x_{k+1} - x_k)$ **$m(x_{k+1} - x_k)=1$** **$x_{k+1} =(1/m)+ x_k$----------(2)** **Case3:** if m=1,both x and y increment in unit intervals i.e..,$x_{k+1}=x_k + 1$ and $y_{k+1} = y_k + 1$ Explanation --------5M	10M	CO1
	b	Explanation of Bresenham's midpoint circle drawing algorithm -----5M Midpoint circle algorithm generates all points on a circle centered at the origin by incrementing all the way around circle. ➔ The strategy is to select which of 2 pixels is closer to the circle by evaluating a function	10M	CO1

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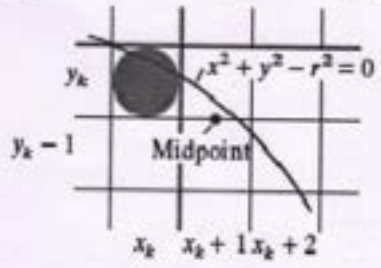
at the midpoint between the 2 pixels

→ To apply the midpoint method, we define a circle function as

→ To summarize, the relative position of any point (x, y) can be determined by checking the sign of the circle function as follows:



$$f_{circ}(x, y) \begin{cases} < 0, & \text{if } (x, y) \text{ is inside the circle boundary} \\ = 0, & \text{if } (x, y) \text{ is on the circle boundary} \\ > 0, & \text{if } (x, y) \text{ is outside the circle boundary} \end{cases}$$

Bresenham's midpoint circle drawing algorithm

1. Input radius r and circle center (x_c, y_c), then set the coordinates for the first point on the circumference of a circle centered on the origin as
$(x_0, y_0) = (0, r)$
2. Calculate the initial value of the decision parameter as
$p0 = 1-r$
3. At each x_k position, starting at $k = 0$, perform the following test:
If $p_k < 0$, the next point along the circle centered on (0, 0) is (x_k+1, yk) and
$p_{k+1} = p_k + 2x_{k+1} + 1$
Otherwise, the next point along the circle is $(x_k + 1, y_k - 1)$ and
$p_{k+1} = p_k + 2x_{k+1} + 1 - 2y_{k+1}$
where $2x_{k+1} = 2xk + 2$ and $2y_{k+1} = 2yk - 2$.
4. Determine symmetry points in the other seven octants.
5. Move each calculated pixel position (x, y) onto the circular path centered at (x_c, y_c) and plot
the coordinate values as follows:
$x = x + x_c$, $y = y + y_c$
6. Repeat steps 3 through 5 until $x \geq y$.
And
p0 = 1 − r (for r an integer) because all increments are integers.
Derive the equation for decision parameter -----5M

OR

4	a	For the given endpoints (5,10) and (10,20) Find all the (x,y) points using DDA algorithm—-----8M Output drawn for the obtained points------2M	10M	CO2

	b	Definition of vertex arrays-----1M
		Using **vertex arrays** reduces the number of function calls and redundant usage of shared vertices
		Explanation of Open GL program to draw a color cube and spin it using OpenGL transformation matrices
		`glEnableClientState( GL_VERTEX_ARRAY );`
		`glEnableClientState( GL_COLOR_ARRAY );`
		`glDrawArrays( GL_QUADS, 0, 24 ); // Draw the first cube!`
		Main prg-2M
		Function calls showing vertex array concepts-------7M
			10M	CO2

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INTERNAL ASSESMENT TEST: II | **DATE:** 15/06/2023
SUB : CG&V [18CS62] | **MAX MARKS :40**
SEM : VI | **TIME :** 75 min

Note: Answer Two full Questions

1	a	Explain general scan line polygon fill algorithm with an example.	10M	CO2
	b	Explain briefly basic 2D geometric transformations along with matrics representation	10M	CO2
		OR		
2	a	i)Prove that two successive scalings are multiplicative? ii) Prove that two successive rotation are additive. iii) Prove that two successive translation are additive.	10M	CO2
	b	Explain 2D viewing pipeline and 3D viewing pipeline with a neat diagram.	10M	CO2
3	a	what is clipping? Explain cohen-sutherland line clipping algorithm with an example.	10M	CO3
	b	Explain sutherland-hodgemen polygon clipping algorithm with an example.	10M	CO3
		OR		
4	a	Explain briefly the color models RGB and CMY including RGB color model and index color model with a neat diagram?	10M	CO3
	b	Explain the following basic illumination models i) ambient light ii) diffuse reflection iii) speculer iv) phong and corresponding openGL functions	10M	CO3

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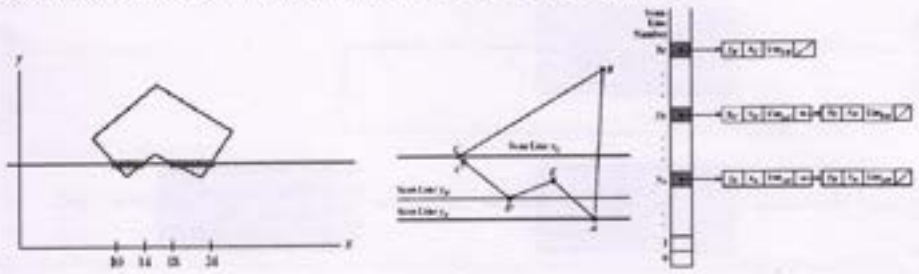
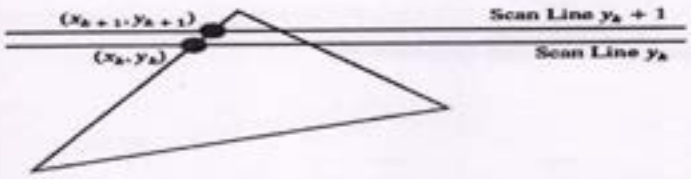
SCHEME AND SOLUTIONS

1	a	Explanation of general scan line polygon fill algorithm-5M A scan-line fill of a region is performed by first determining the intersection positions of the boundaries of the fill region with the screen scan lines.  Scan line polygon fill algorithm example-5M 	10M	CO2
	b	Explanation of basic 2D geometric transformations --5M ***Two-Dimensional Translation*** $\mathbf{P} = \begin{bmatrix} x \\ y \end{bmatrix}, \quad \mathbf{P}' = \begin{bmatrix} x' \\ y' \end{bmatrix}, \quad \mathbf{T} = \begin{bmatrix} t_x \\ t_y \end{bmatrix}$ ***Two-Dimensional Rotation*** $\mathbf{R} = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \quad \mathbf{P}' = \mathbf{P} + \mathbf{T}$ ***Two-Dimensional Scaling*** $\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} s_x & 0 \\ 0 & s_y \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix}$ $\mathbf{P}' = \mathbf{S} \cdot \mathbf{P}$ Matrics representation for Rotation, Translation and Scaling---5M	10M	CO2
		OR		
2	a	Explanation of i)Prove that two successive scalings are multiplicative? –4M S(s2x, s2y) · S(s1x, s1y) = S(s1x · s2x, s1y · s2y) ii) Prove that two successive rotation are additive–3M P = R(θ1 + θ2) · P iii) Prove that two successive translation are additive–3M T(t2x, t2y) · T(t1x, t1y) = T(t1x + t2x, t1y + t2y)	10M	CO2
	b	Explaination of 2D viewing pipeline----3M	10M	CO2

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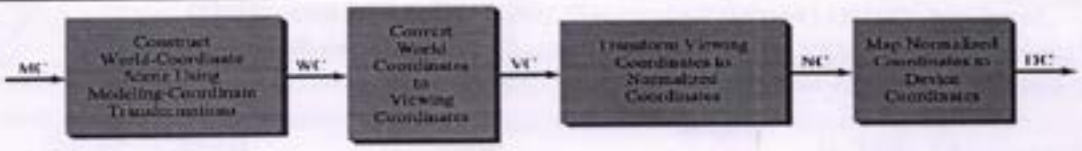
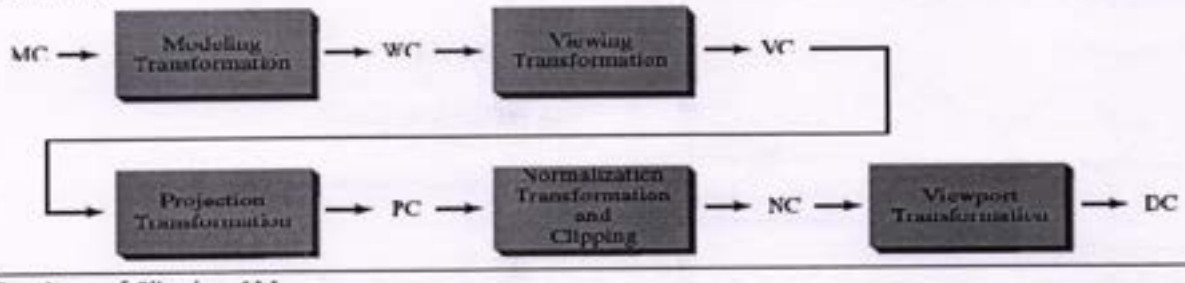
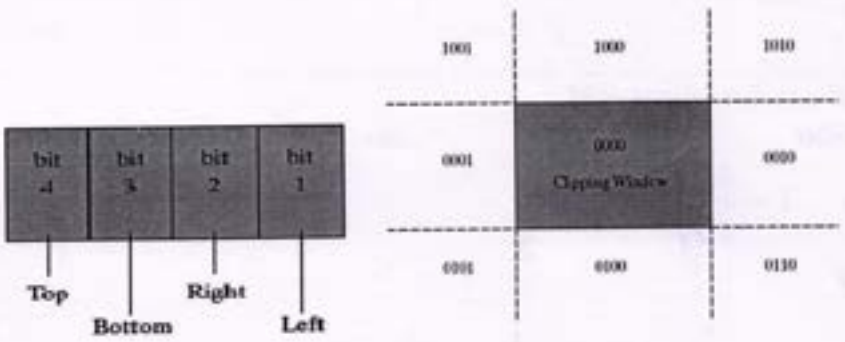


Diagram-2M

and

Explaination of 3D viewing pipeline ----3M
Diagram-2M



3	a	Definationa of Clipping-1M Any procedure that eliminates those portions of a picture that are either inside or outside a specified region of space is referred to as a **clipping algorithm** or simply **clipping** Explaination of Cohen-sutherland line clipping algorithm-2M Diagram-2M  Example----5M	10M	CO3
	b	Explaination of sutherland-hodgemen polygon clipping algorithm----3M Diagram-2M  Example----5M  	10M	CO3
		OR		
4	a	Explaination of color models RGB and CMY---5M According to the *tristimulus theory* of vision, our eyes perceive color through the stimulation of three visual pigments in the cones of the retina. ❖ One of the pigments is most sensitive to light with a wavelength of about 630 nm (red).	10M	CO3

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another has its peak sensitivity at about 530 nm (green), and the third pigment is most receptive to light with a wavelength of about 450 nm (blue).

❖ The three primaries red, green, and blue, which is referred to as the *RGB color model*.

CMY Parameters

❖ A subtractive color model can be formed with the three primary colors cyan, magenta,
and yellow

Explaination of index color model with a neat diagram-5M

b Explain the following basic illumination models — 10M — CO3

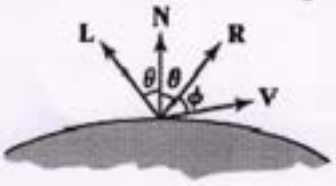
i) **ambient light** the amount of the incident ambient light that is reflected depends on surface
optical properties, which determine how much of the incident energy is reflected and how much is absorbed
------2M

ii) diffuse reflection

$$\text{Intensity} = \frac{\text{radiant energy per unit time}}{\text{projected area}} = \frac{\cos\phi_N}{dA\cos\phi_N} = \text{constant}$$

------2M

iii) **speculer** The bright spot, or specular reflection, that we can see on a shiny surface is the result of total, or near total, reflection of the incident light in a concentrated region



around the specular-reflection angle.

------2M

i) phong ------2M

ii) and corresponding openGL functions------2M

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INTERNAL ASSESMENT TEST: II

SUB: Web Technology and Its Application (18CS63) **MAX MARKS** :40

SEM: 6th sem **TIME** : 90 min

1	a	What is Java script? Discuss the advantage and disadvantage of client side scripting.	CO3	7
	b	Briefly describe the Document object model (DOM)?	CO3	7
	c	Write a JS code that displays text "VTU BELAGAVI" with increasing font size in the interval of 100ms in Blue colour when the font size reaches 50pt it should stop?	CO3	6
		OR		
2	a	With suitable diagram, Explain PHP module in Apache. Describe the role of Apache thread in web application execution.	CO3	10
	b	With a neat diagram, Explain client and server script execution.	CO3	10
3	a	With data flow diagrams, Explain the role of PHP's $_GET and $_POST arrays.	CO4	10
	b	How do you read or write a file on the server from PHP? Give example.	CO4	7
	c	Write a PHP program to display a digital clock which displays the current time of the server.	CO4	3
		OR		
4	a	How do you achieve data encapsulation in PHP? Give Example.	CO4	10
	b	Explain procedural error handling and object-oriented exception handling with suitable code segments.	CO4	10

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1	a	What is Java script? Discuss the advantage and disadvantage of client side scripting.	CO3	7

JavaScript is a scripting language that enables you to create dynamically updating content, control multimedia, animate images, and pretty much everything else.

Advantages of Client-side scripting

- More interactive since it responds immediately to the user action.
- Quick Execution because they don't require a trip to the server.
- improve the user experience for the user whose browser support script.
- An alternative option is available for the user whose browser didn't support script.
- Reusable and obtainable from many resources.

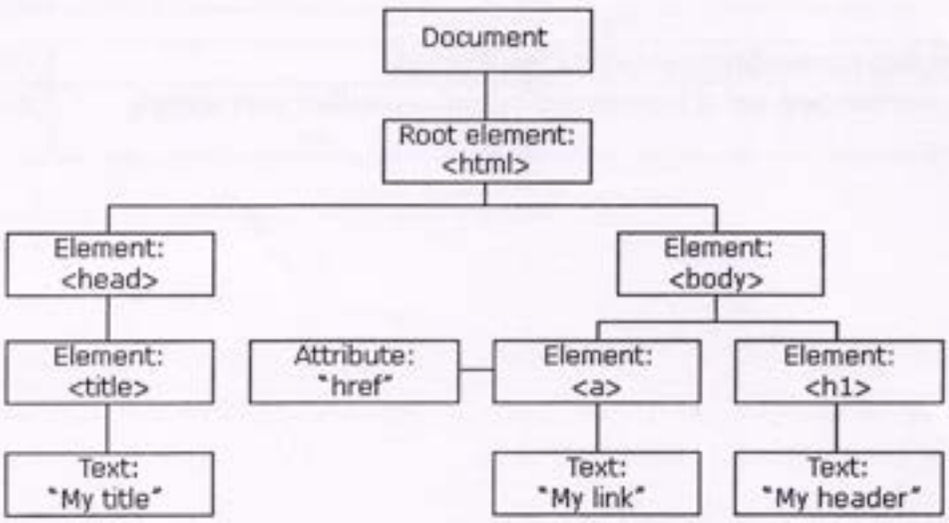
Disadvantages of client-side scripting.

- it is not supported by all browsers. if no alternative is given for the script than the user might get an error.
- Need more testing. because of the different browser and its version support script differently.
- If the Script is not available through other resources than more development time and effort required.
- Developers have more control over the look and behaviour of their Web widgets; however, usability issues can arise if a Web widget seems like a standard control but behaves different way or vice-versa.

1. b	Briefly describe the Document object model (DOM)?	CO3	7

When a web page is loaded, the browser creates a **Document Object Model** of the page.

The **HTML DOM** model is constructed as a tree of **Objects**:



1	c	Write a JS code that displays text "VTU BELAGAVI" with increasing font size in the interval of 100ms in Blue colour when the font size reaches 50pt it should stop?	CO3	6

```
<html>
<body>
<p id="demo">
</p>
<script>
var var1 = setInterval(inTimer,1000);
var size = 5;
var ids = document.getElementById("demo");
function inTimer(){
ids.innerHTML = 'VTU Belagavi';
ids.setAttribute('style',"font-size:"+size+"px; color:blue");
size +=5;
if(size>=){
clearInterval(var1);
}
}
</script
```

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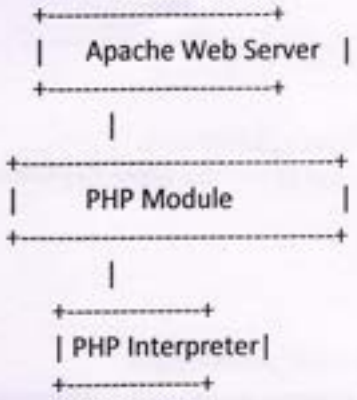
```
</body>
</html>
```

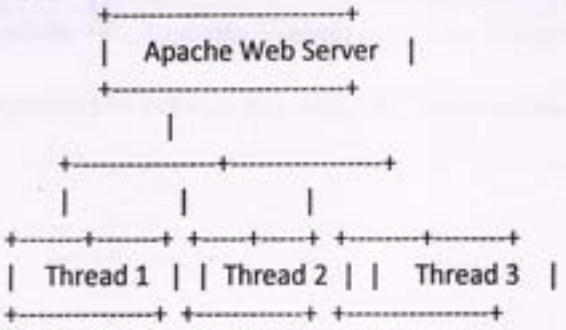
2	a	With suitable diagram, Explain PHP module in Apache. Describe the role of Apache thread in web application execution.	CO3	10

PHP module in Apache: The PHP module in Apache allows the Apache web server to interpret and execute PHP scripts. It acts as a bridge between the web server and the PHP interpreter.

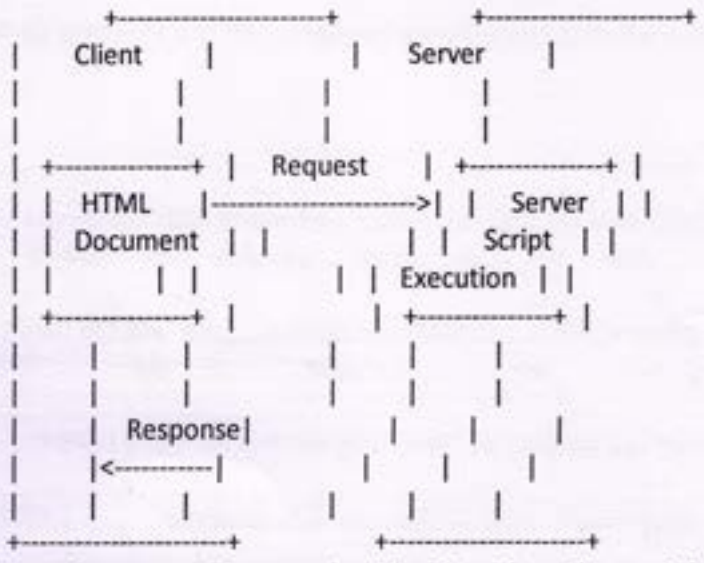
Here's a diagram illustrating the interaction between Apache and the PHP module:



Role of Apache threads in web application execution: Apache web server uses a process-based architecture, where each incoming request is handled by a separate process. Within each process, Apache creates multiple threads to handle multiple requests concurrently. Here's a diagram illustrating the role of Apache threads:



2	b	With a neat diagram, Explain client and server script execution.	CO3	10



In client and server script execution, the client (usually a web browser) makes a request to the server for a web page. Here's how the process works:

1. The client sends a request to the server for a specific web page or resource.
2. The server receives the request and processes it.
3. If the requested resource is a web page, the server starts executing the server-side scripts, if any.
4. The server-side scripts (e.g., PHP, Python, Ruby) handle any dynamic processing required for generating the web page.

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5. The server-side scripts may interact with databases, perform calculations, or process data based on the logic defined in the scripts.
6. Once the server-side scripts have finished executing, the server generates an HTML response containing the processed data or the dynamically generated content.
7. The server sends the HTML response back to the client.
8. The client, upon receiving the response, renders the HTML content, which may include dynamic data, CSS styles, and JavaScript.
9. The client's web browser displays the rendered web page to the user.

3	a	With data flow diagrams, Explain the role of PHP's $_GET and $_POST arrays.	CO4	10

$_GET

- $_GET is a superglobal variable used to collect data from the HTML form after submitting it.
- When form uses method get to transfer data, the data is visible in the query string therefore the values are not hidden.
- $_GET superglobal array variable stores the values that come in the URL

$_POST

- $_POST is a superglobal variable used to collect data from the HTML form after submitting it.
- When form use method post to transfer data, the data is not visible in the query string, so it is more secure than $_GET method.

3	b	How do you read or write a file on the server from PHP? Give example.	CO4	7

1. **fopen("filename.txt","mode"):-** Used for opening file in desired mode, it takes 2 attribute, file name a mode(reading,writing).It is also used to create file.
2. **fread(filename, no of character):-** Used to read file takes two attribute file name and number of character we want to read.
3. **fclose(filename):-** Used to close file.
4. **fwrite(filename,writing content):-** Used to write file
5.

Steps for Reading File in Server:

step1: create a file using fopen with arguments as a file name with .txt extension and mode with which you want to open the file (here reading) and store the file in some variable to access later.

Step2: Read file using fread with arguments as a file name which is a variable we have assigned to a file name earlier and no of characters we want to read.

Steps for Writing File in Server:

step1: create a file using fopen with arguments as a file name with .txt extension and mode with which you want to open the file (here writing) and store the file in some variable to access later.

Step2: Write file using fwrite with arguments as a file name which is a variable we have assigned to a file name earlier and no of characters we want to write.

step3: Close the file with an argument as a file name which is a variable we have assigned to a file name earlier.

3	c	Write a PHP program to display a digital clock which displays the current time of the server.	CO4	3

```
<!DOCTYPE
html>
        <html>
        <head>
            <title>3rd Lab Program</title>
            <!--Required to refresh every 1 second-->
            <meta http-equiv="refresh" content="1">
```

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```
        <style>
            body {
                position: absolute;
                top: 50%;
                left: 50%;
                transform: translate(-50%, -50%);
                background-color: black;
                color: white;
                font-size: 50px;
            }
        </style>
    </head>
    <body>
        <div>
            <?php
            date_default_timezone_set("Asia/Calcutta");
            echo date("h:i:s a");
            ?>
        </div>
    </body>
    </html>
```

4	a	How do you achieve data encapsulation in PHP? Give Example.	CO4	10

- Encapsulation is a concept where we encapsulate all the **data and member functions** together to form an object.
- **Wrapping up data member and method together** into a single unit is called Encapsulation.
- Encapsulation also allows a **class to change its internal implementation** without hurting the overall functioning of the system.
- Binding the data with the code that manipulates it.
- It keeps the data and the code **safe from external interference**.

```
<?php
  class ATM {
    private $custid;
    private $atmpin;
    public function PinChange($custid,$atmpin) {
          ---------perform tasks-----
          }
    public function CheckBalance($custid,$atmpin){
          ---------perform tasks-----
          }
    public function miniStatement($custid) {
          }
    }
  $obj = new ATM();
  $obj ->CheckBalance(10005285637,1**3);
?>
```

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4	b	Explain procedural error handling and object-oriented exception handling with suitable code segments.	CO4	10

Procedural Error Handling: Procedural error handling in PHP involves using functions like **die()** and **trigger_error()** to handle errors and display error messages. Here's an example code segment:

```
function divide($numerator, $denominator) {
  if ($denominator === 0) {
    trigger_error("Division by zero is not allowed.", E_USER_ERROR);
  }

  return $numerator / $denominator;
}

$number1 = 10;
$number2 = 0;

$result = divide($number1, $number2);
if ($result === false) {
  die("An error occurred while performing the division.");
}

echo "Result: " . $result;
```

Object-Oriented Exception Handling: In object-oriented exception handling, PHP provides built-in exception classes and the **try-catch** block to handle and manage exceptions. Here's an example code segment:

```
class DivisionException extends Exception {}

function divide($numerator, $denominator) {
  if ($denominator === 0) {
    throw new DivisionException("Division by zero is not allowed.");
  }

  return $numerator / $denominator;
}

$number1 = 10;
$number2 = 0;

try {
  $result = divide($number1, $number2);
  echo "Result: " . $result;
} catch (DivisionException $e) {
  echo "An error occurred: " . $e->getMessage();
}
```

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INTERNAL ASSESMENT TEST: III
SUB: Web Technology and Its Application (18CS63)
SEM: 6th sem

MAX MARKS :40
TIME : 90 min

1	a	Explain three approaches to restrict the file size in file upload with suitable code segments.	CO4	10
	b	Explain $_SERVER and $_FILES array with code.	CO4	10
		OR		
2	a	Why is state a problem for web application? Explain.	CO4	07
	b	Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Branch, Year of Joining. Make up sample data for 2 students.	CO4	03
	c	What does $() shorthand stand for in jQuery? Explain any three form selectors.	CO4	10
3	a	What is an AJAX? Write UML sequence diagram of an AJAX request	CO5	10
	b	What are HTTP cookies? How do you handle them in PHP.	CO5	10
		OR		
4	a	Explain serialization with code.	CO5	10
	b	Discuss the merits and drawbacks of SOAP and REST based web services and for XML Versus JSON as a REST data format.	CO5	10

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Sign of Staff –Incharge

HOD, CSE

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1	a	Explain three approaches to restrict the file size in file upload with suitable code segments.	CO4	10

```
<form action="" method='post' enctype="multipart/form-data">
<input type="file" name="file"/><br><br>
        <input type="submit" value="Upload"/>
</form>
```

We create a form, a file upload form. We set the action equal to #upload. This allows us the form, once submitted, to jump to where we have <a name="upload><a/>.

```
<?php

$name= $_FILES['file']['name'];

$tmp_name= $_FILES['file']['tmp_name'];

$size= $_FILES['file']['size'];

$path= "Uploads/Files/";

if (isset($name)) {

if (empty($name))
{
echo "Please choose a file";
}
else if ((!empty($name)) && ($size < 20971520))
{
move_uploaded_file($tmp_name, $path . $name);
echo 'Uploaded!';
}
else
{
echo "The size of the file must be less than 20MB in order to be uploaded.";
}
}

?>
```

	b	Explain $_SERVER and $_FILES array with code.	CO4	10

$_SERVER is a PHP super global variable which holds information about headers, paths, and script locations.

The example below shows how to use some of the elements in $_SERVER:

```
<?php
echo $_SERVER['PHP_SELF'];
echo "<br>";
echo $_SERVER['SERVER_NAME'];
echo "<br>";
echo $_SERVER['HTTP_HOST'];
echo "<br>";
echo $_SERVER['HTTP_REFERER'];
echo "<br>";
echo $_SERVER['HTTP_USER_AGENT'];
echo "<br>";
echo $_SERVER['SCRIPT_NAME'];
?>
```

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The global predefined variable **$_FILES** is an associative array containing items uploaded via HTTP POST method. Uploading a file requires HTTP POST method form with enctype attribute set to **multipart/form-data**.

$HTTP_POST_FILES also contains the same information, but is not a superglobal, and now been deprecated

The _FILES array contains following properties –

$_FILES['file']['name'] - The original name of the file to be uploaded.

$_FILES['file']['type'] - The mime type of the file.

$_FILES['file']['size'] - The size, in bytes, of the uploaded file.

$_FILES['file']['tmp_name'] - The temporary filename of the file in which the uploaded file was stored on the server.

$_FILES['file']['error'] - The error code associated with this file upload.

2	a	Why is state a problem for web application? Explain.	CO4	07

In computer science, an input is information put into the program by the user and state refers to the condition of an application according to its stored inputs -- saved as variables or constants.

	b	Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Branch, Year of Joining. Make up sample data for 2 students.	CO4	03

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/css" href="PROG5.css"?>

<STUDENTDATA>

 <STUDENT>
  <USN>USN  : 3GN16CS002</USN>
  <NAME>NAME : ABHISHEK MALI</NAME>
  <COLLEGE>COLLEGE : GNDECB</COLLEGE>
  <BRANCH>BRANCH :CSE</BRANCH>
  <YEAR>YEAR : 2019</YEAR>
  <EMAIL>E-MAIL : abhishek@gmail.com</EMAIL>
 </STUDENT>

 <STUDENT>
  <USN>USN : 3GN16CS029</USN>
  <NAME>NAME : KESHAV POLA</NAME>
  <COLLEGE>COLLEGE : GNDECB</COLLEGE>
  <BRANCH>BRANCH :CSE</BRANCH>
  <YEAR>YEAR : 2019</YEAR>
  <EMAIL>E-MAIL : keshav@gmail.com</EMAIL>
 </STUDENT>

 <STUDENT>
  <USN>USN  : 3GN16CS027</USN>
  <NAME>NAME : KARAN DANGE</NAME>
  <COLLEGE>COLLEGE : GNDECB</COLLEGE>
  <BRANCH>BRANCH :CSE</BRANCH>
  <YEAR>YEAR : 2019</YEAR>
  <EMAIL>E-MAIL : karan@gmail.com</EMAIL>
 </STUDENT>

</STUDENTDATA>
```

prog.css

```
*{
```

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```
    display: block; font-size: 20px;
}
USN {
    color: blue;
    font-size: 30px;
    margin-top: 20px;
}
```

	c	What does $() shorthand stand for in jQuery? Explain any three form selectors.	CO4	10

$ is a short form of jQuery function. $() = jQuery() = window. $() = window. jQuery() $()/jQuery() is a selector function that selects DOM elements.

Selector	Example	Selects
:checkbox	$(":checkbox")	All input elements with type="checkbox"
:submit	$(":submit")	All input elements with type="submit"
:reset	$(":reset")	All input elements with type="reset"
:button	$(":button")	All input elements with type="button"

3	a	What is an AJAX? Write UML sequence diagram of an AJAX request	CO5	10

AJAX is a developer's dream, because you can:

- Read data from a web server - after a web page has loaded
- Update a web page without reloading the page
- Send data to a web server - in the background

	b	What are HTTP cookies? How do you handle them in PHP.	CO5	10

- A cookie is a small file that the server embeds on the user's computer.
- Each time the same computer requests a page with a browser, it will send the cookie too.
- With PHP we can create and retrieve cookie values.

4	a	Explain serialization with code.	CO5	10

Serialization is the process of converting a data object—a combination of code and data represented within a region of data storage—into a series of bytes that saves the state of the object in an easily transmittable form.

	b	Discuss the merits and drawbacks of SOAP and REST based web services and for XML Versus JSON as a REST data format.	CO5	10

SOAP vs REST vs JSON are comparisons that are frequently made in discussions about web services. While SOAP and REST are both leading approaches to transferring data over a network using API calls, JSON is a compact data format that RESTful web services can use.

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INTERNAL ASSESMENT TEST: I **DATE**: 28/04/2023
SUB : OOMD[18CS642] **MAX MARKS** :40
SEM : VI **TIME** : 75 min

Note: Answer Two full Questions

1	a	Differentiate multiplicity of an association and multiplicity of attributes What does scope indicate?	6M	CO1
	b	What is the need for promoting n-ary associations to classes?	6M	CO1
	c	Differentiate aggregation and association. Compare aggregation and composition.	8M	CO1
		OR		
2	a	What are abstract classes. Give examples.	8M	CO1
	b	Explain the Types of multiple inheritance. How do you eliminate multiple inheritance.	8M	CO1
	c	Write notes on metadata and reification.	4M	CO1
3	a	What is a state? How is it denoted in UML? Compare event and state. Explain transitions and guard conditions. How a transition is denoted in UML?	10M	CO1
	b	What is meant by an event. Explain its types	10M	CO1
		OR		
4	a	What is the purpose of a state diagram. Draw and explain a state diagram for Phone line.	10M	CO1
	b	Explain one shot state diagram. Compare activity and do-activity.	10M	CO1

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INTERNAL ASSESMENT TEST: I **DATE**: 28/04/2023
SUB : OOMD [18CS642] **MAX MARKS** :40
SEM : VI **TIME** : 75 min

Note: Answer Two full Questions

1	a	Differentiate multiplicity of an association and multiplicity of attributes 3 What does scope indicate?.	6M	CO1
	b	What is the need for promoting n-ary associations to classes?	6M	CO1
	c	Differentiate aggregation and association. Compare aggregation and composition.	8M	CO1
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Scheme and Solution

Subject: Object oriented modeling and Design(18cs642) Internal assessment-1

1 (a) **Multiplicity of an association:-**

→ The multiplicity of association Specifies the Number of objects which are going to associated with the other Object is called as a multiplicity of association

→ 

Multiplicity of association.

by Considering above figure

→ The Customer can make any number (or) n number of orders

→ The Single (or) Each order is for only the Single Customer

Above this Shows the multiplicity of association

→ which is one-to-many.

Multiplicity of attribute

→ the multiplicity of attribute which Specifies the number of allowed values that can be assigned to the attribute of Object this type of multiplicity is called as multiplicity of attribute.

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→ Here it gives the Specification for the Number of allowed values for the attribute

→ Above figure Describes the multiplicity of an attribute
→ The object 1 having Name & age
→ The object 2 having the attributes of Name and age
→ In the 2nd object we are Specifying the allowed value for an attribute
→ This is called as multiplicity of attribute 6M

1(b) n-ary associations
→ n-ary association is used to represent the association relation between the 3 or more classes the model is called as n-ary association.
→ It is much more need for promoting n-ary associations to classes.
→ promoting n-ary associations to class can provide other extra Beneficiary for the classes
→ Promoting n-ary associations to class can Simplify the model of System by reducing the relationship between the classes
→ promoting n-ary association to class can improve the clarity of System design by providing natural domains
→ promoting n-ary association to class can make more flexible in nature
→ Promoting n-ary association to class can make the modularity.

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→ Promoting n-ary association to classes can Increase the recuse.

→ Promoting n-ary association to classes will make So many Beneficiary for the classes.

→ It also gives the Security for the classes. 6M

1(C)

Aggregation	Association.
* it is a Special Kind of association which is having whole & part . relation.	* It is a type of operation which is going to associate with the objects which is going to associate with the other object
* object were linked to Each other	* objects are mostly to link
* It is flexible in nature	* It is Inflexible in nature
* It is having ".has a" relationship with object followed by Diamond Shaped Structure	* It is also having "has a" relationship with the objects followed by the line Structure
* Aggregation it is a part of association	* Association is Containg a Aggregation.
* Aggregation having one class whole & another class part	* The Association it having whole

4M

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Comparission between the Aggregation & Compersition.

Aggregation :-

→ It is a part of association which is having one a class of whole and other class for part
→ Aggregation cannot Exist without Association

Composition :-

→ It is the strongest part of association which Cannot Exist without the whole so, hence this is Dependent on the whole
→ It is also a part of Aggregation
→ It have the Behaviour of Aggregation also
→ this type of aggregation part is called as Composition

AM

4(a) State Diagram

→ State is the abstraction of values of the State is the links of the object
→ State Diagrams is a like a graph tree which nodes are called as the objects

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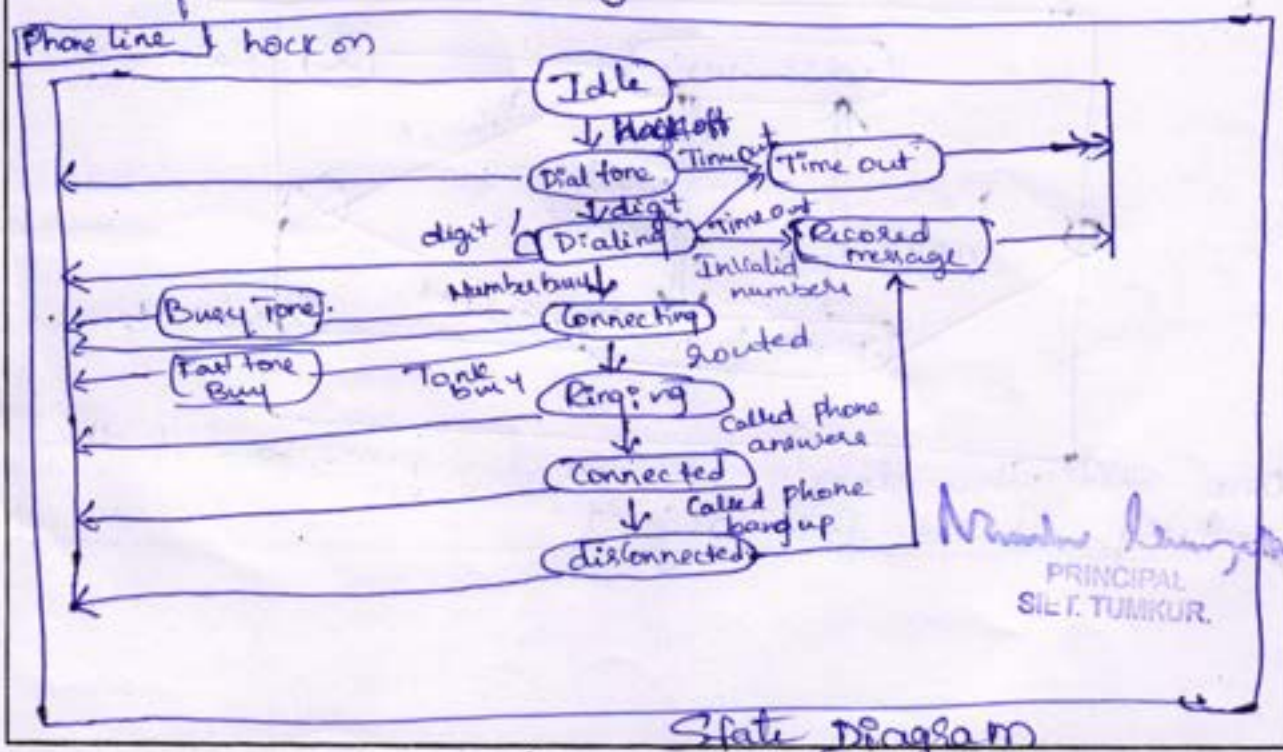
-> The tangentially drawn arc are called as the Transitions.
-> State Diagram is interact with the passing Events and the guard condition
-> Guard Condition is the Boolean which must be true for the transition process
-> when the transition fires up the Event occurs when the Event occurs the guard condition is true
-> The Guard Condition is only checked once
-> The UML notation for the transition is the line
-> The Events were checked frequently
-> The State model having more than one State diagram for each object of class is containing Behavioral Model.
-> The UML notation for the State Diagram is the rectangle with its name in pentagonal in the left corner rectangular Box.



State Diagram

4(b) **One Shot State Diagram**

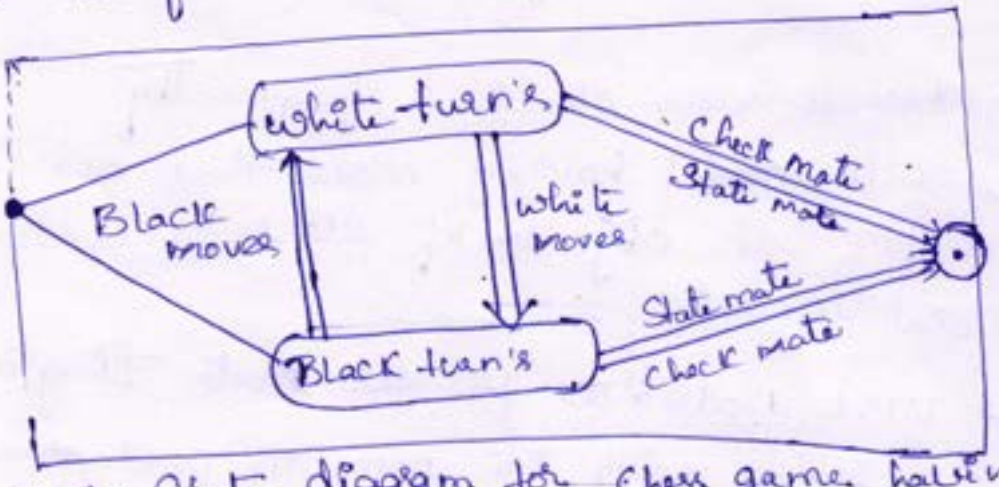
→ One Shot State Diagram is done for those operation which are giving loop time for answers

(loop ; Continuously it will going to give repeated answers)

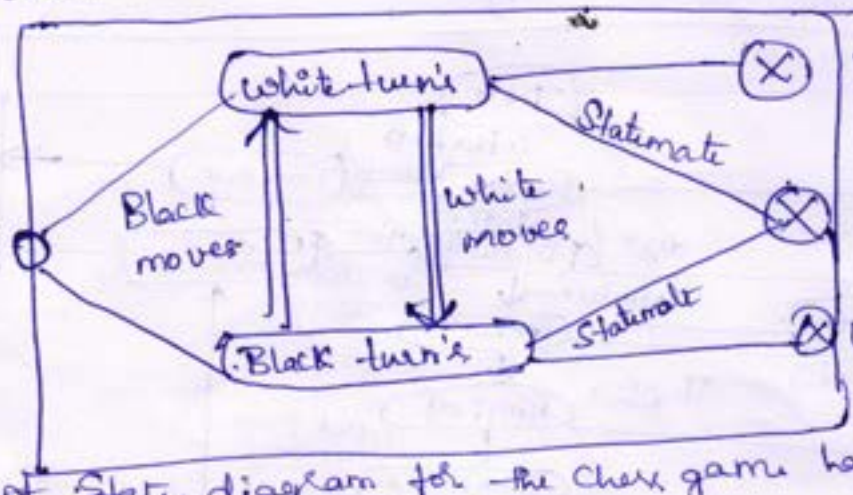
→ One Shot State Diagram will have the two features

→ As the Event occurs or State the Creation of object will done

→ The one-Shot State Diagram having the intial and the final State



One-Shot State diagram for chess game having finite lives



One-Shot State diagram for the chess game having the Entry and the exit object

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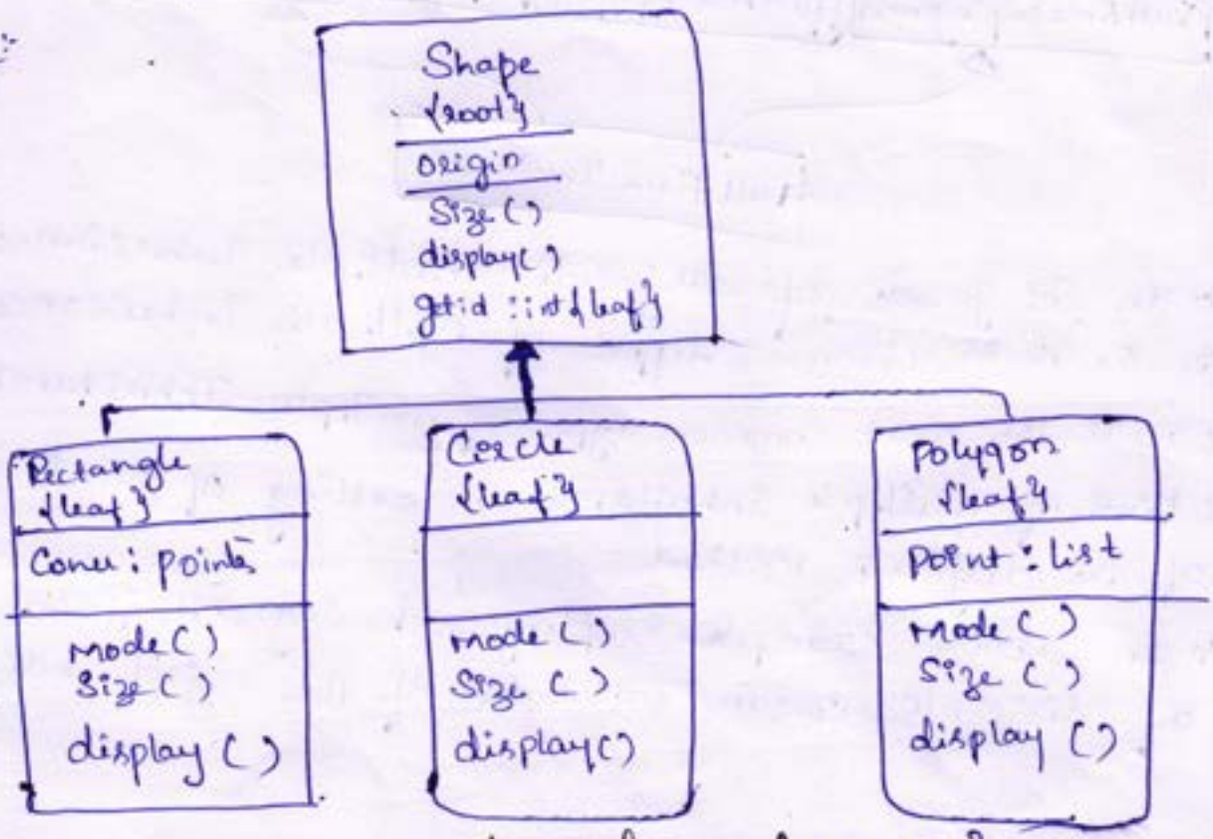
2) a. **Abstract Classes**

* Abstract classes are class that is inheritable having no define instances
* Abstract class is a class having no define instances but whose classes having define Instances
* Concrete class may have define Instances
* Concrete Class having Inheritance of Sub Classes
* An abstract class is denoted by an UML is Indian Italic {abstract}
* An abstract operation is used to define the methods
* An abstract operation is stored in the Sub Classes of one object to another object

Eg:



* Abstract Class is denoted by {abstract}
* For above Example leaf is a abstract class that refers to the Shape of the rectangle, circle, polygon.

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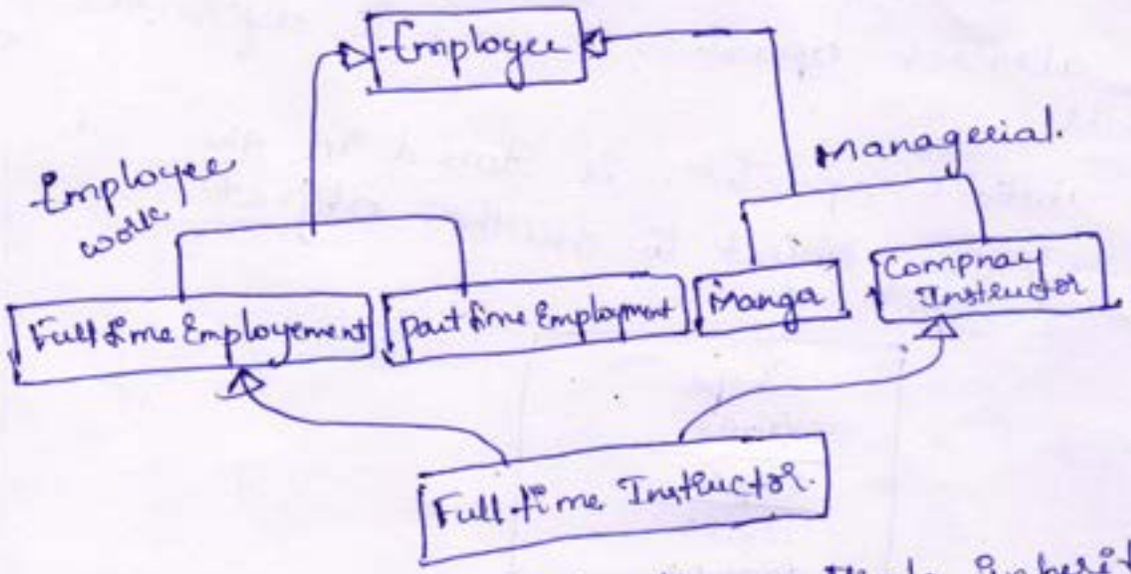
* Abstract class having attributes operations
* An abstact is generalization of Sub classes of the Objects
* Generalization : having Super Sub classes

8M

26. Types of multiple inheritance

1. Set joints of a disjoints
2. with overlapping inheritance

1. Set Joints of disjoints :



* In Set joints of disjoints multiple inheritance is the most Common type of multiple inheritance
* It is the most Common type of multiple Inheritance
* Kind of multiple Inheritance is Setting of Joints of the disjoints method
* In above Example Employee having Set Joint of disjoints Contain attribute of the object Code

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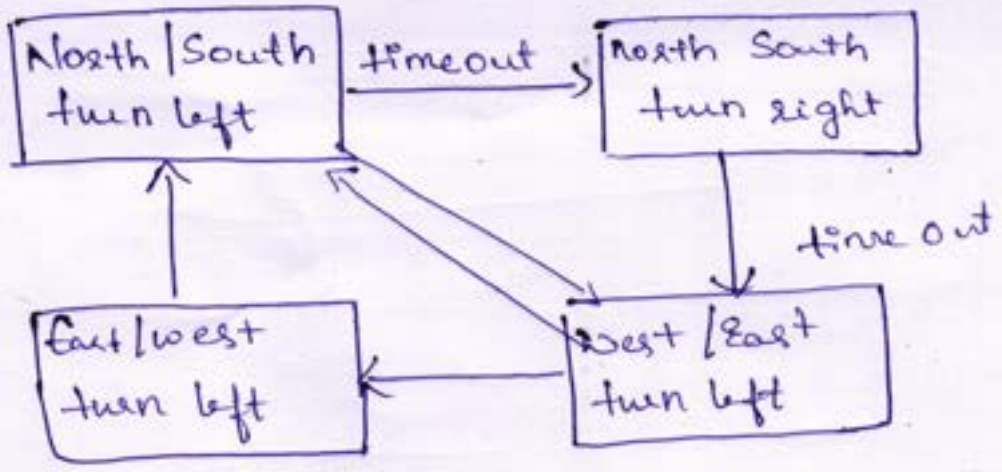

10M

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Eg :- when Jan = 1, 2003
after = 10 sec

3(a) State : describing it self & response message when Event occur is called State

UML : Object
normal variable) occurance of State

* denoted in structure brackets

Event	State
1) occurance at a point of time	1) describing itself with internal of item.
2) particular position happening	2) diffrent position.

Transitions :-

* moving one State to another State is called transition
* There are form Event
  1. Gaurd Event
  2. Sourse Event
  3. Triggering Event

Gaurd Transition :- Gaurd transition is one which when Condition is met then only it happen

UML :- State A — More — State B

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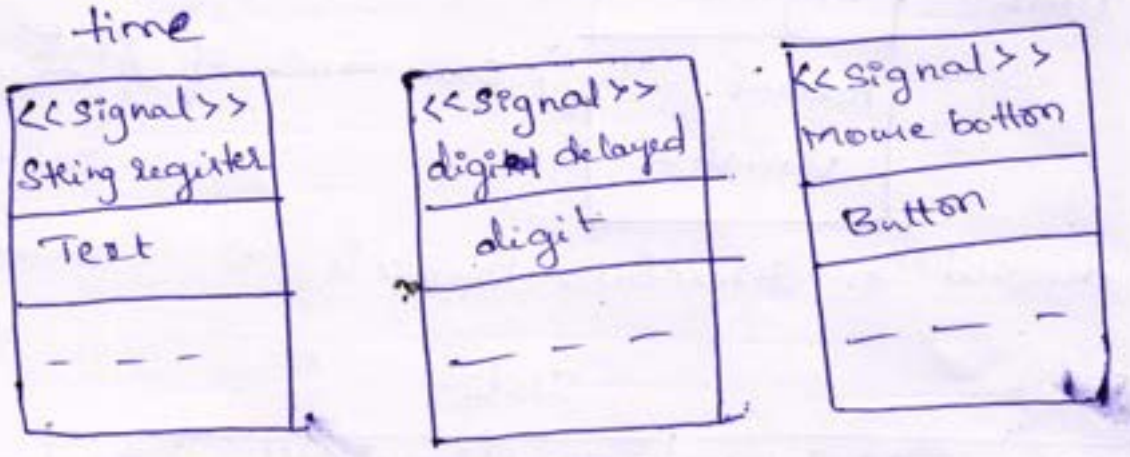
Difference b/w Signal & Signal Event

* Signal is a message on object
* Signal Event is a occurance on a particular time

Ex:-



2. Change Event :-

* Change Event is an event that is caused by the satisfaction of book on expression.
* UML denoted by an keyword of the paranthesis of an expression

Ex :-

when {room temperature < heating ppoint}
when {room temperature > cooling temppoint}
when {power block < temp roots}
when {raise.pressure < minimum pressure}

3) Time Event :

* Time Event is an Event that is caused by absolute time
* Time Event of an UML is denoted by an Keyword of the paranthes is of an Expression

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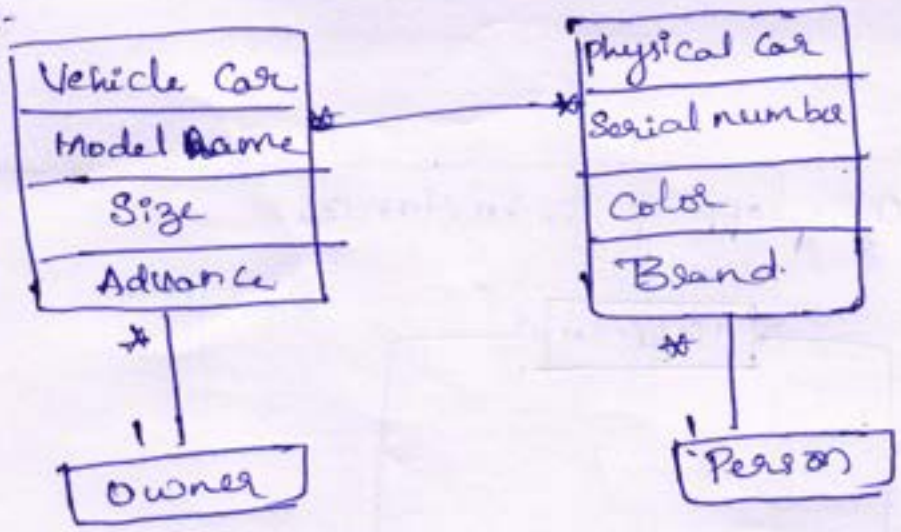
Ex:-



Reification

* Reification is a Creating a data of objects
* It is used to Creating a object with classes, Methods, Inheritance, Sub classes. 4M

3(b) **Event:-**

An Event is an occurance of processing Particular in time

Types of Event:-

1. Signal Event
2. Change Event
3. Time Event

1. **Signal Event :-**

* Signal Event is a Event it is Sending or receving a Signals
* Its having Sub routine functions with return Calls
* An Signal is transmission of one Object to another object 10M

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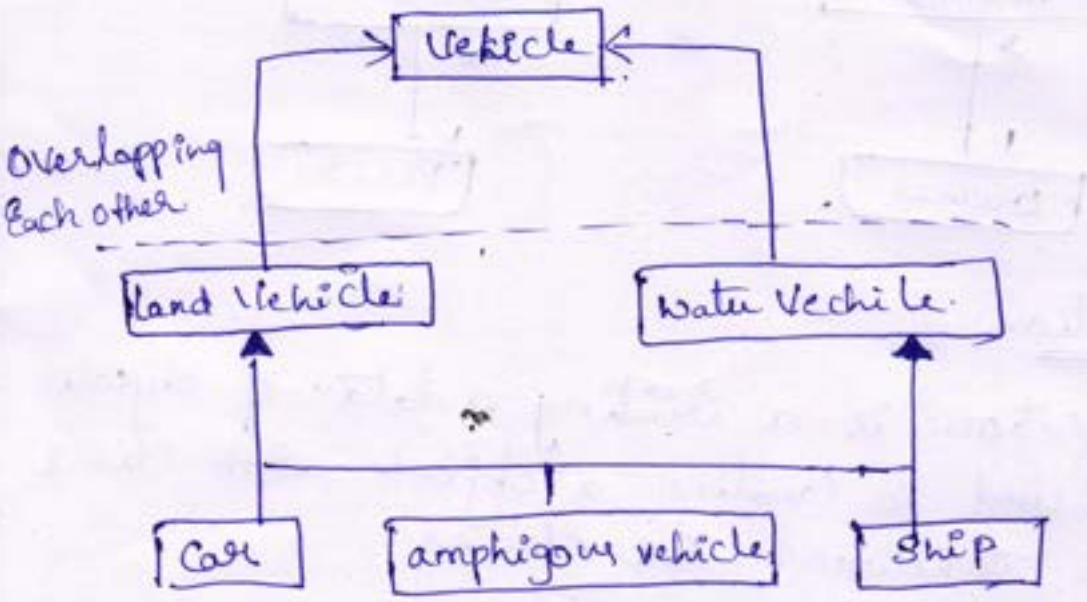
2. With over lopping inheritance



* Overlapping means it Contains both land vehicle & water Vehicle
* amphigous Vehicle having the Cordains of Car, Ship
* means having land Vehicles also & water Vehicles also

Eliminate multiple Inheritance

* Inherited classes are only for Public.
* Inherited classes having no define Instances
* Unlike classes are not provided
* It does not Contain Instances

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2(c) Meta data :-

* metadata is a data describes the other data
* In programming it provides additional, information of using classes, methods, inheritance, Subclasses
* metadata is a data describes the data catalog

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INTERNAL ASSESMENT TEST: II
SUB :OOMD(18CS642)
SEM :VI

DATE: 16/06/2023
MAX MARKS :40
TIME : 75 min

Note: Answer Two full Questions

1	a	List and Explain the rules for developing state charts.	10M	CO2
	b	Define SSD(System Sequence Diagram).What are the steps to develop SSD based on Activity Diagram.	10M	CO2
		or		
2	a	Define use case diagram .Explain the notations used in use case diagram used in use case diagram with example.	10M	CO2
	b	Write a note on 1.Sequence model 2.Activity Model.	10M	CO2
3	a	List and explain the stages of software development process.	10M	CO3
	b	List and explain the steps to construct domain state model.	10M	CO3
		or		
4	a	List and explain the criteria to eliminate unnecessary and incorrect attributes.	10M	CO3
	b	Explain system concept (conception) for automated teller machine (ATM).	10M	CO3

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Scheme and Solution

Subject: Object oriented modeling and Design(18cs642) Internal assessment-II

1) a. State Charts is used to understand the diagram.

Rules for the developing State Charts

1) The name of the State, Transition must be unique
2) The name of the State. Easily to understand & behaviour of the State
3) There are many | Several objects are present only the Essential object can be implement
4) For Every Event there is a appropriate names

1) -> The transition must be unique :-
* Nothing but the transition which we are developed in the State Charts must be Unique

2) **Easy to understand and behaviour of the State :-**
* Through the uniqness of the State chart we can Easily understant & behavior of the State of the object

3) **Several objects only Essential object Should be implemated :-**
* There are many objects should be present to implement but in state chart must be implement only the Essential objects.

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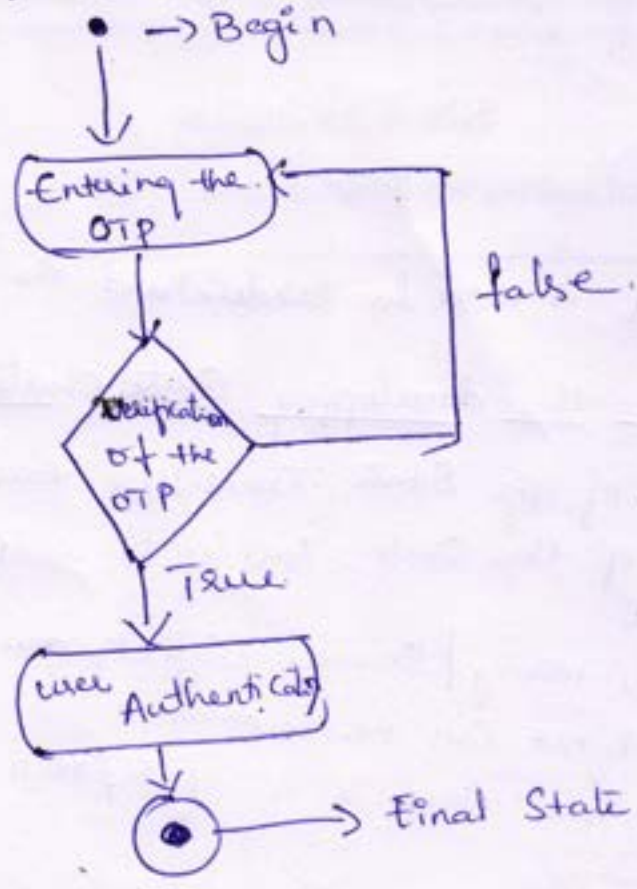
4) Every Event there is a appropriate names :-

* Each Event Contains its own name for that we are using in developing State chart



-5M

Initial State :-

Initial State nothing but begin State or first State, where we Start the produce from the Starting onwards

Final State :-

Final State nothing but the last stage where the process can End

State box :- State box Nothing but Special process in which we are finding the State of the Each object

→ First we are Start from the beging then we are Entering the OTP.

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=> After Entering the OTP the next level goes to Verification of the OTP

=> If the Verification is true then it goes to final State

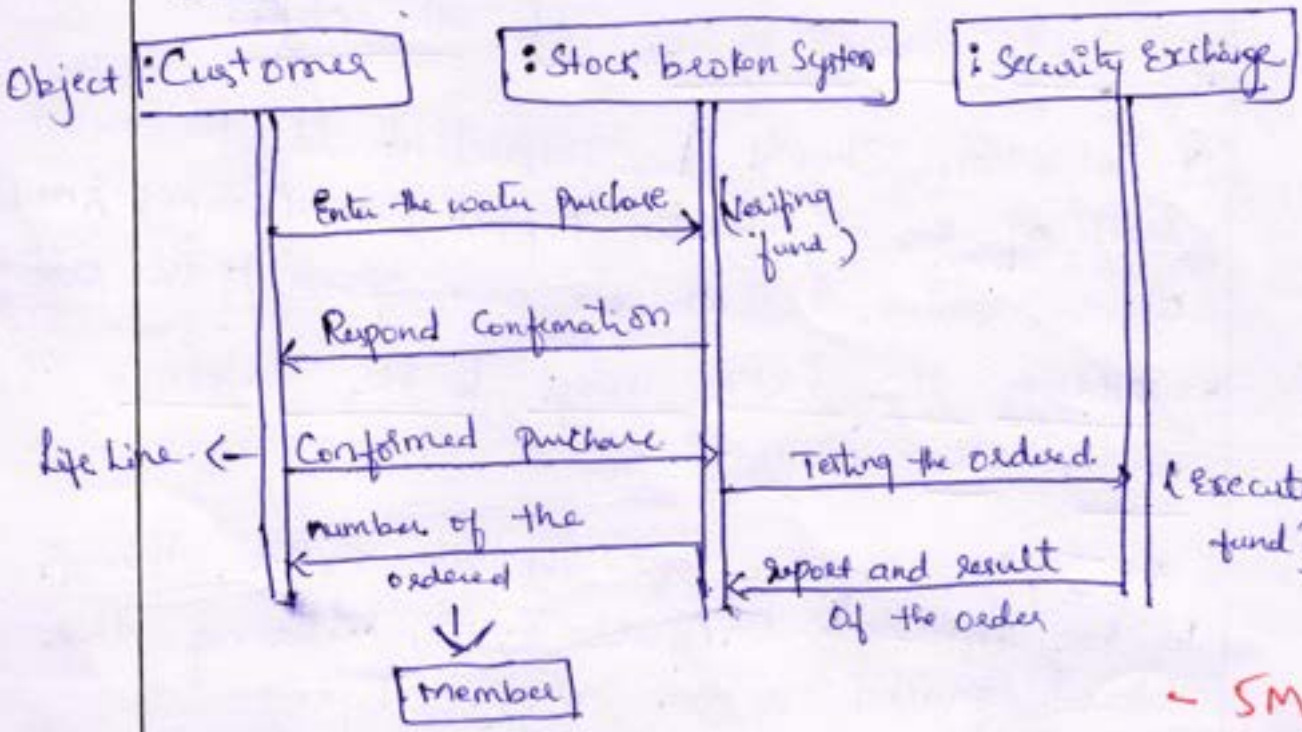
=> Other wise the Verification is false then it goes to the Entering the OTP nothing but Starting Onwards we Should check — 5M

1) b. SSD (System Sequence Diagram) :-

Steps to develop SSD based on activity

System Sequence Diagram is nothing but we are used in UML Language to implement the System Design

. Steps to develop SSD :



— 5M

Steps :-

1) Identify the object which Need a interaction

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* The object which the interaction of we are identify the first object to be interact

2) Identify the message from the object between the system of the object :

=) We are doing message transmition in the second stage, where we can Interact with the object Easily

3) Create a life line of the object :

* we are Just Creating the object between the two life line i.e Confirmed purchase and number of the order which has to be delivered to Confirm the order

4) Creat a activation of the object :

* Activation Should be important to the next level of the object to report the Correct result of the order which we are given to the customer

5) Adding the Extra things to be interact with the object :

* Just we are adding the Extra things to be interact because to increasing the ordered placed in the more object

=> System Sequence Diagram is used for the UML languages

=> where the customer, Stock broker System and Security Exchange play the role of the object

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→ Through this we are verifying the fund and Execute the Conformation of the order

2)a. **use Case diagram**

→ The use Case diagram can be define as the behavioual discription of the System Called use Case diagram

→ The use Case can be used as a discription of the System for the actors

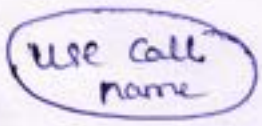
→ The Actor and the System is related by using the use Case

→ The use can be represent in Eclipse notation

The Notation used in the use case diagram are

→ use Case → It is functionality behaviours of a System

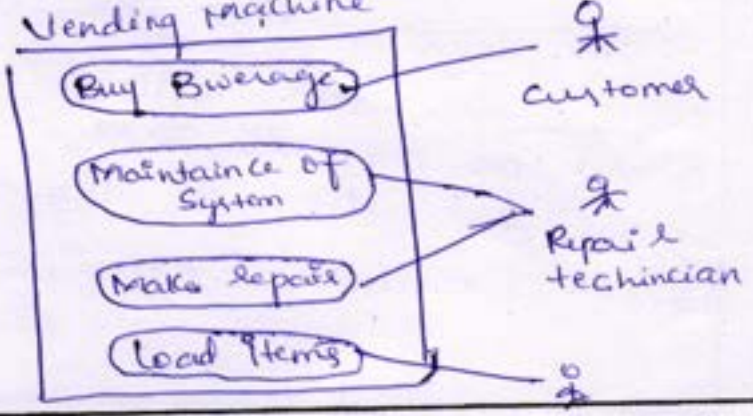
→ The use Case can be represented using the Eclipse notation.



→ The Example of the use Case is the Customer. interact with Vending maching to buy a beverage

→ First the Customer Put the money & Select the Bevarge need to puchase

→ The discription of the System is represent by means of use Cases baied on that the actor will use the System



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→ The two or more actor can related to the use Case & System itself

Actor ->

→ The actor can be represented using 🧍
→ The customer is an actor
→ The customer is an actor buy a Beverage form Vending machine

Repair technician :-

→ The Repair technician will maintain the Vending machine in safe condition by maintaining the System
→ The Repair technician it any problem is occur in the Vending machine the Repair tecnician will make a repair

Stock clerk :- The Stock clerk is also a actor is used to load items in the Vending machine
→ The actors not only the peoples but also a (actor one who will interact with the System)
→ In the Vending machine the Customer is a actor
→ In computer the administration, and user of the System are actor
→ The actor is used for interact with the System based on some use cases
→ The Vending machine is a System through which the actor will use the Vending machine based on the use cases
→ The description of the use case models are actor, use case, Execution

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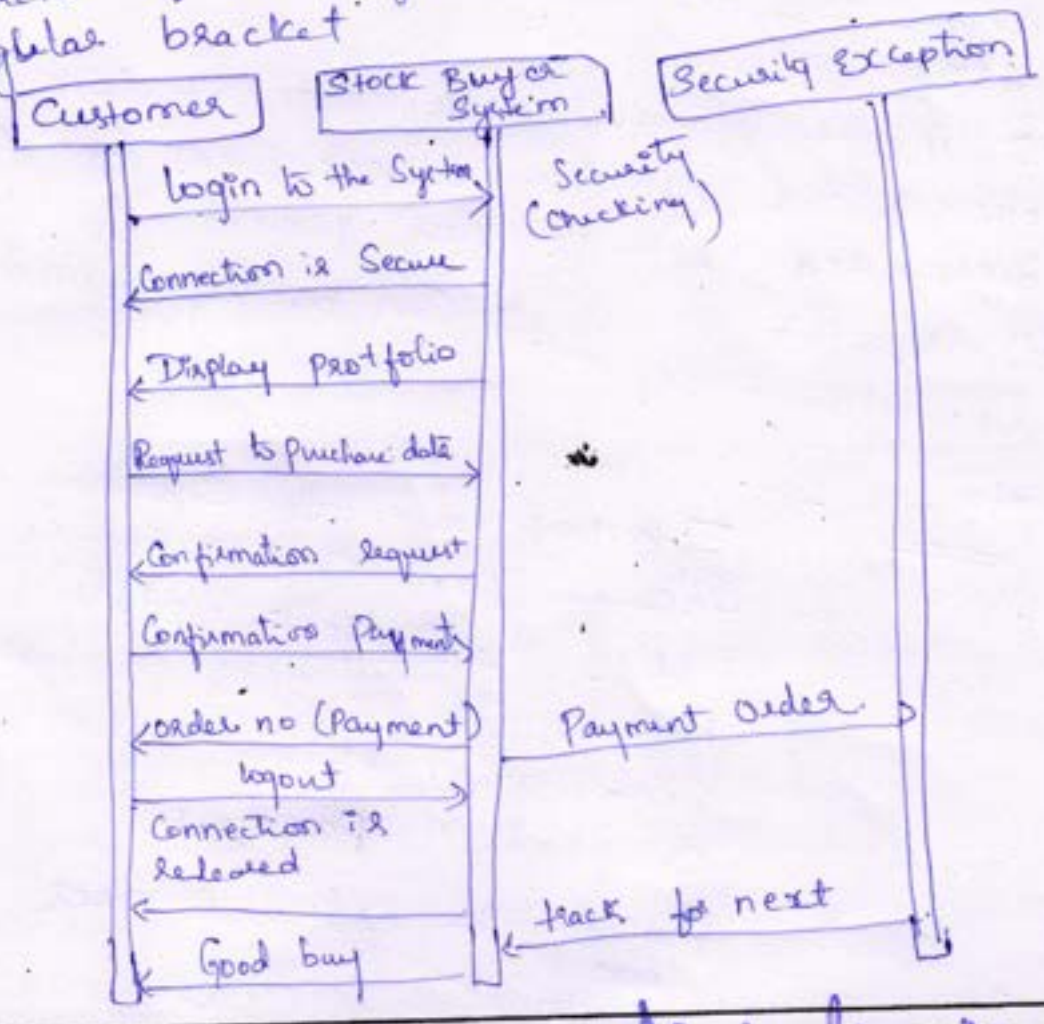
→ In the Case of the Scenario the transaction b/w the two actor is in the texted formate
→ It is difficult to identified the actor present in the transaction
→ Difficult to understand so the scenario model can be shifted the Sequence diagram.

Sequence diagram :-

→ In Senario the Interaction b/w the actors can represented in the form of the textual formate
→ In Sequence model we represent the State & the actors in the verticle line it is called a life line
→ The data transfer between the two actor represented in the horizontal formate
→ The actor & the System is represent in rectangular bracket



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→ the Buy Beverage, Maintance of System, Make Repair, load items are identified as a use Cases.
→ the Customer, Repair technician, Stock cleark are identified as a actor
→ the Vending Machine Coneisting of a three actors and four use Cases — 10M

2b Sequence Model

→ the Sequence Model can be define as a theme of a use Case called Sequence Model
→ It Elaborate the Content of the use Case
→ The Sequence Model can be represent as
i, Senario
ii, Sequence diagram

→ Senario →
→ In the Senario the interaction between the actors can be represent in the form of the text
→ In the Sequence (Senario) it contain all Element and also the object Event ~~can~~ ~~represented~~ that is not present in the System.
→ The Set of Event Can be represented in the Senario

Senario → Joh Doe Login the System
Secure Connection introduce
Display the Protfolio update
Request for the Data Purchase
Confirmation of the Request
Confirmation Payment
Placed the order number — 5M
logout
In secure Connection
Good buy

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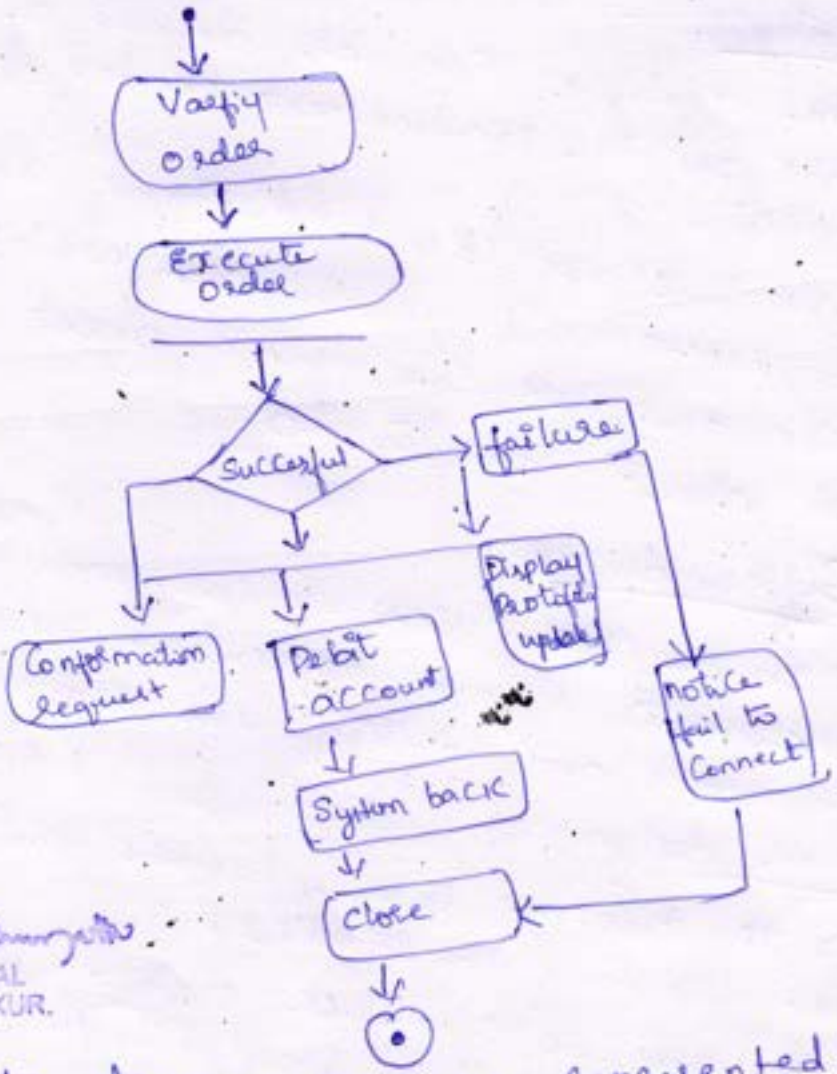
→ the Customer login to the System then their is Strong Connection between the Customer & System
→ Then n it display Portfolio
→ Confirmation request from the System Confirmation Payment get the order number
→ Customer logout then System print Goobuy

Activity Model

→ The activity model is same as the Sequence model It produces complication process
→ It is like workflow of algorithm.



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→ The activity diagram can be represented using rounded rectangle.
→ The Initial State can be represented using
→ The transition between one State another State Can be represented using → (arrow mark)

3a) Software development Process →

System conception :- It is define as a Conceiving the application & tentitive requirement
→ If need to develop the application need to identify the idea the involve: Know the Concept of the requirement for application and tecnique requested

Analysis :-
The analysis can be define as analysis of what are the requirement needed for Developing application
→ In this we can understand deeply about the requirements which are needed
→ In this we can think about what to do not about how to do

System design
→ In the class design we can understand about the architecture of an application we can construct the models and identify the requirement

Class design
→ In this we can understand about the algorithm need for doing the operations
→ In this we can think about the Mathametical Concept rather than Programming

→ Implementation
In this we can convert the design in to work
→ Implementing the application rather than thinking about design.

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Testing →
→ In this we can test the Systems that are Working according to user Exception.
→ All the requirements are working properly or not
→ Need to change the requirement
→ whether the users are fulfill with that

Training
→ The training mean train the System with the Matter techniques
→ Giving training to the System.

Deployement
→ The Deployement mean the System can be working under the users Environment
→ With the different platform
→ with the different Interaction.

Maintance (
→ The System is given the valid time for maintain
→ Validity of the System is more If any problem in occur need to be recover from that

10M

36) Steps to Construct Domain State model

→ First Step →
Identify the domain class with State

Step 2 →
find State

Step 3 →
find Event

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Step 4 → build State diagram

Steps → Evaluate State diagram

Identify the domain class with State.

→ Need to identify the class based on Essential list of the class
→ The class should be in distinct life cycle
→ The State should be in distinct life cycle.

Find State.

→ The State is characterized in object of the classes
→ The State consisting of attributes, multiplicity operation based on that we have to select the State
→ we select the State based on activity.
→ The State diagram represent in rounded rectangle

Find Event →

- The Event need to be select for transition of a State from one State to another State
→ The Some of the with no transaction
→ In Some of the model Event is their but not transition
→ The terminal State has only on transaction ie one State
→ The Initial State has more than one transaction.

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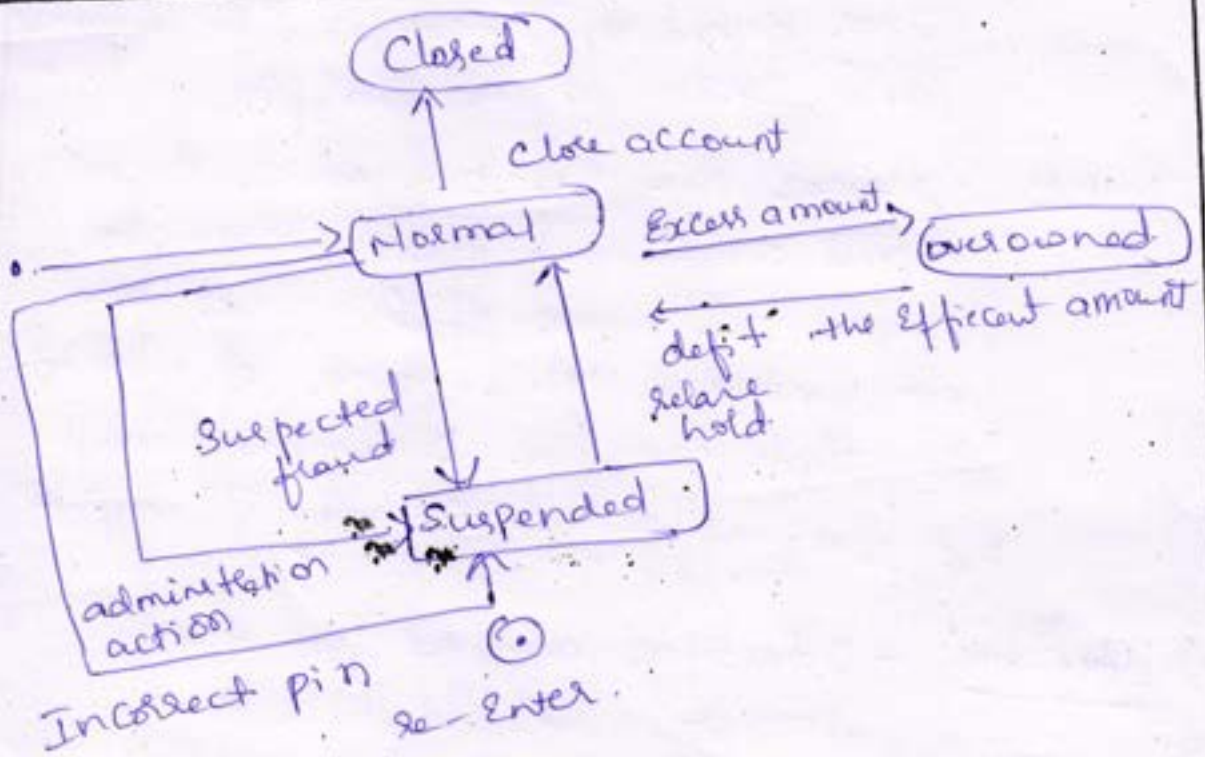

-Evaluate the State diagram →

→ Check all the States are Connected to Each Other.

→ this thing we need to be check

→ Their a path from Each State

→ Their Contain main loop in Each transaction

→ Based the Event the transaction Can be taken place

→ The findl Can be represented using. — 10M

Q a) To Eliminate unnecessary & incorrect attributes

(i) Object :- The Entity which not only Just Exists but rather also has a Value is called object, objects Can be anything which has a Value.

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ii) Qualifer :- Attribute is the one which has a link so whichefer attribute which does depend on Content can be renamed and considered as Qualifier.

iii) Names :- Names are the one which do not depend on Content Names must be unique. the names of Companies are not unique Unlike names of individual.
Ex Dept name in a Company may be unique but as globally it may not

iv) Identifers :- Identifiers are not just the attribute which identifies the identifers are used as notation and to build a model the identifiers may be the ones which describe the attributes

v) Attributes and Association :-
the attributes is something which has a link the attributes define the objects Association is probably of many to many
Ex :- IA Bank is an Association
Salary is the attribute of bank

vi) Input Values :- the values which are used to determine inside but which is invisible outside is just eliminated.

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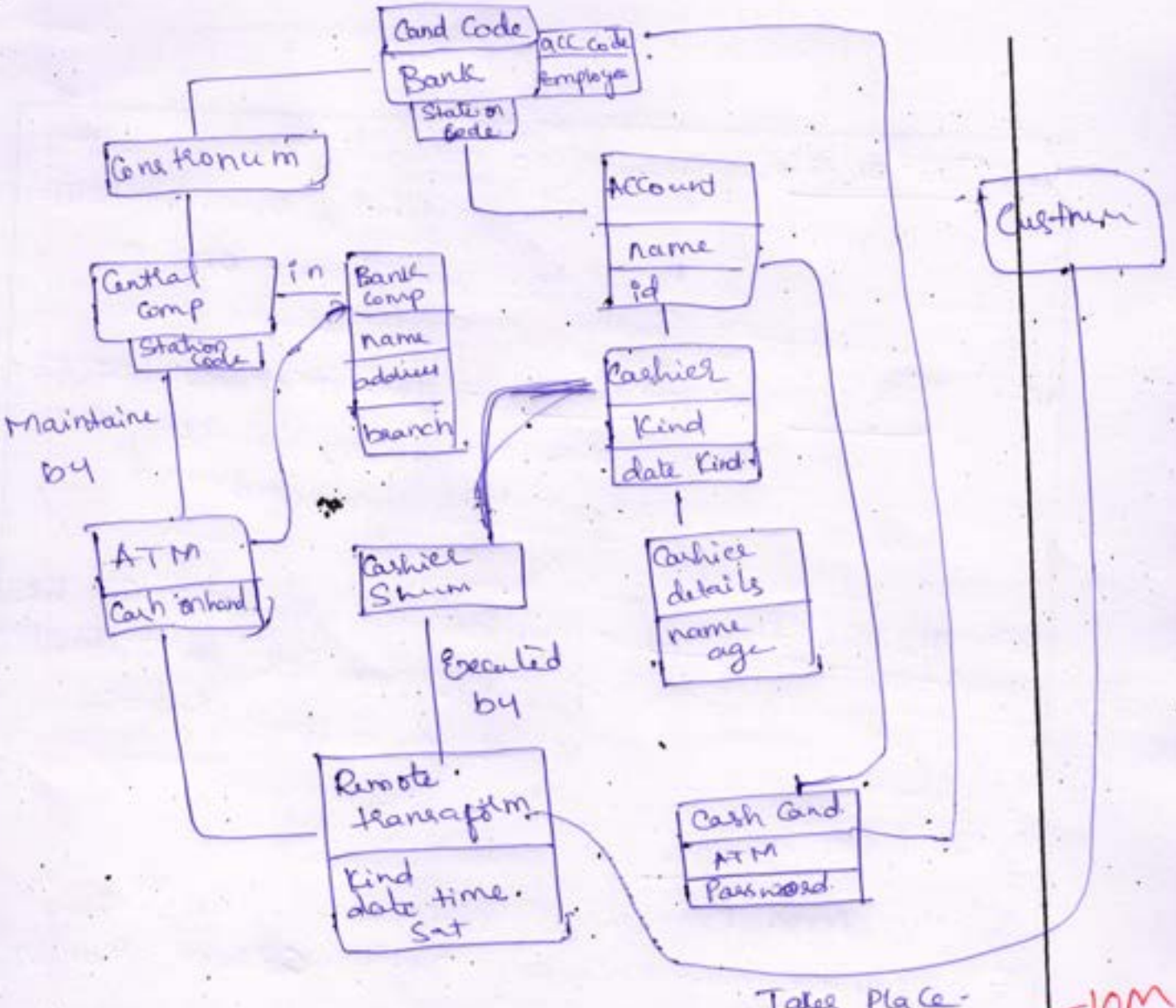

10M

4)b) ATM

* The Automated tell machine is used for finacial transaction
* The ATM user Card like debit or credit Card
* The user comes to withdraws Cash this is done by Sequence of actions
* After Card is inserted verification is done whether the user is authorised
* then after Certain Events the user gets the Cash.
* then the System closes

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vii) Fine details :- The micro attributes present which is not affected by other attributes Nor makes an impact on a System is discarded

viii) Disordered attributes :- the attributes which are not having values not Content is eliminated and discarded

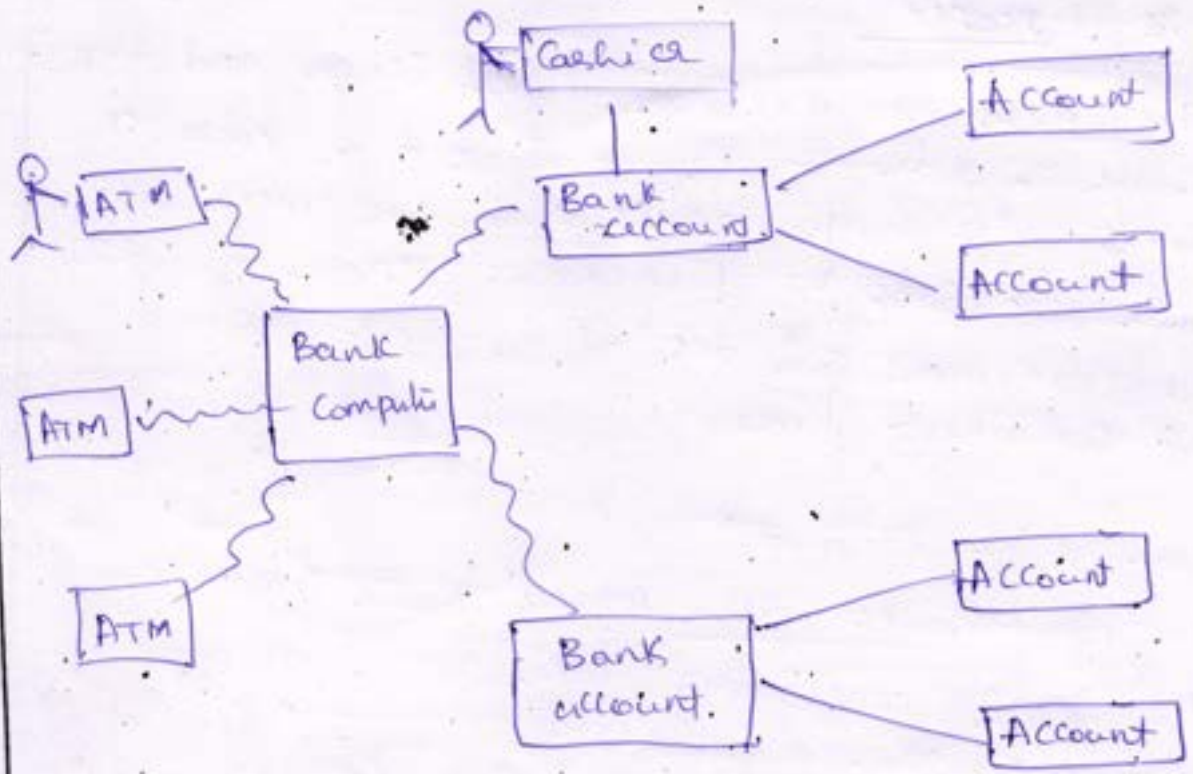
ix) Boolean Attributes :- The Boolean attributes can be broaden and split in to small values of different Entities

Ex :- ATM Example

* The ATM Example is considered to Show how to Eliminate the unCessary and Incorrect attributes
* The ATM is developed by a software which is very tedious and requires lot of Efforts
* As Shown in the diagram to Eliminate unnecessary and incorrect attributes
* The banck contains Card and ATM the Card is protected by password.
* Various attributes form a desried model

How is it needed ?

* The Software can be gained by adopting a 3 tier structure as only big companies can Justify the amount of work and ~~effort~~ Effort is that goes into it to develop the Software product



-10M

Fig System Concept for ATM Machine

* As shown in the diagram, the bank posses various ATM.s
* The Customer can access it as his desired and at we convience
* The use case diagrams are also part of this system concept

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* the various amount of work and cost can only be justified by larger companies
- the ATM Case Study Consists of following Cases

* why is it needed ?

The ATM machine has higher scope and the Software inside it is developed in such a way to help both banks and customers. Banks can stop using manual mode of work and Customers can use it in their desired and convinent time

* where is it needed ?

The banks with ATM's name greater advantage and customers take it as granted So ATM's are available in shops, financial institution etc.

* when is it needed ?

The fast developing and changing Environment has greater scope for the Software developed product and hence it is needed by people in the current business Environment

what is needed ?

- the Software which supports the financial institutions by providing various features incredibly and in the current changing time many other companies are making lost of money with similar developed products

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DEPT. OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: II — DATE: 17/06/2023

Course Name with code: Renewable energy resources (18EE653) — **MAX MARKS**: 40

Class : 6th Sem (CSE and ISE) — Duration :90 Min

NOTE: Answer TWO full questions.

1 a) Explain the plastic recycling in your own words with neat diagrams. 10M [CO4]

b) Write a short note on recycling of wastes and it's benefits In your own words. 10M [CO4]

OR

2 a) State and explain the methods of hydrogen production technologies. 10M [CO4]

b) Briefly explain advantages, disadvantages and problems associated with Hydrogen energy. 10M [CO4]

3 a) Briefly explain various electrolytic hydrogen production technologies. 10 M [CO4]

b) Discuss the considerations, guidelines for wind turbine site selection. Also comment on world wind energy scenario. .10 M [CO4]

OR

4 a) With a neat diagram explain binary cycle based geo-thermal power plant. Also list the advantages of geo-thermal power plant.. 10 M [CO4]

b) Explain World wide Geothermal Resource Utilization in your own words. 10 M [CO4]

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File No.:-059B

Department of Computer Science And Engineering

IA2 Scheme of Solution

B.E III Semester | Second Internal Assessment Test | April / May 2023

Subject Name: RES | Subject code:18EE653 | Faculty In charge: Dr.Charan K V

Max Marks:40

Q.No.	Brief Solution	Allotted Marks
1 a)	Explain the plastic recycling in your own words with neat diagrams. Plastic recycling has been described as the process of recovering scrap or waste plastics and reprocessing the material into useful products, sometimes completely different in form from their original state. Plastics play an important role in almost every aspect of our lives. Plastics are durable; their toughness and inertness are what make them so useful. Unfortunately, they are so durable that they break down very slowly in a landfill. Plastics are used to manufacture everyday products such as beverage containers, toys, and furniture. The widespread use of plastics demands proper end of plastic life management. The largest amount of plastics is found in containers and packaging (e.g., soft drink bottles, lids, shampoo bottles), but they also are found in durable (e.g., appliances, furniture) and nondurable goods (e.g., diapers, trash bags, cups and utensils, medical devices). The recycling rate for different types of plastic varies greatly. Plastics are a versatile material that can be a valuable asset to recycling program. Plastics can be divided into two major categories: 1. Thermosets: A thermoset solidifies or 'sets' irreversibly when heated. They are useful for their durability and strength and are, therefore, used primarily in automobiles and construction applications. Other uses are adhesives, inks, and coatings. 2. Thermoplastics: A thermoplastic softens when exposed to heat and returns to original condition at room temperature. Thermoplastics can easily be shaped and moulded into products such as milk jugs, floor coverings, credit cards, and carpet fibres. According to most estimates, 80% of post-consumer plastic waste is sent to landfill, 8% is incinerated, and only 7% is recycled. Since the production of plastics uses 8% of the world's oil production, it is in the best interests to recycle plastics. In addition to reducing the amount of plastics waste requiring disposal, recycling plastic will reduce the consumption of non-renewable fossil fuels, energy, the amount of solid waste going to landfill, and the amount of carbon emissions. Etc..	10
1b)	Explain advantages and disadvantages of waste recycling in your own words. Recycling is a process of using old or waste products into new products; this is an important step towards energy conservation (to reduce energy usage and reduce the consumption of fresh raw materials) and reduction in pollution (to reduce air, water, land pollution, and greenhouse emissions). 1. Reduced damage to environment: This is the foremost advantage of recycling and this promotes environmental protection in a balanced manner. For instance, let us consider the case of cutting down trees for paper production; here, individuals can create balance by recycling old used papers and new paper products made from trees. In such a way, deforestation and felling is reduced. Natural resources are conserved this way. 2. Reduced consumption of energy: Large amount of energy is consumed when raw materials are processed during manufacturing. Therefore, recycling helps reduce energy	10

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	consumption making production process beneficial and cost effective. It leads to reduced utilization of raw materials. It ensures additional energy availability and saving money. It reduces the creation of waste at source. 3. Reduced environmental impact and pollution: At present, industrial waste is major source of pollution. Recycling industrial products such as plastics and cans help a lot in cutting down levels of pollution for the reason that these materials are being reused instead of being thrown away irresponsibly. It saves on requirement of open landfill spaces, the surroundings clean and healthy. It also reduces environmental impact of traditional methods of waste treatment and disposal. 4. Mitigate global warming: Recycling aids in alleviating or lessening global warming and its harsh effects. Today, massive waste is being burned producing large amount of greenhouse gas emissions. Therefore, recycling is an effective way of ensuring that the process of burning is reduced and waste are regenerated and converted to useful and eco-friendly products without creating harmful impact to the environment. 5. Promotes sustainable utilization of resources: Recycling promotes sustainable and wise use of resources. This activity helps ensure that there is no discriminate use of materials and resources saving them for possible use in the future.	
2 a	State and explain the methods of hydrogen production technologies. The choice of production methods will vary depending on the availability of feedstock or resource, the quantity of hydrogen required, and the required purity of hydrogen. esearchers are developing a wide range of processes for producing hydrogen economically and in an environmentally friendly way. These processes can be divided into three major research areas: 1. Thermo chemical production technologies 2. Electrolytic production technologies 3. Photolytic production technologies Thermochemical Production Technologies Hydrogen bound in organic matter and in water makes up 70% of the earth's surface. Breaking up these bonds in water allows us produce hydrogen, and then, to use it as a fuel. There are numerous processes that can be used to break these bonds. Following sections discuss a few methods for producing hydrogen that are currently used or are under research and development. Most of the hydrogen now produced on an industrial scale by the process of steam reforming, or as a by-product of petroleum refining and chemical production . Steam Reforming Steam reforming uses thermal energy to separate hydrogen from the carbon components in methane and methanol and involves the reaction of these fuels with steam on catalytic surfaces. The first step of the reaction decomposes the fuel into hydrogen and carbon monoxide. Then, a 'shift reaction' changes the carbon monoxide and water to carbon dioxide and hydrogen. These reactions occur at temperatures of 200oC or greater. Etc/..	10
b	Briefly explain advantages, disadvantages and problems associated with Hydrogen energy. ADVANTAGES OF HYDROGEN ENERGY 1. Uncoupling of primary energy sources and utilization. 2. Hydrogen is a gas; thus, it is easier to store than to store electricity. 3. Hydrogen can be obtained from any primary energy source, including renewable energy source. 4. Decentralized production is possible. Hydrogen is viewed as capable of providing services	

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where electricity is not available, in particular as a fuel for vehicles and energy storage in remote areas.
5. Very efficient when used in fuel cells.
6. Very good experience of hydrogen as a chemical reactant (ammonia, methanol, and oil refining).
7. Very good safety records (for a specific range of applications).

DISADVANTAGES OF HYDROGEN ENERGY
1. Poor overall energy efficiency when produced from electricity made with fossil fuels.
2. Very low density and poor specific volume energy density.
3. Need for high pressures and very low temperatures if stored in the liquid phase.
4. Specific safety problems and poor public acceptance (Hindenburg syndrome and Apollo Challenger space shuttle).
5. No existing infrastructures for transport, distribution, and storage.
6. Rather high cost (till today).

PROBLEMS ASSOCIATED WITH HYDROGEN ENERGY
The serious problems that are affecting the development of hydrogen for household and transport applications are as follows:
1. Hydrogen storage: The concerns surrounding the storage of hydrogen are a major issue. It must be stored at extremely low temperatures and high pressure. A container capable of withstanding these specifications is larger than a standard gas tank. Hydrogen storage could be viewed as a problem by consumers.
2. High reactivity of hydrogen: Hydrogen is extremely reactive. It is combustible and flammable. The Hindenburg disaster, where a hydrogen-fi lled blimp exploded and many people died, has caused a fear of hydrogen

3 a) Briefly explain various electrolytic hydrogen production technologies.

Electrolytic Production Technologies Another way to produce hydrogen is by electrolysis. Electrolysis separates the elements of water—H2 and oxygen (O)—by charging water with an electrical current. Adding an electrolyte like salt improves the conductivity of the water and increases the efficiency of the process. The charge breaks the chemical bond between the hydrogen and the oxygen and splits apart the atomic components, creating charged particles called ions. The ions form at two poles: the anode, which is positively charged, and the cathode, which is negatively charged. Hydrogen gathers at the cathode and the anode attracts oxygen. Electrolysis is the process of producing hydrogen and oxygen from water in an electrochemical cell. Two types of electrochemical methods, alkaline or proton exchange membrane (PEM), are used in commercially available equipment commonly referred to as electrolysers. An alkaline electrolyser immerses the two electrodes, the cathode and the anode, into an aqueous alkaline electrolyte, typically a solution of sodium or potassium hydroxide, and a voltage is applied across the electrodes. The resulting migration of ions in solution results in the production of hydrogen at the cathode and oxygen at the anode according to the following equation:

Cathode reaction $4H_2O + 4e^- \rightarrow 2H_2 + 4OH^-$ (5.5)
Anode reaction $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$ (5.6)

Water Electrolysis
Until the 1950s, water electrolysers were in widespread use for hydrogen (or oxygen) production. Currently, electrolysis provides only a small percentage of the world's hydrogen, most of which is supplied to applications requiring small volumes of high purity hydrogen (or oxygen, such as for breathing atmospheres for submarines). There is significant renewed interest in the use of electrolysers to produce hydrogen as a fuel for

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automotive applications, with a number of refuelling stations installed around the world. In addition, research continues in the integration of intermittent renewable resources (PV and wind) with electrolysers for producing hydrogen that has to be used as a fuel or for energy storage.

10 M

Steam Electrolysis

Steam electrolysis is a variation of the conventional electrolysis process. Some of the energy needed to split the water is added as heat instead of electricity, making the process more efficient than conventional electrolysis. At 2,500oC, water decomposes into hydrogen and oxygen. This heat could be provided by a solar energy concentrating device to supply the heat. The problem here is to prevent the hydrogen and oxygen from recombining at the high temperatures used in the process.

3 b) Discuss the considerations, guidelines for wind turbine site selection. Also comment on world wind energy scenario

The selection of a wind farm site is complex and time consuming, and also it involves multiple disciplines working on parallel paths. Financing, government permits, meteorological studies, land use restrictions, and design have to be completed well along before a site is approved and before the construction can begin. However, it is imperative in all of the above-referenced steps that construction expertise be involved and consulted to achieve maximum use of the approved site. Generally, there are three principle sources of construction expertise participating in wind farm projects. They are the design team responsible for conceptual and eventual site design, the developer or construction manager of the project, and the wind turbine generator contractor. Wind is the energy resource that drives a wind turbine. A windmill needs to be placed on a high tower located in wind area. Not just any wind will do, a wind turbine needs air that moves uniformly in the same direction. Eddies and swirls, 'turbulence' in short, does not make good resource for a wind turbine. The rotor cannot extract energy from turbulent wind, and the constantly changing wind direction due to turbulence causes excessive wear and premature failure of turbine. This means that turbine must be placed high enough to catch strong winds, and above turbulent air. Since the tower price goes up quickly with height, there is a limit to what is practical and affordable.

Turbine Height

In general, wind turbines should be sited well above trees, buildings, and other obstacles. When the wind flows over an obstacle like a building or a tree, the wind is slowed down and turbulent

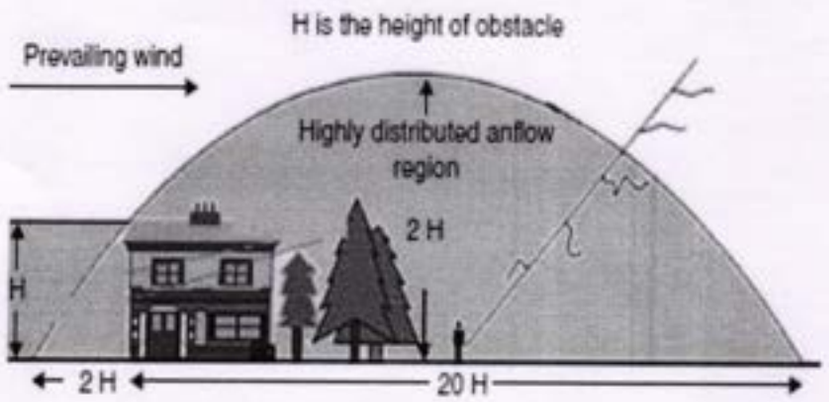

Figure 6.3 Installation of wind turbines

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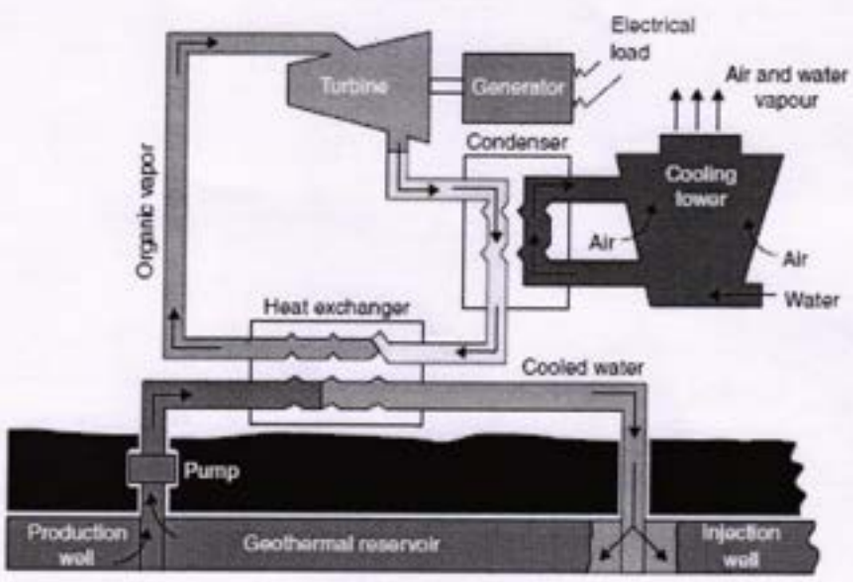
4 a)	With a neat diagram explain binary cycle based geo-thermal power plant. Also list the advantages of geo-thermal power plant.. In the binary process, the geothermal fluid, which can be either hot water, steam, or a mixture of the two, heats another liquid such as isopentane or isobutane (known as the 'working fluid'), that boils at a lower temperature than water. The two liquids are kept completely separate through the use of a heat exchanger that is used to transfer heat energy from the geothermal water to the working fluid. When heated, the working fluid vaporizes into gas and (like steam) the force of the expanding gas turns the turbines that power the generators. Technology developments during the 1980s have advanced lower temperature geothermal electricity production. These plants, known as 'binary' geothermal plants, today make use of resource temperatures as low as 74°C (assuming certain parameters are in place) and as high as 177°C. Approximately 15% of all geothermal power plants utilize binary conversion technology. It is shown schematically in Figure 7.5. Source: Geo-Heat center  **Figure 7.5** Binary cycle-based geothermal electric power plant	10
4 b)	Explain World wide Geothermal Resource Utilization in your own words. Direct Use of Low Grade Geothermal Energy 1. Aquaculture and horticulture: Geothermal renewable energy is used in aquaculture and horticulture in order to raise plants and marine life that require a tropical environment. The steam and heat are all supplied by geothermal energy. Many farmers use geothermal power to heat their greenhouses. In Tuscany, Italy, farmers have used water heated by geothermal energy for hundreds of years to grow vegetables in the winter. Hungary is also a major user of geothermal power. Eighty percentage of the energy demand from vegetable growers is met by using geothermal energy. It is also used in fishing farms. The warm water spurs the growth of animals ranging from alligators, shellfish, tropical fish, and amphibians to catfish and trout. Fish growers from countries like Oregon, Idaho, China, Japan, and even Iceland use geothermal power. 2. Industry and agriculture: Industries are another consumers of geothermal energy. Their uses vary from drying fruits, vegetables, and wood, dying wool to extracting gold and silver from ore. It is also used to heat sidewalks and roads to prevent freezing in the winter. Thus, geothermal power generation is playing a major role in industry and agriculture. Timber is	10

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dried using heat acquired from geothermal energy, and paper mills use it for all stages of processing. There are many potential uses of geothermal energy in the industry.

3. Food processing: The earth naturally contains an endless supply of heat and steam, which can be utilized to sterilize equipment and rooms. This would put an end to the use of chemicals.

Table 7.1 Installed Geothermal Electricity Plant

Country	Capacity (MW) 2007	Capacity (MW) 2010	Percentage of National Production
USA	2,687	3,086	0.3
Philippines	1,969.7	1,904	27
Indonesia	992	1,197	3.7
Mexico	953	958	3
Italy	810.5	843	1.5
New Zealand	471.6	628	10
Iceland	421.2	575	30
Japan	535.2	536	0.1
Iran	250	250	
El Salvador	204.2	204	25
Costa Rica	162.5	166	14
Nicaragua	87.4	88	
Russia	79	82	
Turkey	38	82	
Papua-New Guinea	56	56	
Guatemala	53	52	
Portugal	23	29	
China	27.8	24	
France	14.7	16	
Ethiopia	7.3	7.3	
Germany	8.4	6.6	
Austria	1.1	1.4	
Australia	0.2	1.1	
Thailand	0.3	0.3	
TOTAL	9,981.9	10,959.7	

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Department of MBA

Second Semester Internal Assessment Test –I

Time: 90 Minutes **22MBA21-Human Resource Management** **Date: 31.07.2023**

Answer the following questions **Max marks: 50**

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Human Resource Management.	3M	L1	1
	b	Explain the Managerial functions of HRM.	7M	L2	2
	c	Briefly Explain the principles of HRM.	10M	L2	1
2.		**Case study-** Abhijeet publishing company-Mr. Abhijeet was the founder of a publishing company specializing in management books within a short span of time, the company proposed and grew very fast. Its sales rose from Rs.50,000 the first year to Rs 10 Lakhs in three years. The editing production and sales staff grew almost as fast. But the company was having problems and of late uncertainty and confusion grew in the company. New people were making decision to the best of their ability but many of them did not fit together. One of Mr. Abhijeet's key associates suggested that the company ought to have better planning and certainly needed clear policies to guide decision making, by Mr. Abhijeet was unimpressed. His response was that if he took time off to plan and develop policies to days he might not have a company tomorrow, and that he had no choice but to spend his time meeting to days problems as they came up.			
	a	If you were one of the newer managers in the company and had taken a course in the basis of management, what would you say to Mr. Abhijeet.	10M	L3	4
	b	Outline exactly how you would show him that planning and policy making are important to the company if it has to grow effectively.	10M	L4	4
3.	a	Explain the Operative functions of HRM.	10M	L2	2

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Scheme of Evaluation – Internal Assessment I

Subject : Human Resource Management	Code: 22MBA21
Max marks: 50	No Choice

Sl. No	Answer script	Marks
1.a	According to **Edwin B. Flippo** – "Human resource management is concerned with policies and practices that ensure the best use of the human resources for fulfilling the organizational and individual goals." According to **French Wendell** – "Human Resource Management is the recruitment, selection, development, utilisation of and accommodation to human resources by organisations."	**03 Marks**
b.	**Managerial functions: -** The basic managerial functions comprise planning, organizing, directing and controlling. **=>Planning:** -This function deals with the determination of the future course of action to achieve the desired result. Planning of personnel today prevents the crisis tomorrow. The personnel manager is expected to determine the personnel programme regarding recruitment, selection and training of employees. **=>Organising:** -This function is primarily concerned with proper grouping of personnel activities, assigning of different groups of activities to different individuals and delegation of authority. Creation of a proper structural framework is the primary task. **=>Directing:** -This involves supervising and guiding the personnel. To execute plans, direction is essential. Direction consists of motivation and leadership. The personnel manager must be an effective leader who can create winning teams. While achieving results, the personnel manager must invariably, take care of the concerns and expectations of the employees at all levels. **=>Controlling:** - Controlling function of personnel management comprises measuring the employee's performance, correcting negative deviation and assuring an efficient accomplishment of plans. It makes individuals aware of their performance through review reports, records and personnel audit programmes. It ensures that the activities are being carried out in accordance with stated plans.	**07 Marks**
c.	**HRM PRINICIPLES-** Principles are the fundamental truths related to management of human resource by research, investigation and analysis, generally applicable to all organizations. Principles act as a guide to the managers in formulating policies, programmed procedures and practices Principle of scientific selection	**10 Marks**

		Principle of individual development Principle of Adequate communication Principle of Participation Principle of fair Compensation Principle of Incentive. Principle of Team spirit Principle of dignity of labour Principle of labour management co-operation Principle of contribution to National prosperity	
2.	a	List out the characteristics of effective Leader.	**10 Marks**
	b.	**Planning:** -This function deals with the determination of the future course of action to achieve the desired result. Planning of personnel today prevents the crisis tomorrow. The personnel manager is expected to determine the personnel programme regarding recruitment, selection and training of employees.	**10 Marks**
3.	a	**Operative functions: -** These are related to specific activities of personnel management, like, employment, development, compensation and industrial relation. These functions are to be performed in conjunction with managerial function. **a) Staffing and procurement Function: -** It is concerned with procuring and employing people who possess necessary skill, knowledgeand aptitude. Under its purview we have the following. Job analysis HR Planning Recruitment Selection Placement Induction and orientation Internal mobility **b) Human Resource Development Function: -** It is the process of improving, moulding, changing and developing the skills, knowledge, creative ability, aptitude, attitudes, values and commitments based on present and future requirements both at individual's and organization's level. This function includes: Training. Performance Appraisal. Executive development Career planning and development Transfer and Promotion **C) Motivation and compensation Function: -** It is a process which inspires people to give their best to the organization through the use of intrinsic (achievement, recognition and responsibility)	**10 Marks** **03 marks for listing and 7 marks for explanation**

	and extrinsic (job design, work scheduling, appraisal-based incentives) rewards. Wage and Salary Administration Social security measures Motivation Job evaluation Compensation administration Incentives and benefits **D) Human Relations:** -This tries to integrate the goals of an organisation with employee aspirations through various employee-oriented programmes. Grievance Redressal Discipline Collective bargaining Industrial relations Employee Participation and Empowerment/WPM	

Department of MBA

Second Semester Internal Assessment Test –II

Time: 90 Minutes **22MBA21-Human Resource Management** **Date: 04.09.2023**

Answer the following questions **Max marks: 50**

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Personnel Management.	3M	L1	1
	b	Distinguish between PM and HRM.	7M	L2	2
	c	Explain the Various factors affecting HRP.	10M	L2	2
2.	a	What is Human Resource Planning?	3M	L1	1
	b	Explain the steps involved in Human Resource Planning.	7M	L2	2
	c	Explain the tools for Demand Forecasting.	10M	L2	2
3.	a	Briefly explain the models of HRM.	10M	L2	1

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Department of MBA

Second Semester Internal Assessment Test –II

Time: 90 Minutes **22MBA21-Human Resource Management** **Date: 04.09.2023**

Answer the following questions **Max marks: 50**

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Personnel Management.	3M	L1	1
	b	Distinguish between PM and HRM.	7M	L2	2
	c	Explain the Various factors affecting HRP.	10M	L2	2
2.	a	What is Human Resource Planning?	3M	L1	1
	b	Explain the steps involved in Human Resource Planning.	7M	L2	2
	c	Explain the tools for Demand Forecasting.	10M	L2	2
3.	a	Briefly explain the models of HRM.	10M	L2	1

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Scheme of Evaluation – Internal Assessment II

Subject : Human Resource Management		Code: 22MBA21
Max marks: 50		No Choice

Sl. No	Answer script	Marks
1.a	**Personnel Management** is defined as an administrative specialization that focuses on hiring and developing employees to become more valuable to the company. It is sometimes considered to be a sub-category of human resources that only focuses on administration- **Edward Flippo** **Personnel management** can be defined as obtaining, using and maintaining a satisfied workforce. It is a significant part of management concerned with employees at work and with their relationship within the organization.	03 Marks
b.		07 Marks

Basis	PM	HRM
Meaning	PM is concerned with workforce and their relationship within the entity.	HRM is concerned with effective use of manpower in an entity.
Nature	A Personnel Manager's job is administrative in nature.	A HR Manager's job is persistent in nature.
Functions	Follow Routine functions	Follow Strategic functions
Role	Transactional	Transformational
Mode of Communication	Indirect	Direct
Decision Making	Comparatively Slow	Comparatively Fast
Pay	Job Evaluation	Performance related
Focus	Adopting to organizational rules, regulations and policies.	Nurturing the skills and talents of the workforce

c.	**FACTORS AFFECTING HRP** **Internal Factors:** • Company strategies. • Human resources policies. • Job analysis • Type and Quality of information • Company's production/operations policy **External Factors:** • Government policies • Technological Factors • Economic Factors • Labour Market • Natural Factors	**10 Marks** **03 marks for chart and 07 marks for explanation**
2.a	**Meaning**-HRP is a process of forecasting organizational personnel needs and to supply adequately developed and motivated people to perform the duties and tasks required to meet organizational objectives. **HRP** is a process of planning for human resource in terms of quality and quantity of manpower. i.e Quality-Type of candidate required and quantity-Number of manpower required	**03 Marks**
b.	1. Analysing the Oraganizational Strategies and objectives- 2. Demand Forecasting- 3. Supply Forecasting- 4. Estimate Gaps- 5. Formulate HR Plans	**07 Marks**
c.	**TOOLS FOR DEMAND FORECASTING** **Qualitative Forecasting** • Managerial Judgments	

	• Delphi Technique • Unit Demand Forecasting **Quantitative Forecasting** • Trend Analysis • Regression Analysis • Ratio Analysis. • Work Study Techniques • Assessment of HR Supply • Gap Analysis	**10 Marks** **03 marks for listing and 7 marks for explanation**
3. a	• THE HARVARD BUSINESS MODEL • MODEL OF FOMBRUN, TICHY & DEVANNA/ MICHIGAN BUSINESS SCHOOL/MATCHING MODEL • GUEST MODEL • THE WARWICK MODEL • DAVE ULRICH HR MODEL	**10 Marks** **02 marks each**

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Department of MBA

Second Semester *Internal Assessment Test –III*

Time: 3 Hrs **22MBA21-Human Resource Management** **Date: 30.09.2023**

Note-Answer any four full questions from Q.No 1 to 7 **Max marks: 100**

Q. No 8 is compulsory

Q. No.		Questions	Marks	BT	CO's
1.	a	What is Human Resource Management?	3M	L1	1
	b	Differentiate between HRM & PM.	7M	L2	2
	c	Explain the Functions of HRM.	10M	L2	2
2.	a	Define Recruitment & Selection.	3M	L1	1
	b	Explain the various factors affecting HRM.	7M	L2	2
	c	What is HRP? Explain its Process.	10M	L1,2	2
3.	a	What is Job Analysis, Job Description and Job Evaluation?	3M	L1	1
	b	Explain the tools for Demand Forecasting.	7M	L2	2
	c	Explain the sources of Recruitment.	10M	L2	2
4.	a	Define Performance Appraisal.	3M	L1	2
	b	Explain the selection process in detail.	7M	L2	2
	c	Discuss the types of Test and Interview.	10M	L2	2
5.	a	What is Performance Management?	3M	L1	2
	b	Explain the process of Performance Appraisal	7M	L2	2
	c	Explain the methods of Performance Appraisal	10M	L2	2
6.	a	What is Compensation?	3M	L1	2
	b	Write a short note on Total Compensation and Total Reward System.	7M	L2	4
	c	Explain the Approaches in IR.	10M	L2	2
7.	a	Distinguish between Manufacturing and Service Sector.	3M	L2	3
	b	Explain the Innovative HRM practices in India.	7M	L2	4
	c	Explain the future trends in HRM.	10M	L2	5
8.		**Case Study:** X Manufacturing company has encountered difficulty over the last few years in filling its middle management positions. The company which manufactures and sells complex machinery is organized into size semi autonomous manufacturing departments. Top management believes that it is necessary for the departmental money to choose to know the product lines and the manufacturing process. Because many managerial decisions must be made at that			

		level therefore the company originally recruited employees from within however, they soon found that employees elevated to the middle management level often lack the skills necessary to discharge their new duties. A decision then was made to recruit from outside particularly from educational institute with sound industrial management programmers through the service of a professional recruiter the company was provided with a pool of well qualified management graduates some of them were hired and placed in lower management position as preparation for advancement to the middle management jobs they all left the company however within two years of their recruitment Management reverted to its former policy of promoting employees from within an experienced basically the same results as before. Face it Bethel imminent retirement of employees in several key middle management positions the company decided to call in a consultant who could suggest solutions			
		a. Brief about this case?	5M	L2	3
		b. What is the problem of recruiting in this company?	5M	L3	3
		c. What may be the advantages of internal recruitment source.	5M	L2	3
		d. If you were consultant, what would you recommend	5M	L4	3

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Department of MBA

Scheme of Evaluation – Internal Assessment III

Subject : Human Resource Management **Code: 22MBA21**

Max Marks-100

Sl. No	Answer script	Marks
1.a	Human Resources is used to describe both the people who work for a company or organization and the department responsible for managing resources related to employees. The term *human resources* were first coined in the 1960s when the value of labor relations began to garner attention and when notions such as motivation, organizational behavior, and selection assessments began to take shape. HRM is a process of managing the human resource effectively and efficiently in order to reach the goals and objectives of an organization.	03 Marks
b.	See table below	07 Marks
c.	**Managerial functions: -** The basic managerial functions comprise planning, organizing, directing and controlling. **=>Planning**	

Basis	PM	HRM
Meaning	PM is concerned with workforce and their relationship within the entity.	HRM is concerned with effective use of manpower in an entity.
Nature	A Personnel Manager's job is administrative in nature.	A HR Manager's job is persistent in nature.
Functions	Follow Routine functions	Follow Strategic functions
Role	Transactional	Transformational
Mode of Communication	Indirect	Direct
Decision Making	Comparatively Slow	Comparatively Fast
Pay	Job Evaluation	Performance related
Focus	Adopting to organizational rules, regulations and policies.	Nurturing the skills and talents of the workforce

	=>Organising **=>Directing** **=>Controlling** **<u>Operative functions: -</u>** These are related to specific activities of personnel management, like, employment, development, compensation and industrial relation. These functions are to be performed in conjunction with managerial function. **c) <u>Staffing and procurement Function: -</u>** It is concerned with procuring and employing people who possess necessary skill, knowledgeand aptitude. Under its purview we have the following. Job analysis HR Planning Recruitment Selection Placement Induction and orientation Internal mobility **d) <u>Human Resource Development Function: -</u>** It is the process of improving, moulding, changing and developing the skills, knowledge, creative ability, aptitude, attitudes, values and commitments based on present and future requirements both at individual's and organization's level. This function includes: Training. Performance Appraisal. Executive development Career planning and development Transfer and Promotion **E) <u>Motivation and compensation Function: -</u>** It is a process which inspires people to give their best to the organization through the use of intrinsic (achievement, recognition and responsibility) and extrinsic (job design, work scheduling, appraisal-based incentives) rewards. Wage and Salary Administration Social security measures Motivation Job evaluation Compensation administration Incentives and benefits **F) Human Relations:** -This tries to integrate the goals of an organisation with employeeaspirations through various employee-oriented programmes. Grievance Redressal Discipline	**10 Marks** **02 marks for listing and 08 marks for explanation**

	Collective bargaining Industrial relations Employee Participation and Empowerment/WPM	
2.a	According to **Flippo,** "Recruitment is the process of searching for prospective employees & stimulating & encouraging them to apply for jobs in an organization". **According to Edwin Flippo-**"Selection is the process of differentiating applicants to identify those with greater likelihood of success in a job".	**03 Marks**
b.	**1. External factors** are all those factors which lie outside an organization and affect its working, including human resource management. a. Economic b. Social and Technological c. Political and Legal **2. Internal factors** are all those factors which lie within the organization and affect human resource management. a. Organizational culture b, Trade Union c. Organizational Financial Position	**07 Marks**
c.	**Meaning-**HRP is a process of forecasting organizational personnel needs and to supply adequately developed and motivated people to perform the duties and tasks required to meet organizational objectives. **HRP** is a process of planning for human resource in terms of quality and quantity of manpower. i.e Quality-Type of candidate required and quantity- Number of manpower required 1. Analysing the Oraganizational Strategies and objectives- 2. Demand Forecasting- 3. Supply Forecasting- 4. Estimate Gaps- 5. Formulate HR Plans	**10 Marks** **02 marks for list and 08 marks for explanation**

3.a	Job Analysis is a process of collecting the information about the job, i e tasks, work, roles and responsibilities, skills, knowledge, abilities and other personal attributes required for the job. **Job Description-** JD is a process of describing the details or content about the job i.e roles, responsibilities and working conditions. A list of a job's duties, responsibilities, reporting relationships, working conditions, and supervisory responsibilities—one product of a job analysis. An organized, factual statement of the duties and responsibilities of a specific job. **Job specification- A** minimum acceptable human qualities required for a job i.e education, experience and other personal attributes. It is a written statement of the minimum acceptable human capabilities necessary to perform a job properly and effectively.	**3 Marks**
b.	**TOOLS FOR DEMAND FORECASTING** **Qualitative Forecasting** d. Managerial Judgments e. Delphi Technique f. Unit Demand Forecasting **Quantitative Forecasting** • Trend Analysis • Regression Analysis • Ratio Analysis. • Work Study Techniques • Assessment of HR Supply • Gap Analysis	**7 Marks**
c.	**Methods or Sources of Recruitment** **Internal Sources-** Promotion Transfer Employee Reference Job Posting	**10 Marks 02 marks for list and 8 marks for explanation**

	External Sources- Campus Recruitment Third Party Consultants Walk In Job Mela	
4.a	**Meaning of Performance appraisal-** It is a method of evaluating the behavior of the employees in the work spot. Normally includes both qualitative and qualitative aspects of job performance. Performance appraisal is a process of determining or evaluating or checking the performance of an individual and communicates how he or she performing the job.	**3 Marks**
b.	**SELECTION PROCESS-** Selection is a process of choosing or picking the right candidate for a right job it includes the following steps- • Development basis for selection and resumes, applications, CV's- • Written Examination- • Preliminary Interview- • Employment Interview • Medical Examination- • Reference check • Final decision job offer and employment	**7 Marks**
c.	**SELECTION TESTS-** **Test-** A test is a standardized, objective measure to check the quality, performance of the candidates. **TYPES OF TEST-** 1. **Aptitude Test-** 2. **Psychomotor test-** 3. **Clerical aptitude test-** 4. **Job knowledge test-** 5. **Personality test-** **INTERVIEW-**	**10 Marks 02 marks for listing and 8 marks for explanation**

	It is a direct interaction takes place between interviewer and interviewee. It is an over examination of candidates for employment. **Types of Interview-** 1. **Preliminary Interview** 2. **Core Interview or Employment Interview** 3. **Stress Interview** 4. **Group Discussion Interview** 5. **Decision Making Interview**	
5.a	Performance Management is a systematic process by Which the overall performance of an organization can be improved by improving the performance of an individual and team . Performance management can be regarded as a **systematic process** by which the overall performance of an organization **can be improved by improving the performance of individuals** within a **team framework.** It is a **means** for **promoting superior performance** by **communicating expectations, defining roles** within a required **competence framework,** and establishing **achievable benchmarks.**	**3 Marks**
b.	**Performance Appraisal Process:** a) Establish performance standards b) Communicate the standards c) Measure actual performance d) Compare actual performance with standards e) Taking corrective actions if necessary	**7 Marks**
c.	**Performance Appraisal Methods-** **Individual Evaluation Method** a. Graphical Rating Scale b. Checklist Method c. Confidential Report d. Critical Incident Technique e. Behaviorally Anchored rating scales: f. Management By Objective	**10 Marks** **03 marks for list and 7 marks for explanation**

Group Evaluation Methods- It Includes

i. Ranking Method
ii. Paired Comparison Method
iii. Forced ranking or Forced Distribution Method

Other Methods

a. Human Resource Accounting
b. 360 Degree PA

6.a **Compensation** is the remuneration that the employees receive in exchange for their contribution to the organization. It is a total of all rewards provided to employees in return for their services. **3 Marks**

Compensation offered by an organization can come both **directly through base pay and variable pay and indirectly through benefits.**

b. **TOTAL COMPENSATION** **7 Marks**

Old Pay is the frozen system based on "tenure, entitlement and internal equity."

The New Pay is linked "to the success of the employee and the firm." The New Pay suggests a new system of ten variables that form the Total Compensation system or the Cafeteria Compensation.

The concept of the "new pay" is expressed in terms of an equation with ten variables. The equation is based on Tropman's research at the University of Michigan Business School with MBA students (on what they wanted from their workplace) and numerous interactions with corporate executives and HR professionals.

TC = (BP + AP + IP) + (WP + PP) + (OA + OG) + (PI + QL) + X

TOTAL REWARDS SYSTEM

The concept of total rewards seeks to emphasize the entire canvas of the work experience to hold value to employees, going beyond the limited spheres of pay and employee benefits. It integrates the financial and nonfinancial elements of rewards into a unified whole.

Pay	Benefits
• Base salary • Variable pay • Recognition • Shares	• Health care • Retirement • Savings • Time off • Perks
Learning and Development	**Work Environment**
• Career development • Performance management • Succession planning • Training	• Organizational climate • Leadership • Performance support • Work and life balance

c. **Approaches to IR** — **10 Marks**

Unitary perspective — **2 Marks each**

Human relations approach

Systems Approach

Oxford Approach

Gandhian Approach

7.a

Services Sector	Manufacturing Sector
The output of a service sector such as consultancy, training or maintenance.	Manufacturing sectors produce physical goods that customers can see and touch.
Service firms do not produce a service unless a customer requires it, although they design and develop the scope and content of services in advance of any orders.	Manufacturers can produce goods without a customer order or forecast of customer demand.
Service firms do not require a physical production site. The people creating and delivering the service can be located anywhere	Manufacturers must have a physical location for their production and stock holding operations.

3 Marks

b. **INNOVATIVE HUMAN RESOURCE MANAGEMENT PRACTICES IN INDIA** — **7 Marks**

1. Skill Development Initiatives
2. Flexible Work Arrangements
3. Employee Assistance Programs (EAPs)
4. Diversity and Inclusion
5. Employee Engagement Platforms
6. Gamification

	7. Wellness Initiatives	
c.	**FUTURE TRENDS IN HRM** 1. Artificial Intelligence (AI) and Machine Learning: 2. Enhanced Data Analytics: 3. Employee Experience Platforms: 4. Remote Work and Collaboration Tools: 5. Well-being and Mental Health Tools:	**10 Marks Each carries 2 marks**
8.		
a.	Case is about Recruitment	**05 Marks**
b.	Problems of Recruitment	**05 Marks**
c.	Advantages of Internal Recruitment Source	**05 Marks**
d.	Recommendations of Consultant	**05 Marks**

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Department of MBA

II Semester-Internal Assessment - I

Operations Research (22MBA24)

Time: 1Hr.30Min **Date: 01/08/2023**
Max Marks: 50

Note: *Answer all the questions.*

Q. No.		Questions	Marks	BT	CO's
1.	a.	What is Balanced & Unbalanced Transportation Problem?	3M	L1	CO1
	b.	Find IBFS for the following TP By using NWCR and LCM	7M	L3	CO2
	c.	A firm can produced 3 types of clothes A, B & C. 3 kinds of wool are required that is Red, Green and Blue. One unit of length of type A cloth needs 2mts of Red wool, 3mts of blue wool. One unit of length of type B cloth needs 3mts of Red wool, 2mts of Green wool and 2mts of Blue wool. One unit of length of type C cloth needs 5mts of Green wool and 4mts of Blue wool. The firm had a stock of 8mts of Red, 10mts of Green and 15mts of Blue. It is assumed that the income obtained from one unit of type A is Rs3/-, from B is Rs5/- and from C is Rs4/-. Formulate LPP.	10M	L3	CO2
2.	a	Define LPP.	3M	L1	CO1
	b.	Find IBFS for the following TP By using VAM	7M	L3	CO2
	c.	Find Optimal solution for the following TP	10M	L3	CO2
3	a	Find IBFS for the given TP to maximize the profit. Availability for warehouse X is 200 Units, Y is 500 Units and Z is 300 Units. Demand in the Market A is 180 Units, B is 320 Units, C is 100 Units and D is 400 Units.	10M	L3	CO2

For 1.b.

	A	B	C	D	SUPPLY
1	3	3	4	1	100
2	4	2	4	2	125
3	1	5	3	2	75
DEMAND	20	80	75	125	300

For 2.b.

	A	B	C	SUPPLY
1	10	12	7	180
2	14	11	6	100
3	9	5	13	100
4	4	7	9	120
DEMAND	240	200	200	

For 2.c.

	D1	D2	D3	D4	SUPPLY
S1	8	6	5	4	100
S2	7	3	9	2	150
S3	6	5	4	3	175
DEMAND	75	200	25	125	

For 3.a

	A	B	C	D
X	12	18	6	25
Y	8	7	10	18
Z	14	3	11	20

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3]

a] Balanced T.P →

When the total Supply is Equal to the total demand i.e $\Sigma S = \Sigma D$

-3M-

unBalanced T.P →

When the total Supply is not Equal to the total demand i.e $\Sigma S \neq \Sigma D$

b] Total Supply = Total Demond

By NWCR →

Total Cost → $20 \times 3 + 80 \times 3 + 75 \times 4 + 50 \times 2 + 75 \times 2$

→ $60 + 240 + 300 + 100 + 150$

→ 850/-

By LCM →

Total Cost → $20 \times 1 + 80 \times 2 + 20 \times 4 + 55 \times 3 + 100 \times 1 + 25 \times 2$

-7M-

→ $20 + 160 + 80 + 165 + 100 + 50$

→ 575/-

c] objection Function → -10M-

Max Z = $3x_1 + 5x_2 + 4x_3$ (2M)

Sub to Constraints →

Red Wool → $2x_1 + 3x_2 + 0x_3 \leq 8$ (1M)

Green Wool → $0x_1 + 2x_2 + 5x_3 \leq 10$ (5M)

Blue Wool → $3x_1 + 2x_2 + 4x_3 \leq 15$

Non Negative function → $x_1, x_2, x_3 \geq 0$ (2M)

3]

a] According to William M. Fox. LPP is a technique that permits some objective function to be minimised or maximised with the frame work of given situational restrictions.

∴ LPP is mathematical technique used by the Company in order to maximising the Profit by reducing the Cost or resources -3M-

b] By using VAM

Total Cost → $120 \times 10 + 40 \times 12 + 20 \times 7 + 100 \times 6 + 160 \times 5 + 120 \times 4 + 80 \times 0$

→ $1200 + 480 + 140 + 600 + 800 + 480$

→ 3700/-

-7M-

∴ TC = 3700

$$q_1 = \frac{a_{22} - a_{12}}{a_{11} + a_{22} - (a_{12} + a_{21})} = \frac{4-1}{5+4-(1+3)}$$

$\boxed{q_1 = 0.6}$, $\boxed{q_2 = 0.4}$ -7M-

Value of the game = 3.4

c]

	I	II	III	IV	V	R.M
I	-4	2	5	-6	6	(-6)
II	3	-9	7	4	8	-9
C.Max	3	2	7	4	$\boxed{8}$	

-10M-

There is no saddle pt

i.e Maximin ≠ minimax

	I	II	III	IV	V	
I	-4	2	5	-6	6	x
II	3	-9	7	4	8	1-x

(3M)

Expected Gain function and for Graph (7M)

B's Alternatives

A's Expected payoff

Expected Gain

Graph.

3] a] — 10M

Min Z = $20x_1 + 10x_2$

1] $x_1 + 2x_2 = 40$

$x_1 = 0$ $x_2 = 20$ [0, 20]

$x_2 = 0$ $x_1 = 40$ [40, 0]

2] $3x_1 + x_2 = 30$ (2M)

$x_1 = 0$ $x_2 = 30$ [0, 30]

$x_2 = 0$ $x_1 = 10$ [10, 0]

3] $4x_1 + 3x_2 = 60$

$x_1 = 0$ $x_2 = 20$ [0, 20]

$x_2 = 0$ $x_1 = 15$ [15, 0]

For Graph. (6M)

∴ Feasible region and Substitute the values x_1 and x_2 for every Constants to the objective function.

Consider the minimum value (2M)

Department of MBA

II Semester-Internal Assessment-II

Operations Research (22MBA24)

Time: 1Hr.30Min **Date: 05/09/2023**

Note: *Answer all the questions.* **Max Marks: 50**

Q. No.		Questions	Marks	BT	CO's
1.	a.	What is Game Theory?	3M	L1	CO3
	b.	Solve the following game by using the concept of Dominance Rule	7M	L3	CO3
	c.	A Company manufactures two products A and B. These Products are processed in the same machine, it takes 10 minutes to process one unit of product A and 2 minutes for each unit of product B and machine operates for a maximum of 35 hrs in a week. Product A requires 1KG and B requires 0.5 KG of raw material per unit. The supply of which is 600kg per week. Market constraints on product B are known to be 800 units every week. Product A costs Rs 5 per unit and sold at Rs 10, whereas product B costs Rs 6 per unit and sold at Rs 8. Formulate LPP	10M	L3	CO2

		PLAYER B		
		I	II	III
PLAYER A	I	1	7	2
	II	6	2	7
	III	0	1	6

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Department of MBA

II Semester-Internal Assessment-II

Operations Research (22MBA24)

Time: 1Hr.30Min **Date: 05/09/2023**

Note: *Answer all the questions.* **Max Marks: 50**

Q. No.		Questions	Marks	BT	CO's
1.	a.	What is Game Theory?	3M	L1	CO3
	b.	Solve the following game by using the concept of Dominance Rule	7M	L3	CO3
	c.	A Company manufactures two products A and B. These Products are processed in the same machine, it takes 10 minutes to process one unit of product A and 2 minutes for each unit of product B and machine operates for a maximum of 35 hrs in a week. Product A requires 1KG and B requires 0.5 KG of raw material per unit. The supply of which is 600kg per week. Market constraints on product B are known to be 800 units every week. Product A costs Rs 5 per unit and sold at Rs 10, whereas product B costs Rs 6 per unit and sold at Rs 8. Formulate LPP	10M	L3	CO2

		PLAYER B		
		I	II	III
PLAYER A	I	1	7	2
	II	6	2	7
	III	0	1	6

2.	a	What is Pure and Mixed Strategy?	3M	L1	CO2
	b.	Solve the following Game.	7M	L3	CO2
	c.	Find the value of the game by applying Graphical Method.	10M	L3	CO2
3	a	Solve LPP by using Graphical Method. **Min $Z=20X_1+10X_2$** **Subjected to Constraints**-----$X_1+2X_2\leq 40$ $3X_1+X_2\leq 30$ $4X_1+3X_2\geq 60$ **NNF**-----$X_1, X_2\geq 0$	10M	L3	CO2

		PLAYER B	
		I	II
PLAYER A	I	5	1
	II	3	4

		PLAYER B				
		I	II	III	IV	V
PLAYER A	I	-4	2	5	-6	6
	II	3	-9	7	4	8

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2.	a	What is Pure and Mixed Strategy?	3M	L1	CO2
	b.	Solve the following Game.	7M	L3	CO2
	c.	Find the value of the game by applying Graphical Method.	10M	L3	CO2
3	a	Solve LPP by using Graphical Method. **Min $Z=20X_1+10X_2$** **Subjected to Constraints**-----$X_1+2X_2\leq 40$ $3X_1+X_2\leq 30$ $4X_1+3X_2\geq 60$ **NNF**-----$X_1, X_2\geq 0$	10M	L3	CO2

		PLAYER B	
		I	II
PLAYER A	I	5	1
	II	3	4

		PLAYER B				
		I	II	III	IV	V
PLAYER A	I	-4	2	5	-6	6
	II	3	-9	7	4	8

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Operations Research - 22MBA24

Department of MBA, II Semester I.A Scheme - II 50M

1]

a] Game Theory is a Contest involving two or more Competitors each of whom wants to win. A Theory of game provides a series of mathematical model that may be useful in Explaining interactive D.M Concepts. -3M-

b] Dominance Rule →

Step 1 → Minimax value ≠ Maximin value

The saddle pt doesnot Exists.

Step 2 → Row ≤

	I	II	III
I	1	7	2
II	6	2	7
III	0	1	6

Step 3 → Column ≥

	I	II	III
I	1	7	2
II	6	2	7

$a_{11} = 1$, $a_{12} = 7$. $a_{21} = 6$. $a_{22} = 2$ -7M-

$P_1 = 0.4$ $P_2 = 0.6$

$q_1 = 0.5$ $q_2 = 0.5$

$V = 4$

c] objective function →

$$\text{Max } Z = 5x_1 + 2x_2$$

Sub to Constraints →

Time → $10x_1 + 2x_2 \leq 35$

R.M → $1x_1 + 0.5x_2 \leq 600$

M.Const → $x_2 \geq 800$

N.N.F → $x_1, x_2 \geq 0$.

-10M-

2]

a] Pure strategy → A particular stage that a player chooses to play again and again regardless of another player strategy is referred to as pure strategy.

Mixed strategy → A set of strategy that a player chooses of a particular move of the game with some fixed probabilities

-3M-

b] $a_{11} = 5, \quad a_{12} = 1, \quad a_{21} = 3, \quad a_{22} = 4$

$$P_1 = \frac{a_{22} - a_{21}}{a_{11} + a_{22} - (a_{12} + a_{21})} = \frac{4-3}{5+4-(1+3)}$$

$$\boxed{P_1 = 0.2}$$

$$P_2 = 1 - P_1 \Rightarrow \boxed{P_2 = 0.8}$$

-10M-

c] Total Cost by VAM →

$= 100 \times 4 + 160 \times 3 + 6 \times 75 + 50 \times 5 + 25 \times 4 + 25 \times 3$ (4M)

$= 400 + 450 + 450 + 250 + 100 + 75$

TC = 1725/-

optimal Soln :-

For Allocated Cells

$C_{ij} = u_i + v_j$

For Non Allocated Cells (6M)

$\Delta_{ij} = C_{ij} - (u_i + v_j)$

∴ All the values of Δ_{ij} are +ve

∴ TC = 1725

3]

a] Step 1 → TS = TD = 1000 units

The given TP is Balanced.

Step 2 →

∴ Tc By NWCR → 11.580/-

Tc By LCM → 10.720/- -10M-

Tc By VAM → 10.320/-

∴ Highest value is 25. (Subtract it from remaining)

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Department of MBA

Second Semester *Internal Assessment Test –III*

Time: 3 Hrs **22MBA24-Operations Research** **Date: 26.09.2023**

Note-Answer any four full questions from Q.No 1 to 7 **Max marks: 100**

Q. No 8 is compulsory

Q. No.		Questions	Marks	BT	COs
1.	a	Define Operation Research.	3M	L1	1
	b	Distinguish PERT and CPM.	7M	L2	2
	c	Use the graphical method to solve the following LPP **Max $Z=15X_1+10X_2$** **Subjected to Constraints**-----$4X_1+6X_2\leq 360$ $3X_1+0X_2\leq 180$ $0X_1+5X_2\leq 200$ **NNF**-----$X_1, X_2\geq 0$	10M	L2	2
2.	a	What is Basic Feasible Solution?	3M	L1	1
	b	A computer Cent has three expert programmes. The center wants three application programmess to be developed. The head of the computer center, after studying carefully the programmes to be developed, estimate the computer time in minutes required by the experts for the application programmes as follows. Assign the programmers to the programmes in such a way that the total computer time is minimum.	7M	L2	2
	c	Explain OR Models.	10M	L2	2
3.	a	What is Assignment Problem?	3M	L1	1
	b	Find IBFS for the following TP by using VAM Method	7M	L2	2
	c	Explain the various assumptions, advantages and limitation of LP Models.	10M	L2	2
4.	a	What is Pure strategy and Mixed strategy?	3M	L1	2
	b	A company management and the labour union are negotiating a new three year settlement. Each of these has 4 strategies, the cost of the company are given for every pair of strategic choice. What strategy will the two side adopt and also determine the value of the game.	7M	L2	2
	c	The agricultural Research Institute suggested a farmer to spread out at least 4800 kg of special passphate fertilizer and not less than 7200 kg of special nitrogen fertilizer to raise	10M	L2	2

Programmes	Programmers			
		A	B	C
	1	120	100	80
	2	80	90	110
	3	110	140	120

	D1	D2	D3	D4	SUPPLY
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	80	70	20	18
DEMAND	5	8	7	14	34

Union Strategies	Company Strategies				
		1	2	3	4
	1	20	15	12	25
	2	25	14	8	10
	3	40	2	10	5
	4	-5	4	11	0

	c	The agricultural Research Institute suggested a farmer to spread out at least 4800 kg of special passphate fertilizer and not less than 7200 kg of special nitrogen fertilizer to raise the productivity of the crops in his yields. There are two sources for obtaining these mixtures A and mixture B, both of these are available in bags weighing 100Kg each and they cost Rs 40 and Rs 24 respectively. Mixture A contains phosphate and nitrogen equivalent to 20KG and 80KG respectively, while mixture B contains these ingredients equivalent to 50KG each. Write this as an LPP in order to minimize the cost	10M	L2	2
5.	a	What is Network Analysis?	3M	L1	3
	b	Discuss the steps involved in Decision Making Process.	7M	L2	3
	c	Solve the following game by graphical method: B1 B2 B3 A1 1 3 12 A2 8 6 2	10M	L2	4
6.	a	What is Decision tree analysis?	3M	L1	3
	b	Draw the Network for the following Data Act: A | B | C | D | E | F | G | H P.Act.: - | A | A | B, C | C | D | E | F, G	7M	L2	4
	c	Using the graphical method calculate the minimum time needed to process job 1 and 2 on five machines A, B, C, D and E that is for each machine find the job that should be done first also calculate the total time needed to complete both jobs. Jobs | Machines Job 1-Sequence in Hours: A 3, B 4, C 2, D 6, E 2 Job 2-Sequence in Hours: B 5, C 4, A 3, D 2, E 6	10M	L2	3
7.	a	What is Redundancy?	3M	L1	2
	b	Find a sequence that minimizes the total time required in performing the following jobs on three machines in order ABC. Processing time in hours are given in the following table Jobs | 1 | 2 | 3 | 4 | 5 M-A | 8 | 10 | 6 | 7 | 11 M-B | 5 | 6 | 2 | 3 | 4 M-C | 4 | 9 | 8 | 6 | 5	7M	L2	2
	c	Find Optimal solution for the following TP | D1 | D2 | D3 | D4 | SUPPLY S1 | 8 | 6 | 5 | 4 | 100 S2 | 7 | 3 | 9 | 2 | 150 S3 | 6 | 5 | 4 | 3 | 175 DEMAND | 75 | 200 | 25 | 125 |	10M	L2	4
8.		**Case Study-** For the following project: a) Draw the network diagram. b) Identify critical path and critical activities. c) What is the expected project completion time and project standard deviation? d) What is the probability that the project will be completed in 38 days? Jobs | 1-2 | 1-6 | 2-3 | 2-4 | 3-5 | 4-5 | 6-7 | 5-8 | 7-8 t_o | 3 | 2 | 6 | 2 | 5 | 3 | 3 | 1 | 4 t_m | 6 | 5 | 12 | 5 | 11 | 6 | 9 | 4 | 19 t_p | 15 | 14 | 30 | 8 | 17 | 15 | 27 | 7 | 28	20M	L4	4

Faculty Signature **HOD Signature** **Principal Signature**

1]

a] operations Research is the application of similar ideas to larger, more Complex decisions that Concern the operations of systems. Such as business and networks of machines. -3M-

O.R is a branch of applied mathematics Concerned with applying analytical methods to help make better management decisions.

b]

CPM	PERT
1] Critical path Method	1] Project Evaluation and Review Technique
2] Deterministic	2] probabilistic
3] CPM is a method to Control Cost and time	3] PERT is a technique & Control of time -7M-
4] Activity oriented	4] Event oriented
5] Management of predictab -le activities	5] Management of unpredict -able activities
6] Nature of Jobs are repetitive in nature	6] Non Reptitive in Nature
7] use in Research and Development project	7] Non-Research projects

c] Max $Z = 15x_1 + 10x_2$

Constraints →

1] $4x_1 + 6x_2 = 300$

$x_1 = 0, \quad x_2 = 50 \quad \Rightarrow \quad [0, 50]$

$x_2 = 0 \quad x_1 = 75 \quad \Rightarrow \quad [75, 0]$

-10M-

2] $3x_1 + 0x_2 = 180$

$x_1 = 0, \quad x_2 = 0 \quad [0, 0]$

$x_2 = 0 \quad x_1 = 60 \quad [60, 0]$

3] $0x_1 + 5x_2 = 200$

$x_1 = 0, \quad x_2 = 40 \quad [0, 40]$

$x_2 = 0 \quad x_1 = 0 \quad [0, 0]$

plot the Graph and find the feasible region. Substitute the values of x_1 and x_2 to objective function.

And find the maximum value.

d]

d] Basic feasible Solution means it must satisfy all the supply and demand Constraints [also Called rim Conditions]

-3M-

ie $m+n-1$ = Allocated Cells

b] No of Rows = No of Columns

∴ The given Ap is Balanced.

R.R.M →

	A	B	C
1	40	20	(0)
2	0	(10)	30
3	(0)	30	10

C.R.M →

	A	B	C
1	40	0	(0)
2	0	(0)	30
3	(0)	20	10

∴ A → 3 → 110

B → 2 → 90

C → 1 → 80

280

-JM-

c] O.R. Models

I classification on the Basis of structure

* physical Models
* Analogue -11-
* Iconic -11-

II classification on the Basis of function

* Descriptive Models.

* predictive Models
* Normative -11-

III classification on the Basis of Time reference
* Static Models
* Dynamic -11-

IV classification on the Basis of Degree of Certainty
* Deterministic Models
* probabilistic Models

V classification on the Basis of Solution
* Heuristic Models
* Analytical -11-
* Simulation -11-

-10M-

3]

a] Assignment Problems →

Assignment problem is a particular Case of a transportation problem where the resources are assignees and the destinations are activities.

∴ Assignment Table is a Convenient way to Summarize available data.

-3M-

b] By VAM Method

The given T.p is Balanced.

T. cost = $19 \times 5 + 30 \times 2 + 30 \times 6 + 40 \times 3 + 70 \times 4 + 20 \times 14$

$= 95 + 60 + 180 + 120 + 280 + 280$

$= 1015$

-7M-

∴ Tc = 1015

-10M-

c] Assumptions →

* Certainity * Additivity * optimality * Linearity * Divisibility * Finiteness (6M)

Advantages →

1] L.P.P technique helps decision makers to use their productive resources effectively.

2] L.P Technique improves the quality of decisions (2M)

Limitations →

1] The L.P. Model does not to take in to Consideration the effect of time and uncertainly

2] L.P. Model assumes linear relationships among decision variables. (2M)

4]

a] Pure Strategy → A particular stage that a player chooses to play again and again regardless of -3M-

another player strategy is referred to as pure strategy.

Mixed strategy → A set of strategy that a player chooses of a particular move of the game with some fixed probabilities.

b]

		Company Strategies			
		1	2	3	4
union Strategies	1	20	15	12	25
	2	25	14	8	10
	3	40	2	10	5
	4	-5	4	11	0

∴ Row Minima → 12, 8, 2, -5

Column Maxima → 40, 15, 12, 25

∴ Row max: 12

Colum min : 12

∴ Maximin = Minimax

∴ Value of the game = 12

-7M-

c]

Max Z = $40x_1 + 24x_2$

[objective function]

Subject to Constraints →

phosphate → $20x_1 + 50x_2 \geq 4800$

Nitrogen → $80x_1 + 50x_2 \geq 7200$

Non. Negative function → -10M-

$x_1, x_2 \geq 0$

6] a] Network Analysis →

It is a system of planning project outline by analyzing different activities associated with it.

In N. Analysis, Complex projects are broken down into smaller activities or tasks, which are then organized according to a sequence. Then, the order of tasks / activities is also decided according to a logical sequence -3M-

b] Steps involved in D-M process →

Identification of problems

↓

Analysis of problems

↓ -7M-

Development of Alternatives

↓

Evaluation of Alternatives

↓

Selection of Best Alternatives

↓

Implementation of Alternatives

↓

Review of Implementation.

c]

	B_1	B_2	B_3
A_1	1	3	12
A_2	8	6	2

-10M)-

Apply Dominance rule to Convert 2x2 matrix

For Graph → Consider (6M)

1st plot the Graph and the the boundary. once the boundary has been identified, Consider the interSection pts and Convert 2x2 Matrix

$$P_1 = \frac{a_{22} - a_{21}}{a_{11} + a_{22} - (a_{12} + a_{21})} \qquad P_2 = 1 - P_1$$

(2M)

$$q_1 = \frac{a_{22} - a_{12}}{a_{11} + a_{22} - (a_{12} + a_{21})} \qquad q_2 = 1 - q_1$$

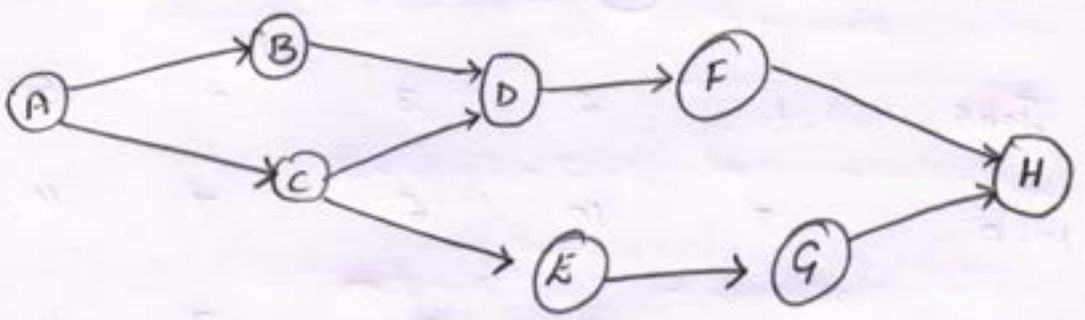
(2M)

$$v = \frac{a_{11}a_{22} - a_{21}a_{12}}{a_{11} + a_{22} - (a_{12} + a_{21})} \Rightarrow \boxed{v = 4}$$

6] a] Decision Tree Analysis is the process of drawing a decision tree, which is a graphic representation of various alternatives solutions that are available to solve problems, in order to determine the most effective courses of action. -3M-

b]

Activity →	A	B	C	D	E	F	G	H
P. Act →	-	A	A	B.C	C	D	E	F.G



-7M-

c]

Jobs	Machines				
J-1	A	B	C	D	E
Sequence (Hrs)	3	4	2	6	2
J-2	B	C	A	D	E
Sequence (Hrs)	5	4	3	2	6

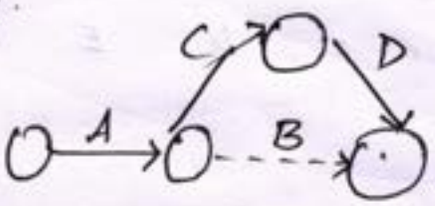
-10M-

By using the data plot the Graph and identify Total Completion time and Elasped Time for J_1 and J_2

7] a] Redundancy →

unnecessarily inserting the dummy activity in network logic is known as the Error of redundancy as shown in the foll. diagram

When the dummy activity is introduced & if is not required, if is called redundancy Errors. -3M-



b]

Jobs	1	2	3	4	5
M-A	8	10	6	7	11
M-B	5	6	2	3	4
M-C	4	9	8	6	5

Step1 → Min $M_1 \geq$ Max M_2

$6 \geq 6$ [Satisfied] ✓

Min $M_3 \geq$ Max M_2

$4 \geq 6$ [Not Satisfied]

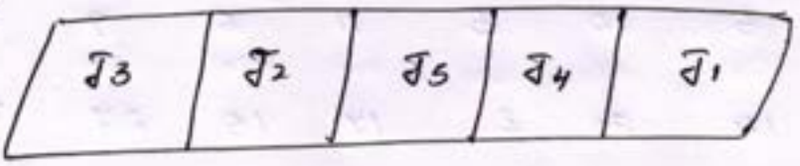
-1M-

Step 2 →

	J1	J2	J3	J4	J5
M(A+B) →	13	16	8	10	15
M(B+C) →	9	15	10	9	9

Sequence →

M_1+M_2 M_2+M_3



∴ Total processing time is 72 hrs

c] optimal soln by modi Method.

$T_C = 100\times4 + 150\times3 + 6\times75 + 50\times5 + 25\times4 + 25\times3$

$T_C = 400 + 450 + 450 + 250 + 100 + 75$

$T_C = 1705/-$

$m+n-1$: Allocated Cells

For Allocated Cells →

$C_{ij} = u_i + v_j$

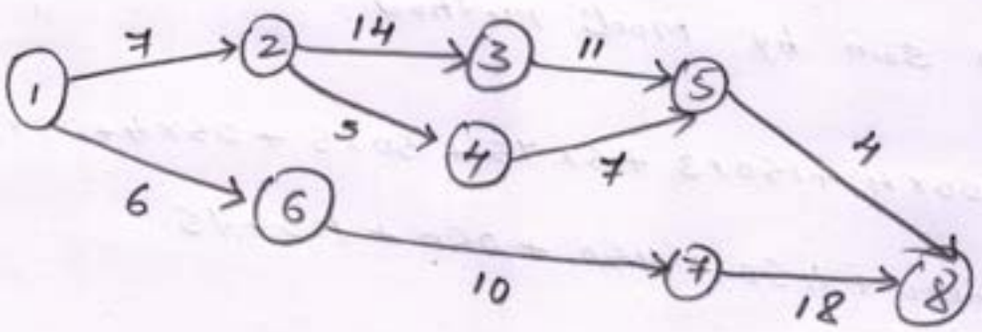
For non Allocated Cells →

$\Delta_{ij} = C_{ij} - (u_i + v_j)$

Since all the values of Δ_{ij} are +ve ∴ the total Cost incurred is 1705/-

e]

Jobs	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
to	3	2	6	2	5	3	8	1	4
tm	6 (24)	5 (20)	12 (48)	5 (20)	11 (44)	6 (24)	9 (36)	4 (16)	19 (76)
tp	15	14	30	8	17	15	27	7	28
te	7	8	14	5	11	7	10	4	18



C-path :- 1-2-3-5-8

∴ variance = $\left[\frac{t_p - t_o}{6}\right]^2$

∴ variance value for C.P = $\sigma = \sqrt{40}$

$= 6.32$

-20M-

Probability value : $Z = \frac{40 - 38}{6.32} = 0.316$

∴ T_S = 48.3 days

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Department of MBA
II Semester - Internal Assessment I
Managerial Economics (22MBA26)

Time: 1Hr.30Min **Date: 02/08/2023**
Max Marks: 50

Note: ***Answer all the questions.***

Q. No.		Questions	Marks	BT	CO's
1.	a.	What do you mean by Managerial Economics?	3M	L1	CO1
	b.	Explain the nature of Managerial economics.	7M	L2	CO1
	c.	Explain the scope of managerial economics	10M	L2	CO1
2.	a.	What do you mean by demand analysis and forecasting?	3M	L1	CO1
	b.	Distinguish between micro and macro economics	7M	L2	CO1
	c.	Discuss the uses of Managerial Economics	10M	L2	CO1
3	a.	Explain the Role and responsibilities of Managerial Economist.	10M	L2	CO1

Faculty Signature **HOD Signature** **Principal Signature**

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Sl. No.	Answer	Marks
1. (a)	"Managerial economics is concerned with the application of economic concepts and economic analysis in to the problems of formulating rational managerial decisions." – Edwin Mansfield "Managerial economics is the integration of economic theory with business practice for the purpose of facilitating decision making and forward planning by management." – Spencer and Sieglman	3M
(b)	1. Art and science: managerial economics required a lot of creativity and logical thinking to come up with a solution. A managerial economist should possess the art of utilizing his capabilities, knowledge and skills to achieve the organizational objective. Managerial economics is also considered as a stream of science as it involves the application of different economic principles to solve business problems. 2. Microeconomics: In managerial economics problems of a particular organization are looked upon rather than focusing on the whole economy. Therefore it is termed as a part of microeconomics. Micro economics deals with the individual units of an economy. Business economics is micro economics in nature because it is based on the concepts of micro economics. 3. Uses macro economics: any organization operated in a market that is a part of the whole economy, so external environment affect the decisions within the organization. Managerial economics uses the concept of macroeconomics to solve problems. Managers analyze the macroeconomic factors like market conditions, economic reforms, and government policies to understand their impact on organization. 4. Multi-disciplinary: managerial economics uses different tools and principles from different disciplines like accounting, finance, statistics, mathematics, production, operation research, human resource, marketing etc. this helps in coming up with a perfect solution. 5. Management oriented and pragmatic: Managerial economics is a tool in the hands of managers that aids them in finding appropriate solutions to business-related problems and uncertainties. As mentioned above, managerial economics also helps in goal establishment, policy formation, and effective decision making. It is a practical approach to find solutions.	7M
(c)	1. Demand Analysis and Forecasting: The very reason for the operation of any business firm is the demand for its product in the market. All significant decisions of the firm depends upon the correct estimation in demand analysis managers seeks to collect information about the various factors which are going to affect demand for a firm's product, various substitutes available in the market and trends prevailing in the market. All these factors have important bearing on the production schedules. Demand analysis and forecasting is therefore really essential for planning business activities and occupies a relevant place in managerial economics. 2. Cost Analysis: Another important area of managerial economics is cost analysis. Whenever managers plan for production, the foremost factors that comes to their mind is the cost of production. Cost analysis facilitates management decisions. The factor that leads to variations in costs is beyond the control of managers and therefore must be recognized. In the absence of cost estimates one may not be able to properly plan its profits & also not able to determine its pricing policies. 3. Production Analysis: Managers while planning for production pays attention to the relation between cost and output, what are the various factors of production which are required to carry on manufacturing, what is the behavior of various cost in relation to the factors, how far we are able to achieve economies of scale. Thus, production analysis also another important domain. 4. Pricing Policies: Pricing is a very important area of managerial economics. Managers have to	10M

spent a lot of time on forecasting & determining the price of products in the various market structures as price acts as a major source of revenue .There are various methods to determine the prices but the choice of right method is the greatest challenge. Wrong pricing decision will turn the firm out of the market. An accurate pricing decision contributes a lot to the success of a business firm.

5. Profit Management: The ultimate objective of any economic organization is to earn handsome profits& is considered as the barometer of success. But we also know that the future is` always uncertain. There is uncertainty on account of various factors such as social , political ,economic factors ,which acts as a obstacle in our way of objective. Thus profit planning and management is regarded as the important area of managerial economics.
6. Capital Management: Capital is regarded as the most important resource and also require greater attention of the managers. Capital expenditure not only have the binding on the present but also on the future profits & once such decisions are taken these are irreversible. Therefore manager do keep focus on this aspect.
7. Advertising: Since decisions making and forward planning are the important areas of managerial economics, therefore the managers have to plan many things about the product they are going to launch in the market. The various activities in this regard are its design, shape, quantity, deciding about the marketing of good etc. In this context advertising is important area of managerial Economics.
8. Environmental issues: There are many areas of macroeconomics which also becomes part of managerial economics, since the business organization can't work in isolation. These areas are related to general business, social, political and demographic environment in which a business enterprise works. All these issues have great bearing on Business activities.
9. Business cycles: Business cycles also seem to affect business decisions. Business cycles are regular fluctuations in economic activities in the country. The various phases that constitute business cycle are depression, recovery, boom and recession. Therefore managers have to modify their plans according to the phase through which the business is passing out.

2. (a) Demand Analysis and Forecasting: The very reason for the operation of any business firm is the demand for its product in the market. All significant decisions of the firm depends upon the correct estimation in demand analysis managers seeks to collect information about the various factors which are going to affect demand for a firm's product, various substitutes available in the market and trends prevailing in the market. All these factors have important bearing on the production schedules. Demand analysis and forecasting is therefore really essential for planning business activities and occupies a relevant place in managerial economics. **3M**

(b)

Micro economics	**Macroeconomics**
The branch of economics that studies the behavior of an individual consumer, firm, family is known as microeconomics	The branch of economics that studies the behavior of the whole economy is known as macro economics
Concerned with particular households, firms and industries	National income, general price levels, national output, unemployment and poverty
Assumptions – rational behavior of individual	Aggregate volume of output of an economy, the extent to which its resources are employed
Analysis demand and supply of labor	Analyzes total employment in the economy
Individual economic variable	Aggregate economic variables
Applied to operational or internal issues	Environment and external issues
It takes into account small components of the whole economy	It takes into consideration the economy of the country as a whole
It is known as price theory	It is known as income theory
It concentrate on the optimization goals of individual consumer and producers	It concentrate on the optimization of the growth process of the entire economy

7M

(c) **Uses of Managerial Economics:**

1. Used for Integration of Economic Theory: Economic theory and business practice is integrated with the help of managerial economics. **10M**

	2. Used as Solution to Practical Business Problems: It acts as a mean to apply economic concepts and principles to solve practical business problems in real life. Managerial economics helps in employing the most modern instruments and tools to find solutions to business problems. 3. Optimum Use of Scarce Resources: It helps in making optimum use of scarce resources of a firm to maximize profits. 4. Used for Other Objectives: The various objectives such as attaining industry leadership, expansion of market share, etc., are achieved with the help of managerial economics. 5. Used for Overall Development: Managerial economics facilitates in making overall development of a firm. 6. Used in Making Right Decisions: A manager understands the details of business problems and taking a right decision at the right time with the help of managerial economics	
3.	**Roles and Responsibilities of economist:** a. Analysis of business operation b. Increase in profit earning capacity c. Analysis of external factors d. Useful advice in economic matters e. Establishing a high reputation and status in the firm f. Reduction in risks of uncertainties g. Close contact with the source of economic information and experts h. Trustworthy forecasting i. Economic operation j. Successful forecasting k. Efforts for reasonable return of capital employed l. Reduction in production and distribution cost m. Increase in competition power of the firm n. Implementation of government policies o. Specific functions of managerial economist p. Sweet relations q. Coordination with external situation	**10M**

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II Semester - Internal Assessment II
Managerial Economics (22MBA26)

Time: 1Hr 30Min **Date: 06/09/2023**
Max Marks: 50

Note: ***Answer all the questions.***

Q. No.		Questions	Marks	BT	CO's
1.	a.	What are Giffen goods?	3M	L1	CO3
	b.	What are the exceptions to law of demand?	7M	L2	CO2
	c.	Explain briefly the objectives of a firm.	10M	L2	CO2
2.	a.	State the meaning of a firm.	3M	L1	CO2
	b.	Explain the determinants of demand.	7M	L2	CO3
	c.	Why does demand curve slope downwards?	10M	L2	CO3
3	a.	Describe Baumol's model with graphical representation.	10M	L2	CO2

Divya - S
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Department of MBA
II Semester - Internal Assessment II
Managerial Economics (22MBA26)

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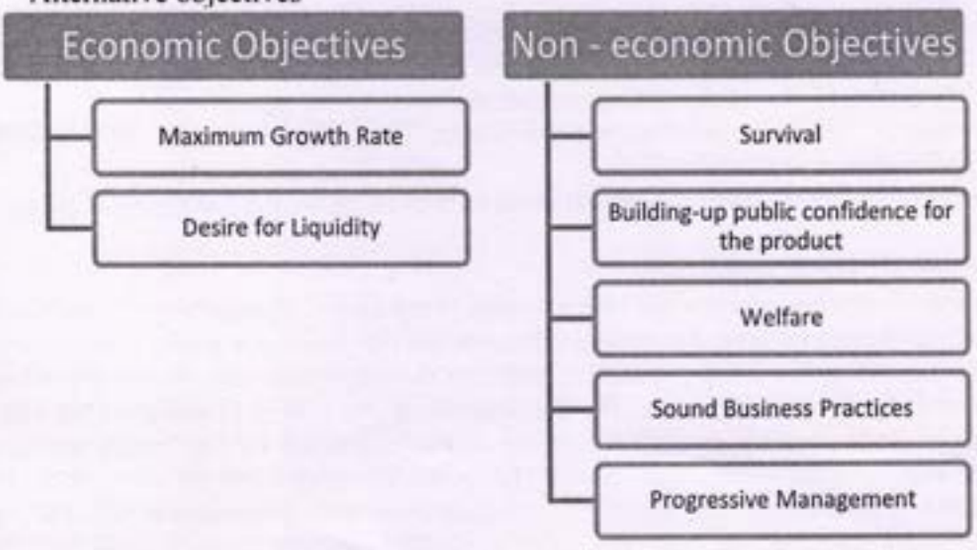
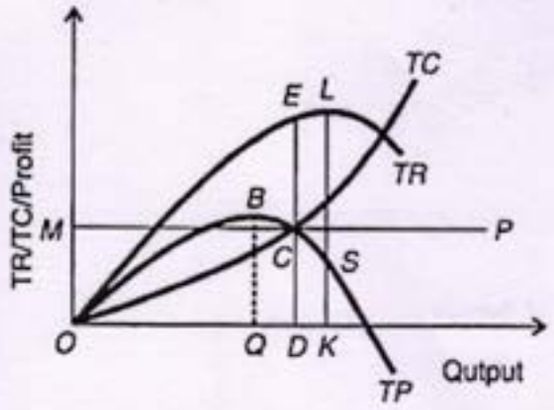
Sl. No.	Answer	Marks
1. a.	According to Sir Robert Giffen, the British workers were demanding more quantity of bread even though the price of bread was high. Thus, this condition was against the law of demand. The demand for the bread would increase because the increased prices of bread had reduced the purchasing power of worker, thus they were forced to reduce down their consumption of the other expensive products such as meat or ice cream. Because the bread was low-priced relative to the other products thus it was demanded more by the workers. Based on the given example, the law of demand cannot be applied in case of Giffen goods.	3M
b.	**Exception to law of demand:** ➢ Conspicuous goods ➢ Giffen goods ➢ Necessities of life ➢ Conspicuous necessities ➢ Future expectations about prices ➢ Impulsive purchases ➢ Ignorance effect ➢ Out-dated goods	7M Explain 8 points
c.	**Objectives of the firm** - Profit maximization - Sales maximization - Value (wealth) maximization - Satisfactory level of profits - Cyert and March's behavior Theory - Alternative objectives 	10M
2. a.	According to Professor S.E. Landsbury, "Firm is an organization that produces and sells goods with the goal of maximizing its profits." According to Professor R.L. Miller, "Firm is an organization that buys and hires resources and sells goods and services."	3M
b.	Determinants of demand ▪ Price of the commodity	7M

	▪ Income of the consumer ▪ Tastes and preferences ▪ Prices of related goods ▪ Advertisement and sales propaganda ▪ Consumer's expectation ▪ Growth of population ▪ Weather conditions 'tax rate ▪ Availability of credit ▪ Pattern of saving ▪ Circulation of money	**explain any 8 points**
c.	Reasons for downward slope of demand curve - Income effect - Substitution effect - New consumer creating demand - Based on the law of diminishing marginal utility - Price effect - Different income groups - Different uses - Tendency to satisfy unsatisfied wants	**10M explain all points**
3.	**Baumol's Model (Sales Revenue Maximising Model)** According to Baumol every firm is more focused on sales maximisation because it tends to achieve both short-run and long-run objective of the management, whereas short- run revenue maximisation will not support long-run profit maximisation. Number of arguments has also been passed by Baumol to support his theory. Those are as follows: 1) Every firm has sensitivity towards sales; even slightest declines in sales are much concerned by firms. 2) The sales of the firm are directly tend to influence the bank credit, creditors and the capital market. 3) Decline in sales will also cover the way for its own distributors and dealers to stop taking an interest in the particular product. 4) The unpopularity of the product may stop the consumer to buy the particular product. 5) Sales are the revenue generators for the firm and if it is declined then the firm needs to cut down its expenses through cutting down its staff and other operating expenses. 6) A large sale of the firm is called economies of sales. Through economies of sales the firm expands and earns a large profit. 7) The extent of sales is directly proportional to the salaries of the worker and the management. **Baumol Model of Sales Maximization:** Baumol model for revenue maximisation through sales is depicted in figure where TC- total cost curve, TR- Total Revenue Curve, TP- Total profit curve and MP- Minimum profit. It can be seen from the diagram that a firm attains maximum profit for the output level OQ, the corresponding point is denoted by B in the TP curve. But the objective of the firm is to maximise the sales rather than its profit; thereby sales maximisation output is denoted by OK where the total revenue generated correspondingly is denoted by KL in the TR curve. From the curve, it can be interpreted that sales maximisation output OK is higher than profit maximisation OK. But the sales maximisation is subject to minimum profit constraint. For sales maximisation, the firm produces output to a certain level to cover the minimum profit and to generate highest total revenue, whose point is OD, the DC here represents the minimum profit generated which is equivalent to OM for the output level DC. DE represents the total revenue generated for the output level OD.	**10M** **Graph 2M and explanation 8M**



In Baumol's model, the point of profit maximisation output, OQ is smaller than sale maximisation output OD. In the model, lower price under sales maximisation is that both total revenue and total output are equally higher while under profit maximisation, total output is much less as compared to total revenue. Imagine if QB is joined to TR in figure. "If at the point of maximum profit," writes Baumol, "the firm earns more profit than the required minimum, it will pay the sales maximiser to lower his price and increase his physical output".

Implications of the Baumol's Model

1) The main objective of sales maximising firm is to prioritise the enhanced sales over the enhanced profit. The prices charged by these firms are less than the profit maximising firm as these firms are maximising their revenue, when MR = 0.
2) The output generated by the sales maximising firms is higher than the output of profit maximising firms.
3) The expenses incurred on advertising by the sales maximising firms are higher than the profit maximising firms in order to earn higher revenues.
4) The conflicts regarding the pricing of product in short- run and long-run may arise. If the firm views the situation from the short-run perspective, where the output cannot be increased then the only way is to increase the price of the product. On the other hand, if it views the situation from the long-run perspective then it is not beneficial for the profit maximising firm. Under this situation, the sales maximising firm is required to keep the prices lower to cover the larger share of market so that higher revenues can be generated.

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Department of MBA
II Semester - Internal Assessment III
Managerial Economics (22MBA26)

Time: 3 hours **Date: 23/09/2023**
Max Marks: 100

Note: 1. Answer any FOUR full questions from Q.No.1 to 7.
2. Q.No.8 is compulsory

Q.No.		Questions	Marks	BT	CO's
1	a	What do you mean by Managerial Economics?	3M	L1	CO1
	b	Discuss the roles and responsibilities of Managerial economist in the present world of competitive environment in achieving the objectives of organization	7M	L2	CO1
	c	Enumerate the alternative objectives of the firm and explain Baumol's model	10M	L3	CO2
2	a	What do you mean by elasticity of demand?	3M	L1	CO2
	b	Explain in detail the determinants of price elasticity of demand	7M	L3	CO2
	c	What do you mean by demand forecasting? Explain the qualitative and quantitative methods of demand forecasting	10M	L2	CO3
3	a	Define Business Environment.	3M	L1	CO6
	b	Discuss the nature and scope of Business environment.	7M	L2	CO6
	c	Explain the structure of Indian Business Environment.	10M	L2	CO6
4	a	What do you mean by Fiscal policy?	3M	L1	CO6
	b	Write a short note on Aatma Nirbhar Bharat Abhiyan	7M	L1	CO6
	c	Explain the role of Small Scale Industries in Indian economy	10M	L3	CO6
5	a	What do you mean by price discrimination?	3M	L1	CO5
	b	Enumerate the features of perfect Competitive market	7M	L2	CO5
	c	Enumerate the problems faced by private sector in India.	10M	L3	CO6
6	a	What do you mean by Industrial Policy?	3M	L1	CO6
	b	Briefly explain Industrial Policy 1991.	7M	L2	CO6
	c	Explain the concept of BEA with neat sketch.	10M	L3	CO4
7	a	What is perfect competition?	3M	L1	CO5
	b	Explain the objectives of monitory and fiscal policy.	7M	L1	CO6
	c	Compare the characteristics of an oligopoly with those of a perfect competition, monopoly and monopolistic competition.	10M	L2	CO5
8		Gagan Pvt. Ltd. was established in 1995. The company started manufacturing of Water Geyser with a brand name of 'Ganga'. During initial 10 years, the company made good profits. But, its profits gradually declined due to competition from national brands. The promoters of the company had a committed team of workers who were constantly working on Research and Development. Finally, they came-out in the year 2006, with an innovative product, named Maha Ganga which runs even at very low voltage and consumes less electricity. Thus, the company is monopoly manufacturer of 'Maha Ganga'. The company is currently supplying its products in geographically separated markets of Punjab and Haryana. The company is currently charging the same price in Punjab and Haryana. The Chief Economist of the company has informed the top management that price elasticity of demand at currently-charged price is 3 in Punjab and 5 in Haryana. The top management is planning to charge two different prices in order to make more profits			
	a	Will it be possible for the company to charge two different prices in Punjab and Haryana? If yes, under what condition? Explain	10M	L4	CO5
	b	Will it be profitable for the company to charge two different prices in Punjab and Haryana? - Explain	10M	L4	CO2

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II Semester - Internal Assessment III
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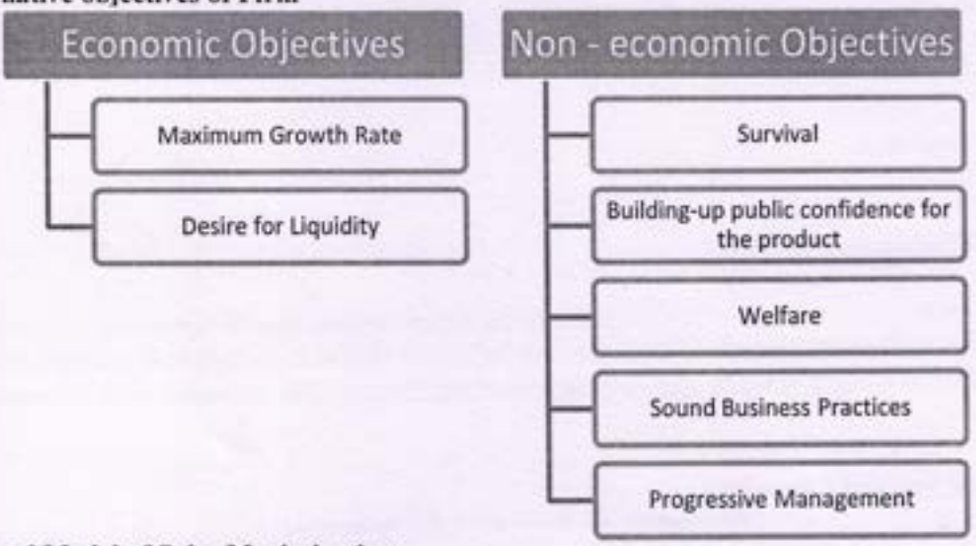
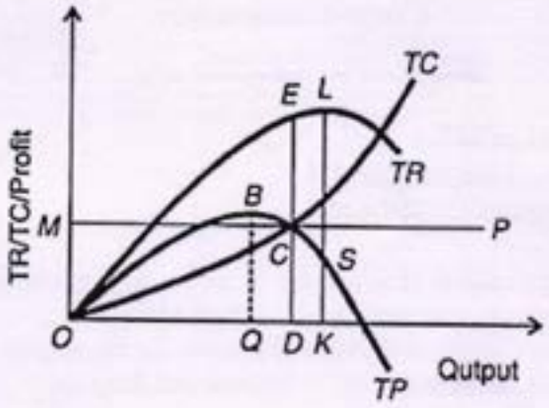
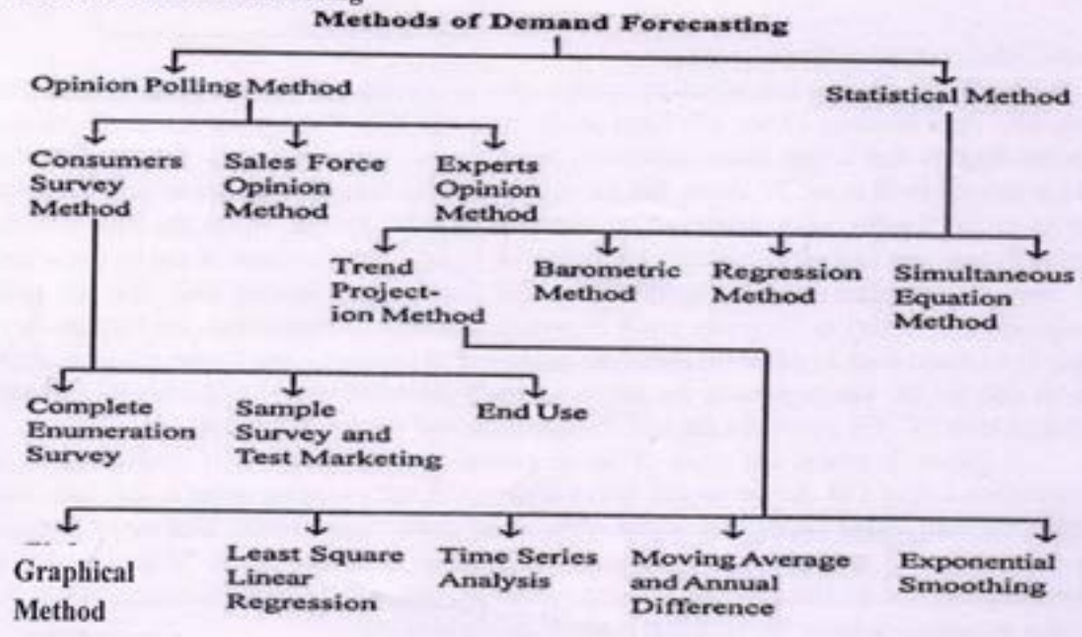
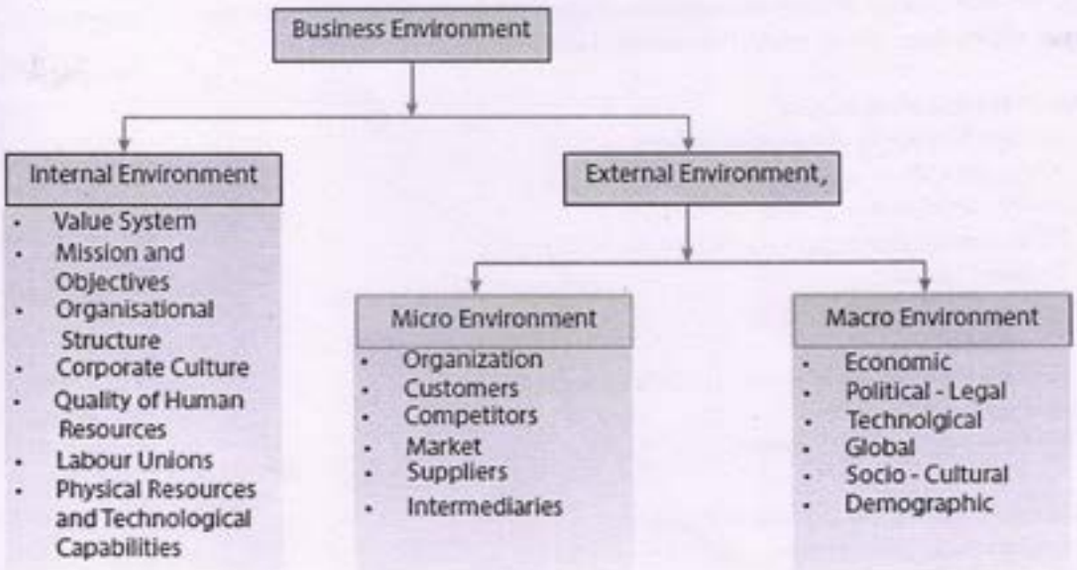
Q.No.		Answers	Marks
1	a	"Managerial economics is concerned with the application of economic concepts and economic analysis in to the problems of formulating rational managerial decisions." – Edwin Mansfield "Managerial economics is the integration of economic theory with business practice for the purpose of facilitating decision making and forward planning by management." – Spencer and Sieglman	3M
	b	Roles and responsibilities of economist: - Analysis of Business Operation - Increase in profit earning capacity - Analysis of external factors - Useful advice in economic matters - Establishing a high reputation and status in the firm - Reduction in risks of uncertainties - Close contact with the source of economic information and experts - Trustworthy forecasting	7M Explain any 8 points
	c	**Alternative objectives of Firm**  **Baumol Model of Sales Maximization:** Baumol model for revenue maximisation through sales is depicted in figure where TC- total cost curve, TR- Total Revenue Curve, TP- Total profit curve and MP- Minimum profit. It can be seen from the diagram that a firm attains maximum profit for the output level OQ, the corresponding point is denoted by B in the TP curve. But the objective of the firm is to maximise the sales rather than its profit; thereby sales maximisation output is denoted by OK where the total revenue generated correspondingly is denoted by KL in the TR curve. From the curve, it can be interpreted that sales maximisation output OK is higher than profit maximisation OK. But the sales maximisation is subject to minimum profit constraint. For sales maximisation, the firm produces output to a certain level to cover the minimum profit and to generate highest total revenue, whose point is OD, the DC here represents the minimum profit generated which is equivalent to OM for the output level DC. DE represents the total revenue generated for the output level OD. In Baumol's model, the point of profit maximisation output, OQ is smaller than sale maximisation output OD. In the model, lower price under sales maximisation is that both total revenue and total output are equally higher while under profit maximisation, total output is much less as compared to total revenue. Imagine if QB is joined to TR in figure. "If at the point of maximum profit," writes Baumol, "the firm earns more profit than the required minimum, it will pay the sales maximiser to lower his price and increase his physical output".	10M 5M for alternative object 5M for model



2	a	Elasticity of demand refers to the percentage change in quantity demanded divided by the percentage change in one of the variable which affect the demand. In other words, price elasticity of demand is generally referred as elasticity of demand. The rate at which the demand changes with respect to the change in price is denoted by the elasticity of demand.	3M
	b	**Determinants of price elasticity of demand:** - Availability of substitutes - Position of a commodity in a consumer's budget - Nature of the need that a commodity satisfies - Number of uses to which a commodity can be put - Possibilities of posting the consumption - Joint demand - Consumer habits - Tied demand - Price range - Brand - Time - Distribution of income	7M
	c	Demand Forecasting is a reasonable judgment of the future probabilities of the market events based on some scientific background. It is an estimate of future demand. It cannot be hundred percent precise. But it gives a reliable approximate regarding the possible outcome with a reasonable accuracy. **Methods of demand forecasting**	10M



3	a	Business environment may be considered as a set of factors that influence the functioning and effectiveness of a business. Interacting and transacting with the environment is the basic need of every business organisation. Thus, there is a mutual interdependence between business and the environment.	3M
	b	**Nature:** - Environment is inseparable from business - Environment is dynamic - Business lacks control over environment - Internal and external factors - Environment is multifaceted - Uncertainty **Scope** - First mover advantage - Early warning signal - Customer focus - Strategy formulation - Change agent - Continuous learning - Directing growth - Image building	7M 3M for nature 4M for Scope
	c	**Components of business environment**  	10M
4	a	Fiscal policy represents the government policy related t tax and expenditure. It is type of economic policy which controls and regulates the tax system, expenditure, borrowings and public debt management within a country. The role of fiscal policy differs according to the requirements of a country. Developed countries use fiscal policy as a tool to increase employment and maintain economic stability. While, underdeveloped countries use fiscal policy to boost the economic growth.	3M
	b	The Aatma Nirbhar Bharat Abhiyan, also known as the Self-Reliant India Mission, was launched by the Indian government in 2020 to promote self-sufficiency and reduce dependence on imports. The Self-Reliance neither signifies any exclusionary or isolationist strategies but involves creation of a helping hand to the whole world. The Mission focuses on the importance of promoting "local" products. The Mission will be carried out in two phases: Phase 1: It will consider sectors like medical textiles, electronics, plastics and toys where local manufacturing and exports can be promoted. Phase 2: It will consider products like gems and jewellery, pharma and steel, etc. The Mission would be based on five pillars namely, 1) Economy	7M

		2) Infrastructure 3) System 4) Vibrant Demography 5) Demand	
	c	**Role of Small Scale Industries in Indian economy:** - Employment generation - Production - Export contribution - Innovation and development - Efficient utilization of resources - Developing entrepreneurial capacity - Increases GDP - Feeder to large industries - Opportunity for artisan - Increase standard of living - Less pressure of population on agriculture - Equitable distribution of Income - Social advantage	10M
5	a	The process of selling technically same product at different prices to the different section of consumers or selling in the different markets, referred as price discrimination. If the elasticity of demand is different for any product in different markets then the policy of price discrimination is profitable for monopolist. Higher price can be charged for any product if the demand of that product is inelastic and charged lower price if the demand of the product is elastic.	3M
	b	**Features of Perfect competition:** - A large number of buyers and sellers - Anti-competitive regulation - Every participant is a price taker - Homogenous products - Rational buyers - No barriers to entry or exist - No externalities - Non increasing returns to scale and no network effects - Perfect factor mobility - Profit maximization to sellers	7M
	c	**Problems faced by private sectors in India** - Loss to small businesses - Hectic working environment - Fear of job loss - Cut throat competition - Limited job perks - Corruption - More focus on profits - Lack of transparency	10M
6	a	Industrial policy is the set of standards and measures set by the government to evaluate the progress of the manufacturing sector that ultimately enhances economic growth and development of the country. The government take measures to encourage and improve the competitiveness and capabilities of various firms.	3M
	b	The Government of India announced its new industrial policy 1991 on July 24, 1991, with the goal of correcting the distortions and weaknesses in the country's industrial structure that had developed over four decades, raising industrial efficiency to international levels, and accelerating industrial growth. The economic reforms that were started in the early 1990s were centred on the New Industrial Policy of 1991. The new industrial policy served as the foundation for all subsequent reform initiatives such as Liberalization, Privatization, and Globalization. Some of the features are	7M

as follows:

- Abolition of Industrial Licensing
- Diminishing role of public sector
- Incentives and concessions for Foreign investment and Technology
- Drastic Amendments to MRTP Act
- Removal of compulsory convertibility clause

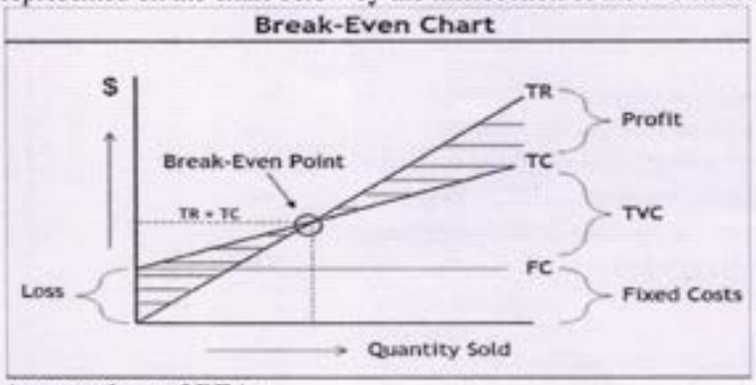
Implications of New Industrial Policy in India:

1. Growth of New Economy Companies: The introduction of NIP, helped in the expansion of 'new economy' companies. For example, Infosys has grown potentially in terms of size and structure due to industrial policy.
2. Economy Bailed Out: NIP was the saviour to the Indian economy at the time of economic emergency and degradation.
3. New Breed of Entrepreneurs: NIP facilitated the recovery and emergence of suitable market conditions and opportunities for developing new breed of entrepreneurs like Sunil Mittal of Bharti enterprises.
4. FDI and New Technologies: The industrial policy of 1991 focused on foreign technology and foreign investment for the development of Indian economy. It was observed that the motive behind these changes was to invite Foreign Direct Investment (FDI) and new technologies from the global environment.
5. Greater Competitive Strength: NIP 1991 provided certain policies and regulations that improved the effectiveness of Indian organisations and helped in their competitive growth. Entrepreneurship was also encouraged and supported. It made the Indian economy capable of withstanding the competition from multinationals.
6. Healthy Competition: MRTP Act was responsible for the blocked growth of Indian enterprises for a long time. Its role was to prevent monopoly and restrictive trade practices, but it did not perform well. NIP 1991 made amendments in the MRTP Act, so as to create a healthy competitive environment.
   A new Log called competition law enacted for promoting competition among companies along with punishing the inhibitors of healthy competition.
7. Sustained economic growth: NIP 1991 help in creating and maintaining improved productivity and employment, along with sustained economic growth. This was the result of NIP along with certain reforms like fiscal and monetary policy.

c

Break even analysis is the relationship between cost volume and profits at various levels of activity, with emphasis being placed on the breakeven point. The breakeven point is where the business neither receives a profit nor a loss; this is when total money received from sales is equal to total money spent to produce the items for sale.

The Break-Even Chart: It is a graphical representation of costs at various levels of activity shown on the same chart as the variation of income (or sales, revenue) with the same variation in activity. The point at which neither profit nor loss is made is known as the "break-even point" and is represented on the chart below by the intersection of the two lines:



Assumptions of BEA:

1. The cost function and revenue functions are linear.
2. The total cost is divided into fixed and variable costs.
3. The selling price is constant.
4. The volume of sales/production is identical.
5. Average and marginal productivity of factors are constant.

10M
2M graph
3M assumption
5M explanation

		6. The product mix is stable in case of multi product firm. 7. Factor price is constant.	
7	a	Perfect competition refers to the market structure where competition among the buyers and sellers prevail in the most perfect form. In a perfectly competitive market, a single market price prevails for a commodity which is determined by the forces of total demand and total supply in the market. Hence every participant is a price taker and not the price maker. This type of market may at the most exist for farm products but outside of agriculture, it is rare phenomenon. The term perfect competition refers to a theoretical market structure.	3M
	b	**Objectives of Monetary policy** ✓ **Controlling Inflation:** Monetary policies can target inflation levels. A low level of inflation is considered to be healthy for the economy. If inflation is high, a contractionary policy can address this issue. Contractionary monetary policy is used to temper inflation and reduce the level of money circulating in the economy. Expansionary monetary policy fosters inflationary pressure and increases the amount of money in circulation. ✓ **Managing Employment Levels/Unemployment:** Monetary policies can influence the level of unemployment in the economy. For example, an expansionary monetary policy generally decreases unemployment because the higher money supply stimulates business activities that lead to the expansion of the job market. ✓ **Maintaining Long Term Interest Rates/Currency Exchange Rates:** Using its fiscal authority, a central bank can regulate the exchange rates between domestic and foreign currencies. For example, the central bank may increase the money supply by issuing more currency. In such a case, the domestic currency becomes cheaper relative to its foreign counterparts. **Objectives of fiscal policy:** - Stabilizing the economy - Promoting economic growth - Managing unemployment - Price stability - Income redistribution - Balancing the budget - Improving public services	7M 3M for monetary objective 4M for fiscal objective
	c	<u>Perfect Competition:</u> Number of Firms: Many small firms. Product Differentiation: Homogeneous products (identical or perfect substitutes). Entry and Exit: Easy entry and exit of firms in the industry. Price Setting: Price is set by the market forces of supply and demand. Market Power: No individual firm has market power; each is a price taker. Examples: Agricultural markets, some online commodity markets. <u>Monopoly:</u> Number of Firms: One single firm dominates the market. Product Differentiation: Unique product with no close substitutes. Entry and Exit: High barriers to entry, making it difficult for new firms to enter. Price Setting: The monopolist sets the price; there is no competition. Market Power: Significant market power; the monopolist is a price maker. Examples: Local utilities, certain patented products. <u>Monopolistic Competition:</u> Number of Firms: Many small to medium-sized firms. Product Differentiation: Products are differentiated but not perfect substitutes. Entry and Exit: Relatively easy entry and exit. Price Setting: Firms have some control over prices due to product differentiation. Market Power: Limited market power; firms can differentiate but face competition. Examples: Restaurants, clothing stores, and other retail markets.	10M 2.5M each

		Oligopoly: Number of Firms: Few large interdependent firms dominate the market. Product Differentiation: Products may be homogeneous or differentiated. Entry and Exit: Barriers to entry are usually high. Price Setting: Prices may be set independently or interdependently (collusion). Market Power: Significant market power; firms are interdependent. Examples: Automobile industry, telecommunications, soft drink industry.	
8	a	Yes, it is possible for the company to charge two different prices in Punjab and Haryana under certain conditions. Price discrimination, or charging different prices in different markets, is feasible when certain criteria are met. One key condition is that the demand elasticity should differ between the two markets. In this case, the price elasticity of demand (PED) is provided: 3 in Punjab and 5 in Haryana. Price discrimination is more likely to be successful when the company can identify and separate the markets effectively, preventing arbitrage (buying in the lower-priced market and reselling in the higher-priced market). Additionally, there should be a lack of price communication between the two markets. If the company can implement these conditions and effectively segment the markets, it may be feasible to charge two different prices.	10M
	b	To determine the profitability of charging two different prices, the company needs to consider the elasticity of demand in each market. Generally, the company should set a higher price where demand is less elastic and a lower price where demand is more elastic. Given the information provided (PED of 3 in Punjab and 5 in Haryana), the company should charge a higher price in Punjab (where demand is less elastic) and a lower price in Haryana (where demand is more elastic). The profit-maximizing strategy involves setting marginal revenue equal to marginal cost. The company should compare the marginal revenue from selling an additional unit in each market with the marginal cost of producing that unit. If the marginal revenue exceeds marginal cost in both markets, the company can increase profits by charging different prices. However, the extent to which prices can be differentiated depends on market conditions, competition, and the company's production costs. The company should conduct a thorough analysis of its cost structure, market conditions, and the response of consumers in each market to determine the optimal pricing strategy that maximizes overall profitability. It's essential to ensure that the company's pricing strategy complies with legal and ethical considerations, as certain forms of price discrimination may be subject to regulatory scrutiny.	10M

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Department of MBA
Fourth Semester Internal Assessment Test –I
20MBAFM401-Risk Management & Insurance

Time: 90 Minutes **Date: 03.07.2023**
Max marks: 50

ote: ***Answer all the questions.***

Q. No.		Questions	Marks	BT	CO's
1.	a.	Define Risk?	3M	L1	CO1
	b.	Explain the Sources of Risk?	7M	L2	CO1
	c.	Explain the different types of Risk?	10M	L2	CO1
2.	a.	What do you mean by risk Measurement?	3M	L1	CO2
	b.	Explain the techniques for estimating frequency and Severity of losses?	7M	L2	CO2
	c.	Explain the risk Management process?	10M	L2	CO1
3	a.	Illustrate the process of Business Risk Exposure?	10M	L2	CO2

Faculty Signature **HOD Signature** **Principal Signature**

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Department of MBA
Fourth Semester Internal Assessment Test –I
20MBAFM401-Risk Management & Insurance

Time: 90 Minutes Date: 03.07.2023
Max marks: 50

ote: Answer all the questions.

Q. No.		Questions	Marks	BT	CO's
1.	a.	Define Risk?	3M	L1	CO1
	b.	Explain the Sources of Risk?	7M	L2	CO1
	c.	Explain the different types of Risk?	10M	L2	CO1
2.	a.	What do you mean by risk Measurement?	3M	L1	CO2
	b.	Explain the techniques for estimating frequency and Severity of losses?	7M	L2	CO2
	c.	Explain the risk Management process?	10M	L2	CO1
3	a.	Illustrate the process of Business Risk Exposure?	10M	L2	CO2

Faculty Signature HOD Signature Principal Signature

Internal Assessment Test - I

Risk management & Insurance (20MBAFIN401)

1
a. Define Risk?

According to Federation of Insurance Institute. Risk can be defined as degree of variation in the possible outcome from an uncertain event (or) as the variable in the possible outcome.

However, there is a degree variability around this value. He might dude out (or) list a century.

Example: Virat Kohli's batting average is 72 based on past data. So the expected score he is likely to hit is 72.

1
b. Explain the Sources of Risk?

I External Sources.

1. Economic factors
2. Natural Factors
3. Political Factors.

II. Internal Factors

1. Operational Factors
2. Human Factors
3. Technological Factors
4. Physical Factors.

I. External Sources.

1. Economic Factors

It refer to elements within the broader economy that can introduce resks to individuals and busin-ess. These factors include economic fluctuations, exchange rate volatility, interest rate changes, and market instability. Economic fluctuations can lead to reduced demand and financial challenges during recessions.

2. Natural Factors

These factors include natural disasters such as earthquakes, floods, hurricans, wildfires, and tsuramis, which can cause extensive damage to infrastructure and disrupt economies. Climate change, with rising temperatures and

increased frequency of extreme weather events, also introduces risks like droughts, storms, and sea-level rise.

3. Political Factors

This risks arising from governmental actions, policies, and geopolitical events. These factors incluc-de political instability, such as civil unrest (or) regime changes, which can disrupt businessess and economic growth. Charges in government regulations and trade policies can introduce compliance burd-ens and impact market conditions.

II Internal Sources

1. Operational Factors

These factors arise from within an organisation. It includes human factors, such as errors, negligence, misconduct, (or) inadequate trafnig, which can lead to operational failures. Flaws in operational processes, such as inefficiencies (or) system failures, can disrupt business operations and resut in financial losses.

2. Human Factors

It arise from the actions, behaviours, and characteristics of individuals within an organization. These factors can lead to operational failures, accidents, breaches of security, (or) non-compliance with regulations.

3. Technological Factors

Technological factors can introduce risks such as system failures, data loss, unauthorized access, (or) operational disruptions. It is crucial for organizations to proactively manage technological factors by implementing robust cybersecurity measures, staying updated with emerging technologies, conducting regular risk assessments and ensuring proper training and awareness among employees.

4. Physical Factors.

It includes hazards such as structural deficiencies, equipment malfunctions, (or) workplace accidents. Physical factors can lead to injuries, property

damage, (or) disruptions to operations. It is important for organizations to identify and mitigate physical risks through regular maintenance, safety protocols, employee training, and adherence to relevant regulations and standards.

1.

C. Explain the different types of Risk?

1. Financial and non financial Risk.
2. Static and dynamic Risk.
3. Fundamental & Particular Risk.
4. Pure & Specualative Risk.
5. Quantifiable & non quantifiable Risk.

Financial and Non financial Risk.

Financial risk relates to potential losses (or) negative impacts on financial resources, investments and financial stability. Examples include market risks, credit risk, liquidity risk and currency risk.

Non financial risks do not directly impact on organizations financial position but can still have significant consequences. These risks include operational risks, reputational risks, legal and regulatory risks, strategic risks, environmental risks and cybersecurity risks. Non financial risks can affect an organizati-ons operations, reputation, brand value, legal compliance, and relationships with stakeholders.

Static and Dynamic risk

Static risks are usually associated with known hazards or events with fixed probabilities and impacts, Static risks can be assessed and managed through established risk management practices and procedures. Examples of static risks include natural disasters, market fluctuations, and regulatory compliance.

Dynamic risks are characterized by their unpredi-ctability, complexity, and the potential for new and unknown risks to emerge. Managing dynamic risks requires flexibility, adaptability, and the

ability to anticipate and respond to changing circumstances.

Fundamental and Particular Risk

Fundamental risk refers to risks that are inherent to an entire class (or) category of assets (or) investments. These risks cannot be eliminated through diversification. They are systematic in nature and affect all assets within a specific market (or) industry.

Particular risks can be reduced (or) eliminated through diversification. Particular risks are unique to a specific company, sector, (or) investment and can include factors such as management performance, competitive pressures, regulatory changes, (or) company-specific events.

Pure & Speculative Risk

Pure risk refers to risks that only have the potential for loss (or) no loss at all. It involves situations where there is a possibility of a negative outcome (or) loss but no opportunity for gain.

Examples of pure risk include natural disasters, accidents, property damage, liability claims, and health - related risks.

Speculative risks that involve both the possibility of gain and the possibility of loss. Unlike pure risk, speculative risk offers the potential for profit (&) positive outcomes, along with the potential for loss.

Quantifiable and Non Quantifiable Risk.

Quantifiable risks can be analyzed using statistical methods, historical data, probability assessments, and mathematical models. These risks have identifiable and measurable factors such as frequency, severity, of financial impact.

Non quantifiable risks are difficult (&) impossible to measure in precise numerical terms. It typically involve factors such as reputation, brand image, public perception, regulatory changes (&) emerging theats.

2.
a. What do you mean by risk measurement?

Risk measurement refers to the process of quantifying (or) assessing the magnitude, probability, and potential impact of risks. It involves using various techniques, models, and metrics to evaluate the level of risk associated with a particular event, situation, (or) decision. The purpose of risk measurement is to provide a quantitative (or) qualitative understanding of the risks involved so that informed decisions can be made regarding risk management and mitigation strategies.

2.
b. Explain the techniques for estimating frequency and severity of losses?

1. Risk Profiling (Risk Mapping)
2. Statistical Concepts.
3. Loss Distributions used in Risk Management.
4. Integrated Risk Measures.

Risk Profiling.

Risk profiling refers to the process of assessing and categorizing individuals, businesses, or organizations based on their risk tolerance, risk appetite, and risk preferences. It involves gathering information about an entity's risk-related characteristics, such as financial objectives, time horizon, risk capacity, and willingness to take on risks. Risk profiling helps determine the appropriate level of risk exposure and guides decision making in areas such as investments, insurance coverage, and risk management strategies.

Statistical Concepts.

It refers to the fundamental principles, methods, and techniques used in statistical analysis and data interpretation. These concepts provide a framework for collecting, organizing, analyzing, and interpreting numerical data to make informed decisions and draw meaningful conclusions.

Statistical concepts include measures of dispersion, measures of central tendency (mean, median, mode), probability distributions, hypothesis testing, confidence intervals, correlation analysis, regression analysis, and sampling techniques.

Loss Distributions used in Ris Management.

Loss distributions provide a framework for quantifying and analyzing the potential magnitude and frequency of losses associated with different risk events. Loss distributions are typically derived from historical data, simulations, (or) mathematical models and are used to assess the potential impact of risks, calculate risk measures such as Value at Risk (VaR) (or) Expected Loss (EL), and make informed decisions regarding risk management strategies, insurance coverage, and capital allocation.

Integrated Risk Measures.

It refers to approaches that aim to capture and assess risks across various dimensions (or) types in a unified manner. Instead of analyzing risks in isolation, integrated risk measures consider the interdependencies and correlations between different risk factors. These measures provide a comprehensive view of an organization's overall risk profile, allowing for a more complete understanding of the potential impact and interactions of multiple risks.

2.
C. Explain the risk Management Process?

→ Risk Identification
→ Risk Assessment
→ Risk mitigation
→ Risk Monitoring
→ Risk Raview and Adaption
→ Communication and Stakeholder Engagement.

Risk Identification

The first step is to identify and recognize potential risks that could affect an organization. This involves conducting risk assessments, reviewing historical data, engaging stakeholders, and using various techniques such as brainstorming, checklists, and industry analysis to identify risks.

Risk Assessment

Once risks are identified, they need to be assessed in terms of their likelihood of occurrence and potential impact. This step involves analyzing the probability and severity of each risk and considering their interdependencies. Qualitative and/or quantitative techniques, such as risk matrices, scenario analysis, or statistical models, can be used to assess risks.

Risk Mitigation.

After assessing the risks, organizations develop and implement risk mitigation strategies. This

step involves evaluating available options to minimize (or) control risks. Strategies can include risk avoidance, risk reduction, risk transfer (or) risk acceptance.

Risk Monitoring

Risk management is an ongoing process, and risks need to be monitored continuously. Organizations should establish mechanisms to monitor the effectiveness of risk mitigation strategies, track changes in the risk landscape, and identify emerging risks. Regular reviews, audits, performance indicators, and risk reporting are essential to monitor risks effectively.

Risk Review and Adaption.

Organizations should periodically review and reassess their risk management practices. This step involves evaluating the effectiveness of risk management strategies, updating risk registers, and adapting risk management processes based on new information, changing circumstances, (or)

emerging risks. Feedback loops and lessons learned are crucial for continuous improvement in risk management practices.

Communication and Stakeholder Engagement.

Effective risk management includes transparent and timely communication with stakeholders. Stakeh-older engagement fosters awareness, understanding, and collaboration in managing risks. Regular communication channels, reporting mechanisms, and feedback loops help ensure all relevant partie-s are involved and informed about risk management efforts.

3.

a. Illustrate the process of Business Risk Exposure?

* Risk Identification
* Risk Assessment / Analysis.
* Risk Evaluation
* Risk Response
* Risk Review and Adaption.
* Risk Monitoring.

Risk Identification

The business identifies potential risks by conducting risk assessments, examining industry trends, analysing historical data, and considering internal and external factors that could impact the organization's operations, finances, reputation & strategic objectives.

Risk Analysis.

The identified risks are analyzed to understand their potential impact and likelihood. Quantitative and qualitative techniques are used to assess the severity of each risk, considering factors such as financial impact, probability of occurrence, and potential legal & regulatory implications.

Risk Evaluation

The evaluated risks are then evaluated based on their significance and potential consequences for the business. Risks are categorized as high, medium & low based on

their potential impact and likelihood, allowing the organization to prioritize its focus and resources accordingly.

Risk Response.

Once risks are evaluated, the organization develops and implements risk response strategies. This may involve risk avoidance, risk reduction, risk transfer (or) risk acceptance.

Risk monitoring.

The organization continuously monitors the identified risks and their effectiveness of risk response strategies. Regular monitoring allows for early detection of changes in risk exposure, emerging risks, (or) shifts in the business environment, enabling timely adjustments to risk mitigation measures if needed.

Risk Review and Adaptation.

The organization periodically reviews its

risks exposure, reassesses risks, and evaluates the effectiveness of risk management strategies. This process ensures that risk management practices remain relevant and up to date, considering any changes in the business environment & the risk landscape.

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Department of MBA

Fourth Semester Internal Assessment Test –I

Time: 90 Minutes **20MBAMM403-Digital Marketing Management** **Date: 05.07.2023**

Max marks:

Note: ***Answer all the questions.***

Q. No.		Questions	Marks	BT	CO's
1.	a.	What is Digital Marketing?	3M	L1	CO1
	b.	Explain the POEM Frame Work?	7M	L2	CO1
	c.	Briefly Explain the different elements of Digital Marketing Plan?	10M	L2	CO1
2.	a.	What is Paid Media?	3M	L1	CO1
	b.	Explain the skills required in Digital Marketing?	7M	L2	CO1
	c.	Explain different players involved in Programmatic Advertising?	10M	L2	CO2
3	a.	Explain different types of YouTube Ads	10M	L2	CO2

Faculty Signature **HOD Signature** **Principal Signature**

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Department of MBA

Fourth Semester Internal Assessment Test –I

Time: 90 Minutes 20MBAMM403-Digital Marketing Management Date: 05.07.2023

Max marks: 50

ote: *Answer all the questions.*

Q. No.		Questions	Marks	BT	CO's
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3	a.	Explain different types of YouTube Ads	10M	L2	CO2

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Internal Assessment Test - I

Digital Marketing Management (20MBAMM403)

1

a. What is Digital Marketing?

Digital marketing is defined as a marketing approach that primarily relies on the internet to connect with the target audience through various digital media channels and platforms. Digital marketing, also called online marketing, is the promotion of brands to connect with potential customers using the internet and other forms of digital communication.

1.

b. Explain the POEM Frame work?

* Paid Media
* Owned Media
* Earned Media.

Paid Media.

Paid media includes sponsored advertisements in different channels of digital marketing such as search engines, websites, Facebook, LinkedIn and Twitter. They include compaigns run through different platforms such as Google Ads and Compaign Manager of Facebook, LinkedIn and Twitter.

Owned media.

Owned media is like an asset of the company, i.e., the company has the ownership of these media. It includes company's official website, ~~microsifte~~ microsite, social media pages such as Facebook page, LinkedIn page, YouTube channel and Twitter handle, It includes mobile apps (or) blogs.

Earned Media.

Earned media is a organic and unpaid. It includes publicity that is generated through recommendations and word of mouth. It also includes social media engagement suchas likes, shares, comments, replies, retweets, favorites etc. Earned media is generated by users and hence is more credible and has the power to give exponential reach to the marketer. Earned media succeeds only when users like that content and engage with it.

1.
C. Briefly Explain the different elements of Digital Marketing Plan?

→ Objectives

→ Buyer Personas

→ Content

→ channel

→ Timelines

→ Budget

→ measurement.

Objectives

The starting point is to identify the objectives of digital marketing. This can be split into Branding and Performance objectives. Both goals can coexist. Some compaigns and activities may have the objective of increasing brand awareness and brand recall, whereas others may have the objective of increasing sales (or) leads (or) con versions.

Buyer Personas.

This should be based on an analysis of past data and profile of your best customers and not based on hunch (or) assumptions. The information that you need about your best customers can be categorized into three areas.

a) Who :- You should identify the age, gender, location, job title, responsibility, education of your customers and make a pen profile.

b) What :- You must consider the goals of your customers and their pain points that they want to be resolved.

c) Why :- Ultimately you must ask if they will buy your product, your unique selling proposition, your elevator pitch and how compelli-ng it is to convince the customers to buy.

Content

You must analyse the performance of each of the content types such as video, image, infogra-phics, e-books, webinars, games, how to, trends and create more of the variety that performed better.

Channel :-

The channels are platforms you can use

to reach your target audiences online. They might include social media, search engines & websites. Digital marketing channels give you the opportunity to sell products, build brand awareness and position yourself within a given industry.

Timelines

You must prepare a month-wise calendar to document which activities are for which month. You must further break down content strategy, channel strategy, target audience week wise so that there is a starting point to refer to.

Budget

How much budget will you allocate to digital marketing? It depends upon what percentage of the marketing objectives will be met through digital. It also depends upon the industry and the role of marketing communications in marketing mix and the role of digital in

marketing communications mix.

Measurement.

The measurement metrics will be dependent upon the objective. If the objective is branding then measurement will involve recall, attitude and association studies, You may wish to hire a in agency to do it either online (a) offline.

2.

a. What is paid media ?

Paid media includes sponsored advertisements in different channels of digital marketing such as search engines, websites, Facebook, LinkedIn and Twitter. They include campaigns run through different platforms such as Google Ads and Campaign Manager of Face book, LinkedIn and Twitter. It also includes campaigns run through and networks (or) Demand Side Platforms.

2.
b. Explain the skills required in Digital marketing?

- ☆ Think.
- ☆ Feel
- ☆ Act

Think

Digital marketing requires people who can think and conceptualize. They should be able to look at matrics and analyse the performance and optimize. They should have analytical skills and should be able to run compaigns on search, display and social media. They should be able to do A/B testing to know what works and what does not and optimize. They should be able to identify some strategic goals of digital marketing such as testing some product concepts or doing market research for consumer trends.

Feel.

This is one of the most important skills in digital marketing. It is the ability to empathize with your customers by stepping into their shoes and understanding their plan pain points. This skill will enable the digital marketer to identify the content strategy that will resonate with their ~~go~~ target audiences.

Act.

Digital marketing requires a lot of execution. You need people who can understand the brand concept and the content strategy and create creative images and videos. These people should be graphic designers (or) be from institutes of design and know software for editing photos and videos. They should not only know how to use tools and software but should also be artistic and creative.

2 c. Explain different players involved in Programmatic Advertising?

- Publisher
- Supply-Side Platform
- Demand Side Platform
- Data management Platform.
- Ad Server
- Ad Exchange.

Publisher.

Publishers have ad impressions through which they monetize the site and it is a major source of revenue of them as most of the content websites in India are free and hence do not have subscription revenues. Big publishers have their own sales team, which sells and inventory to the advertisers.

Supply - Side Platform.

An SSP (also called Sell - Side Platform) is a techno -logy platform that enables the publishers to manage their ad impression inventory and maximi ze revenue from digital media. An SSP is a yield manager of the publisher. It maximiz -es the yield for publishers by selling impression -s for as much CPM as possible.

Demand Side Platform.

A DSP is a platform that allows the advertiser to buy the inventory from various ad exchanges and data exchange accounts through an interface called RTB. The DSPs represent the interest of the advertiser and attempt to find the most effiient impressions given the constraints imposed by the advertiser.

Data management Platform.

A Data management Platform (DMP) is used by publishers and buyers to store and manage.

audience data from multiple sources. These sources include publisher's websites, apps, videos, etc. There are three sources of data.

* First Party Data
* Second Party Data providers.
* Third Party Data Provider.

Ad Server.

There are ad server technology companies that will host your ad and give independent reporting, analytics and verification of display of ads, It is a good idea to use them as then you are not dependent on analytics given by the publisher and you know for sure how many ad impressions were served.

Ad Exchange.

An exchange brings together buyers and sellers to buy and sell online and inventory in an automated manner. Like a stock exchange, real-time auctioning for ad spaces on publisher websites.

happen in an ad exchange. Further, ad exchanges are of two types: open exchanges and private exchanges.

3.

a. Explain the different types of YouTube ads.

* TrueView Ads
  a) In-Stream Ads
  b) Video Discovery Ads.
* Non-Skippable In-Stream Ads.
* Bumper Ads
* Overlay Ads
* Sponsored Cards
* Masthead Ads.

TrueView Ads.

Trueview Ads are the most common type of YouTube ads. They give viewers the option to skip the ad after five seconds. Advertisers are only charged when viewers watch the ad beyond the initial five seconds.

In stream Ads.

These ads play before, during (or) after another video. Viewers can choose to skip the ad after five seconds. In stream ads can be skippable (or) non - skippable (which must be watched in full).

Video Discovery Ads:-

These ads appear as thumbnail images alongside YouTube search results, on the YouTube homepage, (or) in the suggested videos section. When viewers click on the thumbnail, they are taken to the advertiser's video.

Non Skippable In - Stream Ads.

These ads are similar to in stream ads but cannot be skipped by viewers. They typically have a maximum duration of 15 (or) 20 seconds, depending on the region. Non skippable ads are often used for shorter messages (or) when the advertiser wants to ensure their entire ad is viewed.

Bumper Ads.

Bumper ads are short, non skippable video ads of upto six seconds. They are designed to quickly convey a message and capture viewers attention. Bumper ads are shown before, during (or) after another video and cannot be skipped.

Overlay Ads.

Overlay ads are semi transparent ads that appear on the lower part of a video while it's playing. They are displayed for a few seconds and can be closed by the viewer. Overlay ads are suitable for promoting products, websites, (or) other content.

Sponsored Cards.

Sponsored cards are ads that display content that may be relevant to the video being watched. They appear as small info cards that viewers can click on to see more details. Sponsored cards can promote.

products, video, playlists, (or) websites.

Masthead Ads.

Masthead ads are premium ad placements that appear ~~that~~ at the top of the YouTube homepage on all devices. They provide high visibility and are designed to create maximum brand exposure. Masthead ads can be either static (or) dynamic, with dynamic ads being interactive.

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Department of MBA

IV Semester

Internal Assessment - 1

Indirect Taxation (20MBAFM403)

Time: 1Hr.30Min **Date: 05/07/2023**
Max Marks: 50

Note: ***Answer all the questions.***

Q. No.		Questions	Marks	BT	CO's
1.	a.	What do you mean by GST	3M	L1	CO1
	b.	Explain the structure of GST Council and its functions	7M	L2	CO1
	c.	A dealer effected the following sales during the month July a) Invoice No. 171, dated 02-07-2022 for Rs. 26000 b) Invoice No. 172, dated 15-07-2022 for Rs. 70000 c) Invoice No. 173, dated 18-07-2022 for Rs. 51000 d) Invoice No. 174, dated 22-07-2022 for Rs. 12200 e) Invoice No. 175, dated 26-07-2022 for Rs. 20000 All the above goods were sold in the course of interstate trade. Calculate GST payable if the Tax Rate is 12%	10M	L3	CO2

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Department of MBA
IV Semester
Internal Assessment - 1
Indirect Taxation (20MBAFM403)

Time: 1Hr.30Min
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2.	a.	State the meaning of GSTN	3M	L1	CO1
	b.	Describe the advantages of GST	7M	L2	CO1
	c.	Mr. Ram a registered dealer in Bangalore made following transaction in the month of May, 2023 a. Sold goods to Mr. Sham of Mysore Rs. 25000 b. Sold goods to ABC Ltd., Mumbai Rs. 55000 c. Sold goods to MN ltd., Tumkur Rs. 12500 d. Total inward supply from Mysore Rs. 12000 e. Total inward supply from interstates Rs. 10000 Calculate GST payable if the Tax rate is 12%	10M	L3	CO2
3	a.	Define the term "taxable supply"	10M	L1	CO2

Faculty Signature **HOD Signature** **Principal Signature**

2.	a.	State the meaning of GSTN	3M	L1	CO1
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3	a.	Define the term "taxable supply"	10M	L1	CO2

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Department of MBA

IV Semester Internal Assessment Test -I

Financial Derivatives (20MBAFM402)

Q. No.	Answers	Marks
1. a.	GST is known as the Goods and Services Tax. It is an indirect tax which has replaced many indirect taxes in India such as the excise duty, VAT, services tax, etc. The Goods and Service Tax Act was passed in the Parliament on 29th March 2017 and came into effect on 1st July 2017 GST - Goods and Service Tax is a destination-based consumption tax to be levied on supply of goods and services, taxable event being supply. i.e. a value added tax levied on manufacture, sale and consumption of goods and services. **The term 'GST' is defined in Article 366 (12A) to mean "Any tax on supply of goods or services or both except taxes on supply of the alcoholic liquor for human consumption"**	3
b.	As per Article 279A of the Constitution of India, the President of India is empowered to constitute Goods and Services Tax Council. The President of India constituted the GST Council on 15th September, 2016. The GST Council shall consist of Union Finance Minster as a Chairperson, Union Minister of State in charge of Finance as a member, the State Finance Minister or State Revenue Minister or any other Minister nominated by each State as a member of the Council. The GST Council shall select one of them as Vice Chairperson of Council. **Functions of the GST Council:** GST Council is to make recommendations to the Central and the State Governments on ✓ Tax rates ✓ Exemptions ✓ Threshold limits ✓ Dispute resolution ✓ GST legislations including rules and notifications etc	7
c.	Calculation of GST payable Particulars | Amount | Amount a) Invoice No. 171, dated 02-07-2022 — 26000 b) Invoice No. 172, dated 15-07-2022 — 70000 c) Invoice No. 173, dated 18-07-2022 — 51000 d) Invoice No. 174, dated 22-07-2022 — 12200 e) Invoice No. 175, dated 26-07-2022 — 20000 Total — 179200 Add: GST @ 12% — 21504 IGST @ 12% 200704	10
2. a.	GSTN is a Technology backbone for GST in India. GST being a destination based tax, inter- state trade of goods and services (IGST) would need a robust settlement mechanism amongst the States and the Centre. This is possible only when there is a strong IT Infrastructure and Service back bone which enables capture, processing and exchange of information amongst the stakeholders (including tax payers, States and Central Governments, Accounting Offices, Banks and RBI). As a result Goods and Services Tax Network (GSTN) has been set up.	3

b. Benefits of GST: 7

1. To Traders:
   - Reduction in multiplicity of taxes
   - Mitigation of cascading/double taxation.
   - Development of common national market.
   - Simpler tax regime (Fewer rates and exemptions)
2. To Government:
   - Simpler tax system.
   - Improved Compliance and Revenue collections.
   - To reduce errors and increase efficiency.
   - Uniform SGST and IGST rates to reduce incentive of tax evasion.
   - Reduction incompliance Costs as no requirement of multiple record keeping.
3. To the Citizens:
   - Simpler tax System.
   - Reduction in prices of goods and services due to elimination of cascading effect
   - Uniform prices throughout the country.
   - Transparency in Taxation system
   - Increase in Employment opportunities
4. Other benefits of implementation of GST in India:
   - GST will end cascading of taxes
   - Growth of revenue
   - Reduce unnecessary wastage
   - Eliminates the multiplicity of taxes
   - Reduces average tax burden
   - Uniformity of tax rate in all states

Limitations:
- Additional software expenses
- Online tax regime
- Higher taxes in some cases
- Registration of all states
- Composition Scheme will not be availed for many customers.

c. 10

Calculation of Outward GST

Particulars	Inter State	Intrastate
a. Sold goods to Mr. Sham of Mysore Rs. 25000		25000
b. Sold goods to ABC Ltd., Mumbai Rs. 55000	55000	
c. Sold goods to MN ltd., Tumkur Rs. 12500		12500
Total	55000	37500
Add: GST @ 12%		
IGST @ 12%	6600	
Add: GST @ 12%		
CGST @ 6%		2250
SGST @ 6%		2250
	61600	42000

Calculation of Inward GST

Particulars	Inter State	Intrastate
a. Total inward supply from Mysore		12000
b. Total inward supply from interstates	10000	
Total	10000	12000
Add: GST @ 12%		
IGST @ 12%	1200	
Add: GST @ 12%		
CGST @ 6%		720
SGST @ 6%		720

	11200 13440	
	Calculation of GST payable	10

Particulars	IGST	CGST	SGST
Outward GST	6600	2250	2250
Inward GST	1200	720	720
GST payable	5400	1530	1530

c. As per Section 7(1) Supply includes

Supply includes All forms of supply of goods and/or services such as 10

- sale,
- transfer,
- barter,
- exchange,
- license,
- rental,
- lease or
- disposal

Made or agreed to be made for a consideration by a person in course of or furtherance of business.

Import of services [Sec. 7(1)(b)]

Import of services for a consideration whether or not in the course or furtherance of business;

Supply without consideration [Sec. 7(1)(c)]

1. Permanent transfer or disposal of business assets where input tax credit has been availed on such assets.
2. Supply of goods or services or both between related persons or between distinct persons as specified in section 25, when made in the course or furtherance of business: Provided that gifts not exceeding Rs. 50,000/- in value in a financial year by an employer to an employee shall not be treated as supply of goods or services or both.
3. Supply of goods—
   (a) by a principal to his agent where the agent undertakes to supply such goods on behalf of the principal; or
   (b) by an agent to his principal where the agent undertakes to receive such goods on behalf of the principal.
4. Import of services by a taxable person from a related person or from any of his other establishments outside India, in the course or furtherance of business.

Activities specified in Schedule III (i.e. Negative list):

1. Servicesbyemployeetoemployerinthecourseoforinrelationtohisemployment.
2. Services by court or Tribunal
3. Services by Member of Parliament and others
4. Services by funeral, burial etc.
5. Sale of land/Building
6. Actionable claim other than lottery, betting and gambling.

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Department of MBA
IV Semester - Internal Assessment – II
Indirect Taxation (20MBAFM403)

Time: 1Hr.30Min **Date: 02/08/2023**
Max Marks: 50

Note: ***Answer all the questions.***

Q. No.		Questions	Marks	BT	CO's
1.	a.	What is GST dual model?	3M	L1	CO1
	b.	Explain the difference between composite supply and mixed supply with example.	7M	L2	CO1
	c.	Calculate net GST liability of Mr. X for the month of Aug 2022 a) Purchase of raw materials within State Rs. 200000 excluding GST at 5% b) Purchase of raw material from other state Rs. 500000 excluding GST at 12% c) Sale of output within state Rs. 800000 at 12% GST d) Sale of output to other state Rs. 200000 at 18% GST	10M	L3	CO2

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2	a.	Mention the tax rate applicable under composition scheme.	3M	L1	CO2
	b.	What do you mean by the term 'Aggregate Turnover'? How is it calculated?	7M	L2	CO2
	c.	What is composition scheme? Discuss the conditions and threshold limits applicable for the scheme.	10M	L2	CO1
	a.	Hotel King Pvt. Ltd. is a registered person under GST. P.Y. turnover was 100 lakhs. Inputs cost 7,80,000 (exclusive of GST 18%). Profit margin is 40% on cost. Find the invoice price under both composition and normal cases. There is no opening balance and closing balance for the tax period.	10M	L3	CO2

Faculty Signature **HOD Signature** **Principal Signature**

2	a.	Mention the tax rate applicable under composition scheme.	3M	L1	CO2
	b.	What do you mean by the term 'Aggregate Turnover'? How is it calculated?	7M	L2	CO2
	c.	What is composition scheme? Discuss the conditions and threshold limits applicable for the scheme.	10M	L2	CO1
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Department of MBA

IV Semester Internal Assessment Test -II

Indirect Taxation (20MBAFM403)

Q. No.	Answers	Marks
1. (a)	Dual GST model or dual GST structure is a simple tax with two different taxation components. Central Goods and Service Tax (CGST) and the State Goods and Service Tax (SGST) are the tax components that can be levied on a single transaction in India within a state on account of its federal nature. The dual GST model refers to a concept where both the Centre and states simultaneously levy taxes on the supply of goods and services while the administration is run separately. It is dissimilar to the Single National GST model, where the taxes are levied only by the Centre involving sharing such revenue with the provinces/states.	3
(b)	See table below	7
(c)	See tables below	10

Sl. No.	Composition Supply	Mixed Supply
1.	It means a supply comprising of two or more goods/ services, which are naturally bundled & supplied in with each other in the ordinary course of business.	It means a combination of two or more goods or services made together for a single price of which each item can be supplied separately.
2.	Principal supply can be identifies	There is no principal supply
3.	Naturally bundled	Not naturally bundled
4.	Tax rate of principal is charged	The item or service with the highest GST rate is charged
5.	Example: TV and remote are naturally bundled	Example: Items in hamper can be sold separately.

Calculation of Outward GST

Particulars	Inter State	Intrastate
a. Sale of output within state		800000
b. Sale of output to other state	200000	
	200000	800000
Add: GST @ 18%	36000	
IGST @ 18%		
Add: GST @ 12%		
CGST @ 6%		48000
SGST @ 6%		48000
	236000	896000

Calculation of Inward GST

Particulars	Inter State	Intrastate
a. Purchase of raw materials within state		200000
b. Purchase of raw material from other state	500000	
Total	500000	200000
Add: GST @ 12%		
IGST @ 12%	60000	
Add: GST @ 5%		

CGST @ 2.5% SGST @ 2.5%		5000 5000
	560000	210000

Calculation of GST payable

Particulars	IGST	CGST	SGST
Outward GST	36000	48000	48000
Inward GST	36000	5000	5000
	Nil	43000	43000
		24000	
GST payable	Nil	19000	43000

2. (a)

Sl. No.	Category	Rate
1.	Manufactures other than manufacturers of notified goods, i.e., ice cream, pan masala, tobacco and aerated water	1%
2.	Restaurant services and outdoor catering	5%
3.	Any other supplier eligible for composition levy under section 10 and the provisions of this chapter	1%

3

(b) Aggregate turnover as per Section 2(6) of CGST Act, 2017: The term "aggregate turnover" means the aggregate value of all taxable supplies (excluding the value of inward supplies on which tax is payable by a person on reverse charge basis), exempt supplies, exports of goods or services or both and inter-state supplies of persons having the same Permanent Account Number, to be computed on all India basis but excludes central tax, state tax, union territory tax, integrated tax and cess. 7

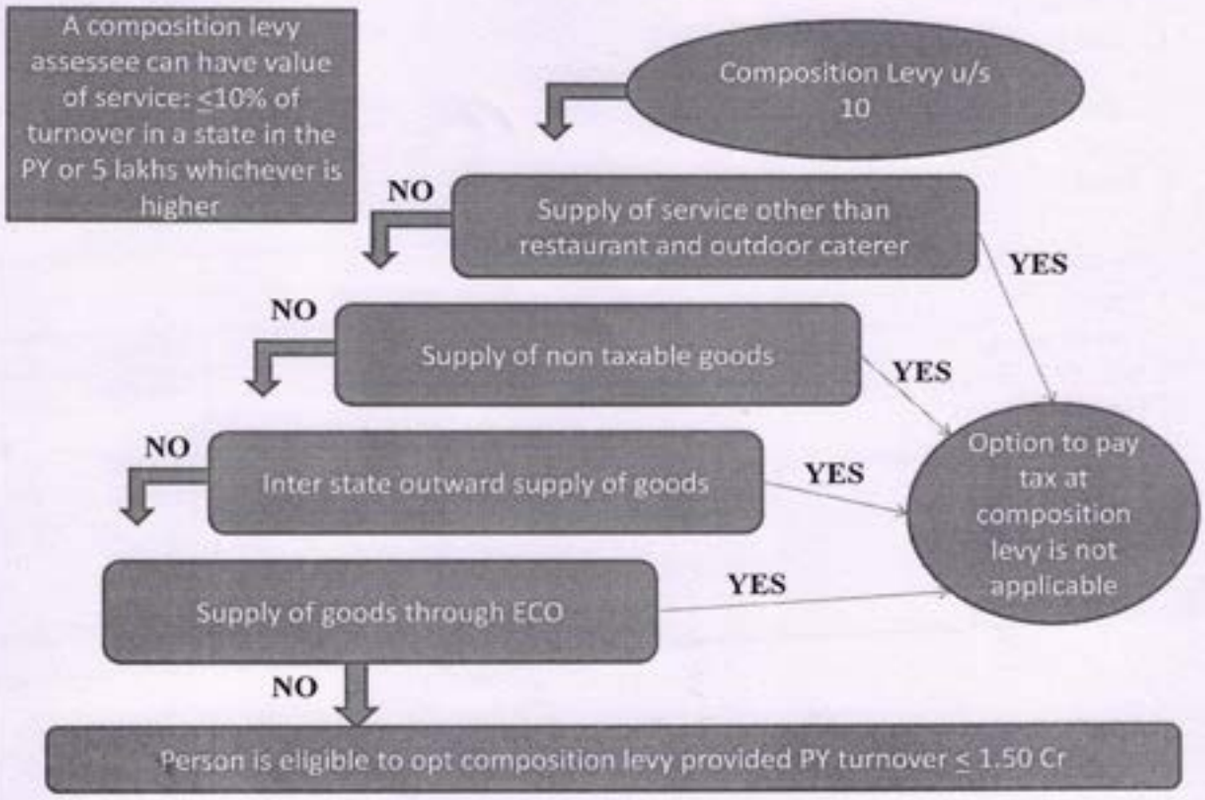
Aggregate turnover include	Aggregate turnover excludes
The value of exported goods/ services	Inward supplies on which the recipient is required to pay tax under Reverse Charge Mechanism (RCM).
Exempted goods/services or both which attracts nil rate of tax or wholly exempt from tax and includes nontaxable supply.	• Central tax(CGST), • State tax(SGST), • Union territory tax and • Integrated tax(IGST)
Inter-state supplies between distinct persons having same PAN	Composition Cess
Supply on own account and on behalf of principal.	Interest earned on deposits, loan and advances

(c) The Government of India provides for simplified and easy of doing business scheme for payment of taxes and filling of returns to certain categories of taxable person. As a result such taxable person is not required to maintain elaborate records and filing detailed returns. Section 10 of the CGST Act, provides for composition levy to such person 10

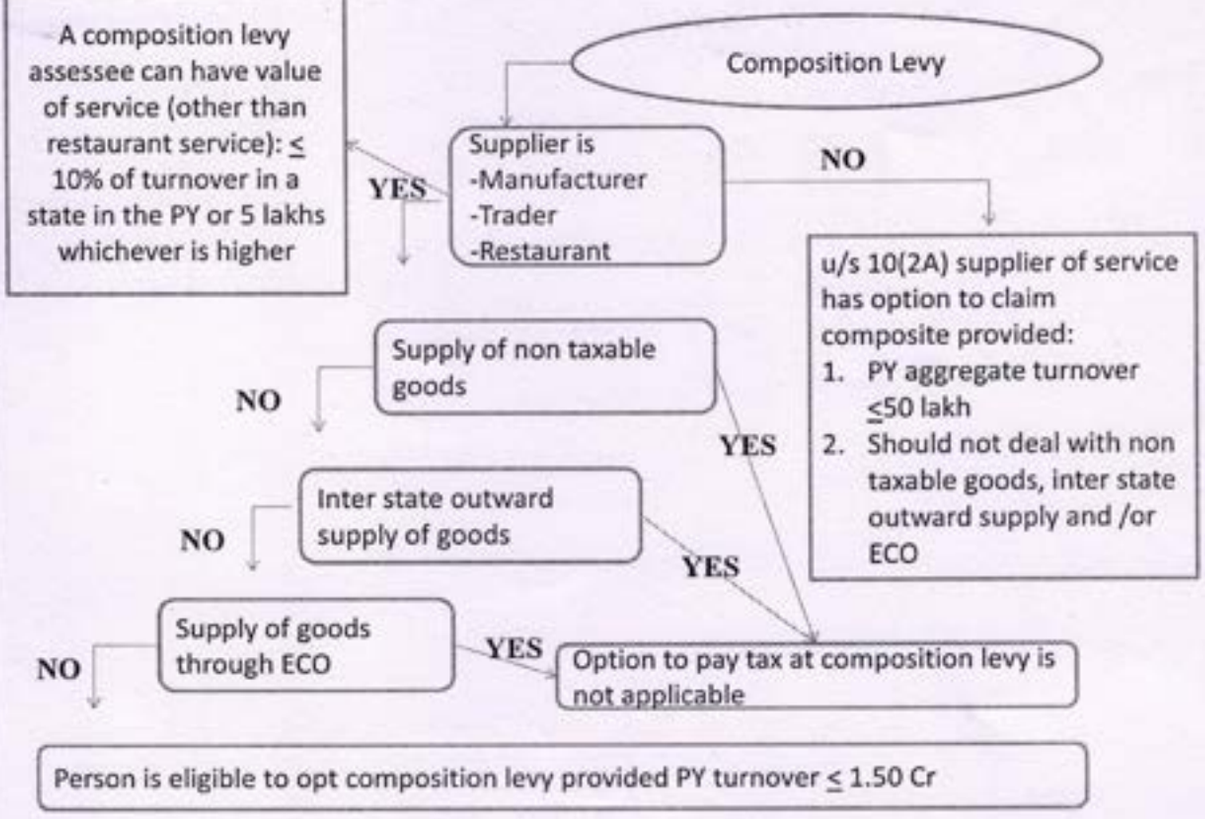
Note:

1. Composition scheme assessee is not eligible to avail Input Tax Credit.
2. Casual Taxable Person and Non-Resident taxable person are not eligible for composition scheme

COMPOSITION SCHEME



COMPOSITION SCHEME



Particulars	Amount
Cost of inputs	780000
Add: GST 18% on inputs	140400
Total cost	920400
Add: Profit margin 40%	368160
	1288650
CGST - 2.5%	32214
SGST – 2.5%	32214
Total	1352988

Normal Provision

Particulars	Amount
Cost of inputs	780000
Add: GST 18% on inputs	-
Total cost	780000
Add: Profit margin 40%	312000
	1092000
CGST - 9%	98280
SGST – 9%	98280
Total	1288560

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Department of MBA

Fourth Semester *Internal Assessment Test –III*

Time: 3 Hrs **20MBAFM403-Indirect Taxation** **Date: 08.09.2023**

Note-Answer any four full questions from Q.No 1 to 7 **Max marks: 100**

Q. No 8 is compulsory

Q. No.		Questions	Marks	BT	CO's
1.	a	State the meaning of GSTN	3M	L1	1
	b	Explain the structure of GST council and its functions.	7M	L2	2
	c	Describe the advantages and disadvantages of GST	10M	L2	2
2.	a	Mention the tax rate applicable under composition scheme	3M	L1	1
	b	Explain the activities which are treated as supply even if made without consideration.	7M	L2	2
	c	A Ltd imported a machine at an invoice price of GBP (Great British Pound) 10000. This sum include 2000 attributable to post importation activities to be carried out by the seller. A Ltd., had supplied raw materials worth 500 to the seller for the manufacture of the said machine. The importer imported these goods by vessel and actual cost of transport is 1500 and lighterage and barge charges in India are Rs. 50000. Ship demurrage charges of Rs. 10000. The importer also incurred in India Rs. 25000 for transportation of goods from exchange rate 1 = Rs. 103.06 Note: post – shipment expenditure is not pre – condition for such import. Calculate the assessable value of the machine.	10M	L2	2
3.	a	What do you mean by Place of Supply	3M	L1	1
	b	What do you mean by Aggregate Turnover? How is it calculated?	7M	L2	2
	c	What is the procedure of Registration under CGST Act and Rules 2017? Explain	10M	L2	2
4.	a	What are the benefits of Filing returns under GST to the manufacturers?	3M	L1	2
	b	How Casual Taxable Person is different from Non – Resident taxable person.	7M	L2	2
	c	ABC Ltd. , is in the business of monitors (20 inches), digital cameras, recorders and projectors. The 28% of GST rate is applicable on these items. The company also manufactures Agricultural implements like spades, forks and axes etc., which are exempt from GST. The following is the turnover of the Company during April to June 2018	10M	L2	2

	Particulars of Supplies	Value of supply	GST rate
A	Computer Monitors	2100000	18
B	Digital Camera	1100000	28
C	Projector	700000	28
D	Agricultural Implements	900000	Nil
	Total	4800000	

<table>
<tr><td></td><td></td><td>The Co. fulfills all the conditions required for adoption of composition levy scheme. Calculate the total tax liability under composition scheme if the Company ABC Ltd., is Case 1 – Manufacturer of these items and Case 2 – Trader.</td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">5.</td><td>a</td><td>Define the meaning of FOB and CIF value</td><td>3M</td><td>L1</td><td>3</td></tr>
<tr><td>b</td><td>Explain mixed and composite supply with example.</td><td>7M</td><td>L2</td><td>3</td></tr>
<tr><td>c</td><td>Explain in brief the applicable rules to the valuation of exported goods.</td><td>10M</td><td>L2</td><td>4</td></tr>
<tr><td rowspan="3">6.</td><td>a</td><td>What is Baggage?</td><td>3M</td><td>L1</td><td>3</td></tr>
<tr><td>b</td><td>What is customs duty? Explain the types of duties charges under Customs Act of 1962.</td><td>7M</td><td>L2</td><td>4</td></tr>
<tr><td>c</td><td>Describe the provisional assessment of customs duty</td><td>10M</td><td>L2</td><td>3</td></tr>
<tr><td rowspan="3">7.</td><td>a</td><td>What do you mean by GST?</td><td>3M</td><td>L1</td><td>2</td></tr>
<tr><td>b</td><td>A dealer effected the following sales during the second Quarter (July – September) 2020-21.
a. Invoice No. 171, dated 02-07-2020 for Rs. 26000
b. Invoice No. 172, dated 19-07-2020 for Rs. 70000
c. Invoice No. 173, dated 02-08-2020 for Rs.51000
d. Invoice No. 174, dated 04-09-2020 for Rs. 12200
e. Invoice No. 175, dated 25-09-2020 for Rs. 20000
f. Good worth Rs. 6100 against invoice No.174 were returned on 28-09-2020
g. Goods worth Rs. 5200 sold on 25-02-2020 were returned on 30-08-2020
All the above goods were sold in the course of interstate trade. Calculate the taxable turnover and IGST payable if the tax rate is 12%.</td><td>7M</td><td>L2</td><td>2</td></tr>
<tr><td>c</td><td>Determine the time of supply in the following cases assuming the GST is payable under reverse charge:
<table>
<tr><th></th><th>Date of payment by the recipient for supply of services</th><th>Date of invoice by the supplier of service</th></tr>
<tr><td>1</td><td>August 10</td><td>June 29</td></tr>
<tr><td>2</td><td>August 10</td><td>June 1</td></tr>
<tr><td>3</td><td>Part payment made on June 30 and balance amount paid on Sept 1</td><td>June 29</td></tr>
<tr><td>4</td><td>Payment is entered in the books of accounts on June 28 and debited in recipient's bank account on June 26</td><td>June 1</td></tr>
<tr><td>5</td><td>Payment is entered in the books of account on June 30 and debited in recipient's Bank A/c on June 26</td><td>June 29</td></tr>
</table></td><td>10M</td><td>L2</td><td>4</td></tr>
<tr><td>8.</td><td></td><td>Case Study:</td><td></td><td></td><td></td></tr>
</table>

		Red pepper Ltd., Delhi a registered supplier, is manufacturing taxable goods. It provides the following details of taxable inter-state supply made by it during the month of March. **Sl. No / Particulars / Amount** 1 — List price of taxable goods supplied inter-state (exclusive of taxes) — 1500000 2. — Subsidy received from the Central Govt. for supply of taxable goods to Government School (Exclusively related to supply of goods included at Sl. No. 1) — 210000 3. — Subsidy received from an NGO for supply of taxable goods to an old age home (exclusively related to supply of goods included at Sl. No.1) — 50000 4. — Tax levied by Municipal authority — 20000 5. — Packing charges — 15000 6. — Late fee paid by the recipient of supply for delayed payment of consideration (Recipient has agreed to pay Rs. 6000 in lumpsum and no additional amount is payable by him) — 6000 The list price of the goods is net of the two subsidies received. However the other charges/ taxes/ fee are charged to the customers over and above the list price. Calculate the Total value of taxable supplies made by Red Pepper Ltd., during the month of March. Rate of IGST is 18%	20M	L4	3

Faculty Signature **HOD Signature** **Principal Signature**

Department of MBA

IV Semester Internal Assessment Test -III

Indirect Taxation (20MBAFM403)

Scheme of valuation

Q.No.		Answers	Marks
1	a	GSTN is a Technology backbone for GST in India. GST being a destination based tax, inter- state trade of goods and services (IGST) would need a robust settlement mechanism amongst the States and the Centre. This is possible only when there is a strong IT Infrastructure and Service back bone which enables capture, processing and exchange of information amongst the stakeholders (including tax payers, States and Central Governments, Accounting Offices, Banks and RBI). As a result Goods and Services Tax Network (GSTN) has been set up.	
	b	As per Article 279A of the Constitution of India, the President of India is empowered to constitute Goods and Services Tax Council. The President of India constituted the GST Council on 15th September, 2016. The GST Council shall consist of Union Finance Minster as a Chairperson, Union Minister of State in charge of Finance as a member, the State Finance Minister or State Revenue Minister or any other Minister nominated by each State as a member of the Council. The GST Council shall select one of them as Vice Chairperson of Council. **Functions of the GST Council:** GST Council is to make recommendations to the Central and the State Governments on ✓ Tax rates ✓ Exemptions ✓ Threshold limits ✓ Dispute resolution ✓ GST legislations including rules and notifications etc	
	c	Advantages of GST: 1. To Traders: - Reduction in multiplicity of taxes - Mitigation of cascading/double taxation. - Development of common national market. - Simpler tax regime (Fewer rates and exemptions) 2. To Government: - Simpler tax system. - Improved Compliance and Revenue collections. - To reduce errors and increase efficiency. - Uniform SGST and IGST rates to reduce incentive of tax evasion. - Reduction incompliance Costs as no requirement of multiple record keeping. 3. To the Citizens: - Simpler tax System. - Reduction in prices of goods and services due to elimination of cascading effect - Uniform prices throughout the country. - Transparency in Taxation system - Increase in Employment opportunities 4. Other benefits of implementation of GST in India: - GST will end cascading of taxes - Growth of revenue - Reduce unnecessary wastage - Eliminates the multiplicity of taxes - Reduces average tax burden - Uniformity of tax rate in all states	

Limitations:

- Additional software expenses
- Online tax regime
- Higher taxes in some cases
- Registration of all states
- Composition Scheme will not be availed for many customers.

2 a

Sl. No.	Category of registered persons	Rate of tax (As per Rule 7 of Chapter II of CGST Rules, 2017)	Rate of tax (As per SGST Rules)	Effective rate of tax
1	Manufacturers, other than manufacturers of such goods as may be notified by the Government.	0.5%	0.50%	1%
2	Restaurant services and outdoor catering services	2.5%	2.5%	5%
3	Any other supplier eligible for composition levy under Section 10 and the provisions of this chapter	0.5%	0.50%	1%

b

1. Permanent transfer or disposal of business assets where input tax credit has been availed on such assets.
2. Supply of goods or services or both between related persons or between distinct persons as specified in section 25, when made in the course or furtherance of business: Provided that gifts not exceeding Rs. 50,000/- in value in a financial year by an employer to an employee shall not be treated as supply of goods or services or both.
3. Supply of goods –
   (a) by a principal to his agent where the agent undertakes to supply such goods behalf of the principal; or
   (b) by an agent to his principal where the agent undertakes to receive such goods on behalf of the principal.
4. Import of services by a taxable person from a related person or from any of his other establishments outside India, in the course or furtherance of business.

c

Particulars	Amount
Cost of machine [(10000-2000)*103.6]	828800
Less: Raw material supplied	51530
FOB	777270
Add: fright (1500*103.6)	155400
Lighterage and barge changers	50000
Ship demurrage charges	25000
Insurance @1.125%	8744
Assessable vale	1016414

3 a

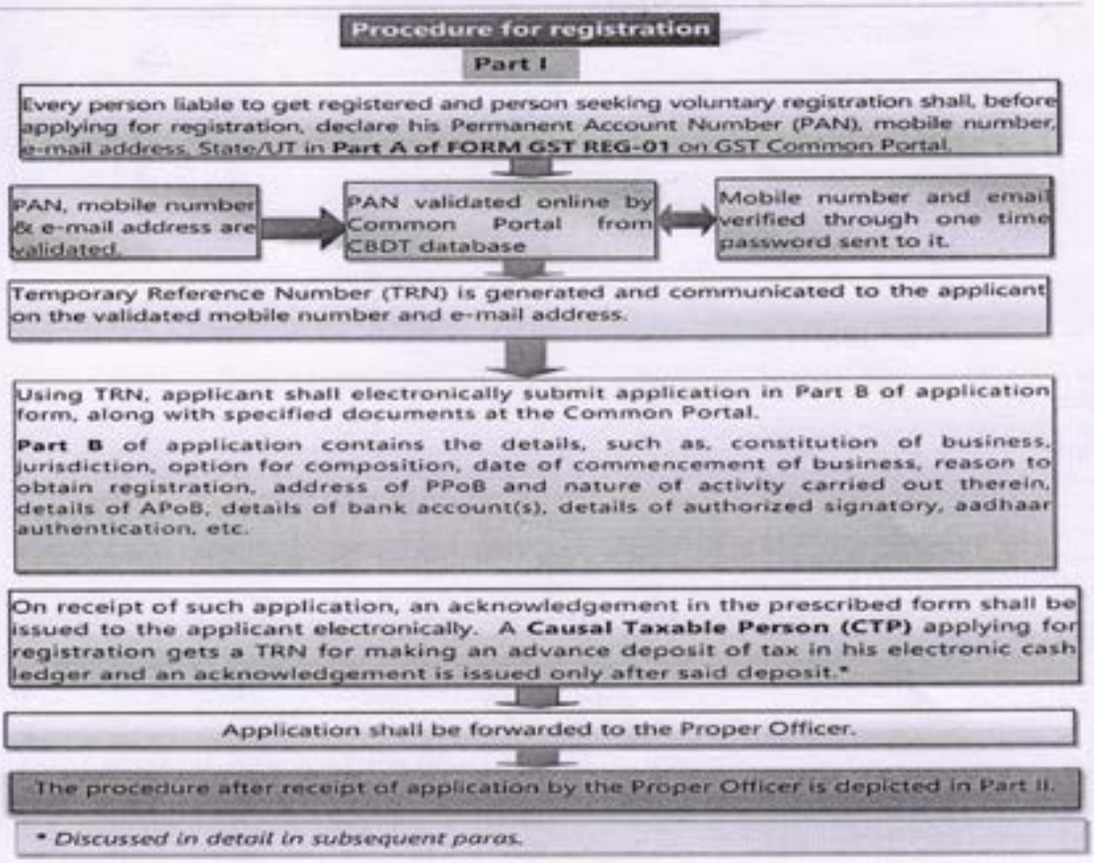
The "place of supply" is a crucial concept that determines the location where a supply of goods or services is deemed to take place. The place of supply is essential for determining the applicable GST rate and jurisdiction (i.e., which state's GST will be applicable). The

GST law in India has specific provisions for determining the place of supply for goods and services, and these rules vary depending on whether the supply is an intra-state supply (within the same state) or an inter-state supply (across different states or Union Territories).

b Aggregate turnover as per Section 2(6) of CGST Act, 2017: The term "aggregate turnover" means the aggregate value of all taxable supplies (excluding the value of inward supplies on which tax is payable by a person on reverse charge basis), exempt supplies, exports of goods or services or both and inter-state supplies of persons having the same Permanent Account Number, to be computed on all India basis but excludes central tax, state tax, union territory tax, integrated tax and cess.

Aggregate turnover include	Aggregate turnover excludes
The value of exported goods/ services	Inward supplies on which the recipient is required to pay tax under Reverse Charge Mechanism (RCM).
Exempted goods/services or both which attracts nil rate of tax or wholly exempt from tax and includes nontaxable supply.	• Central tax(CGST), • State tax(SGST), • Union territory tax and • Integrated tax(IGST)
Inter-state supplies between distinct persons having same PAN	Composition Cess
Supply on own account and on behalf of principal.	Interest earned on deposits, loan and advances

c



Part II

Proper Officer examines the application and accompanying documents.

If same are found in order?

No → Proper Officer issues notice electronically, within 7 working days✧ from application submission date thereby seeking clarification**, information or documents from the applicant.

✧ *notice may be issued not later than 30 days from application submission date in case where a person fails to undergo Aadhaar authentication/does not opt for Aadhaar authentication or PO deems it fit to carry out site verification*

If applicant has furnished the clarification**, information or documents within 7 working days from receipt of notice?

No

Yes

If proper officer is satisfied with it?

No

Yes

Yes → within *7 working days*✧ from the date of submission of application without site verification if applicant successfully validates his aadhaar authentication

✧ *in case where applicant fails to undergo/ does not opt for Aadhaar authentication or PO deems it fit to carry out site verification, registration is granted within 30 days of application after verification of site & prescribed documents*

Proper officer will grant registration certificate in **Form GST REG-06** within 7 working days from the date of receipt of information/ clarification/ documents

Proper officer may reject the application for reasons to be recorded in writing.

**Clarification includes modification/correction of particulars declared in the application for registration, other than PAN, State, Mobile No. & E-mail address.

Deemed Approval of Application

in case where registration is to be granted after physical verification of the premises of a person (i) who fails to undergo the aadhaar authentication/does not opt for aadhaar authentication or (ii) since proper officer deems it fit to carry out physical verification of places of business	*within a period of 30 days from the date of submission of the application*
in case of a person other than those covered above	*within a period of 7 working days from the date of submission of the application*
in cases where proper officer issues notice seeking clarification, information or documents from the applicant	*within 7 working days from the date of receipt of clarification, information or documents furnished by the applicant*

4 a

- Legal compliance
- Input tax credit
- Transparency and accountability
- Refund
- Avoidance of penalties
- Government initiatives

b

Casual taxable person

Casual Taxable Person means a person who occasionally undertakes transactions involving supply of goods or services or both in further course of business in a State or Union Territory where no fixed place of business has.

There may be a situation where the taxpayer is having GST in 1 state but he might want to supply goods or services or both from another state where he don't have any fixed place of business. In this case, he can register as casual taxable person

Example: Balaram Enterprises is having fixed place of business in Bangalore, and they have registered under GST in Karnataka. Balarama enterprise wants to participate in Numaish exhibition in Hyderabad for 45 days and they don't have any fixed place of business in Hyderabad, Telangana. In this case, Balaram enterprises can register as casual taxable person

Non-resident taxable person

Non-Resident taxable person means a person who occasionally undertakes involving supply of goods or services or both but who has no fixed place of business or residence in India

Example: Mr James who is a citizen of United Kingdom wants to sell some Specialized items in India but he doesn't have any residence or business place in India. In this cases, Mr James needs to register as Non Resident taxable Person

Non-Resident taxable person cannot opt to pay tax under composition scheme

c

Case – 1: Manufacturer

Particulars	Amount
Computer monitors	2100000
Digital camera	1100000
Projectors	700000
Agricultural implements	900000
Total	4800000
Tax @1%	48000

Case – 2: trader

Particulars	Amount
Computer monitors	2100000
Digital camera	1100000
Projectors	700000
Agricultural implements	nil
Total	3900000
Tax @1%	39000

5 a

Free on Board (FOB) is a shipment term that defines the point in the supply chain when a buyer or seller assumes responsibility for the goods being transported. FOB terms like FOB Origin and FOB Destination help define ownership, risk, and transportation costs for both buyers and sellers

CIF is an international shipping agreement that is used in the transportation of goods between a buyer and a seller and differs in who assumes liability for the goods during transit.

b

Sl. No.	Composition Supply	Mixed Supply
1.	It means a supply comprising of two or more goods/ services, which are naturally bundled & supplied in with each other in the ordinary course of business.	It means a combination of two or more goods or services made together for a single price of which each item can be supplied separately.
2.	Principal supply can be identifies	There is no principal supply
3.	Naturally bundled	Not naturally bundled
4.	Tax rate of principal is charged	The item or service with the highest GST rate is charged
5.	Example: TV and remote are naturally bundled	Example: Items in hamper can be sold separately.

c

- Determination of the method of valuation
- Determination of export value by comparison
- Computed value method If the value cannot be determined under rule 4, it shall be based on a computed value
- Residual method Subject to the provisions of rule 3
- Declaration by the exporter
- Rejection of declared value

6 a Baggage is another word for the bags you put your stuff in when you travel. It's also known as "luggage" or "suitcases." If someone says you have baggage but you're not holding anything, they're talking about emotional baggage.

b Customs is a form of indirect tax. Standard English dictionary defines the term customs as duties imposed on imported goods or less commonly exported goods. This term is usually applied to those taxes which are payable upon goods or merchandise imported or exported.
The various types of Customs Duties are:

(1) Basic Customs Duty (B.C.D) (Sec. 12 Customs Act, Rate as per Tariff)
(2) Protective duties Sec. 6 (1)
(3) Safeguard duty Sec. 8B (1)
(4) Countervailing duty on subsidized articles Sec. 9
(5) Anti-dumping duty Sec. 9A
(6) IGST Sec. 3(7)
(7) GST Compensation Cess 3(9)

c The Finance Act, 2011 introduced self-assessment under which importers and exporters are mandatorily required to self-assess the duty in terms of Section 17 of the Customs Act, 1962. This self-assessment is subject to verification by the proper officer of the Customs and may lead to reassessment by the proper officer of Customs if it is found to be incorrect. However, in terms of Section 17(1) of the Customs Act, 1962 in case an importer or exporter is not able to make selfassessment, he may, request in writing to the proper officer for assessment. Also, in terms of Section 18 of the Customs Act, 1962, in case, the proper officer is not able to verify the selfassessment or make re- assessment of duty or he deems it necessary to subject any imported or export goods to any chemical or other tests or where necessary documents have not been produced or information has not

been furnished and it is necessary to make further enquiry, he may direct that the duty leviable on such goods be assessed provisionally.

Conditions for provisional assessment: For making provisional assessment the proper officer is required to estimate the duty to be levied i.e. the provisional duty. Wherever, duty is to be assessed provisionally, in terms of section 18, the importer or exporter shall:

(a) for the purposes of undertaking to pay on demand the deficiency, if any, between the duty as may be finally assessed or re-assessed and the duty provisionally assessed, execute a bond, in the prescribed form and;

(b)furnish such security for the payment of duty deficiency as prescribed.

7 a GST stands for Goods and Services Tax. It is a comprehensive indirect tax that was introduced in India on July 1, 2017. GST replaced a complex system of multiple indirect taxes such as VAT (Value Added Tax), excise duty, service tax, and others. The aim of GST is to create a unified and simplified tax structure for goods and services across the country.

b Calculation of IGST payable

Particulars	Amount
Invoice No. 171	26000
Invoice No. 172	70000
Invoice No. 173	51000
Invoice No. 174	12200
Invoice No. 175	20000
	179200
Less: return	
- Invoice 174	6100
- Sold on 25.02.2020	5200
Taxable supply	167900
IGST @ 12%	20148
	188048

c In the case of reverse charge mechanism under GST, the time of supply is determined by the earliest of the following dates: the date of receipt of goods, date of payment or the date immediately after 30 days from the date of issue of an invoice by the supplier

- July 29
- July 01
- June 30
- June 26

8 a

Particulars	Amount
Price of taxable supply	1500000
Subsidy from central Govt.	-
Subsidy from NGO	50000
Tax by municipal	20000
Packing charges	15000
Late fee	6000
	1591000
IGST @18%	286380
	1877380

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ESTD:2002

Department of MBA

IV Semester - IA-1

Financial Derivatives (20MBAFM402)

Time: 1Hr.30Min **Date: 04/07/2023**
Max Marks: 50

Note: ***Answer all the questions.***

Q. No.		Questions	Marks	BT	CO's
1.	a.	What do you mean by Financial Derivatives?	3M	L1	CO1
	b.	State the factors causing growth of derivates.	7M	L1	CO1
	c.	Explain different functions of Derivative Market	10M	L2	CO1
2.	a.	Who are hedgers?	3M	L1	CO1
	b.	Discuss the types of Financial Derivatives	7M	L2	CO1
	c.	Explain the benefits and limitations of derivatives	10M	L2	CO1
3	a.	Illustrate the players of derivative markets.	10M	L2	CO1

Divya.S

Faculty Signature **HOD Signature** **Principal Signature**

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Department of MBA

IV Semester Internal Assessment Test -I

Financial Derivatives (20MBAFM402)

Q. No.	Answers	Marks
1. a.	Financial derivatives are financial instruments that are linked to a specific financial instrument or indicator or commodity, and through which specific financial risks can be traded in financial markets in their own right. Financial derivatives were also known as off-balance sheet instruments because no assets or liability underlying the contract was put on the balance sheet as such.	3
b.	1. **Price Volatility**: Financial derivatives help in transferring of risk from one party to another party and, therefore, are expected to increase participation in the financial market, which in other words, leads to better capital allocation. These instruments make financial market a more viable option for a variety of investors who, otherwise, might not have participated in the market. For example, a risk-averse investor, in presence of derivatives products in a market, has an option to transfer risk once volatility in the market hits a level beyond his tolerance. 2. **Increase Globalization**: Another important factor that has contributed towards growth of derivatives is cross-border integration of economies. Since economic integration of countries. Amidst variety of benefit, transfers various risks of from one economy to another, it results in increased risk (volatility) in the financial markets of integrated economies. Since derivatives provide a shield against such risks, growth in this segment of financial markets (derivatives) becomes imperative. 3. **Structured Product:** Derivatives help portfolio managers to provide their clients with a variety of structured financial products, which are best suited to their risk appetite. For example, an investor demands for an investment opportunity with very high risk and return profile. Such a strategy can be developed using the spot market itself; but the manager would prefer a route through derivatives market, given the less amount of investment required in latter to have same level of exposure. Therefore, the usage of derivatives products in serving variety of investors (through structured financial products), amongst other benefits, leads to growth of this segment of financial markets.	7
c.	1. **Management of Risk:** Financial derivatives are helpful in allowing the efficient management of different types of risk. Such practices are not only focused on reducing the risk but are more about the proper management of such risk factors. Financial derivatives are powerful tools which may be used by individuals and organizations for the purpose of managing their risk appetite. However, these entities should be fully aware of the basic principles involved in such transactions. Proper use of derivatives can help in reducing costs and magnifying returns. 2. **Exploit Opportunities to Enhance Returns:** Various derivative instruments such as forwards, futures and options, etc. can help in boosting returns on a portfolio. Derivatives help in allocating risk across a wide range of investors." is helps in optimising the cost of diversification. Derivative prices may also help in price determination, making the financial markets much more robust. It also aids the process of speculation and design alternative forms of payoffs, in response to change in market forces. Derivatives are also helpful in making market more efficient as it becomes more flexible. Such markets are also more efficient economically while ensuring that the assets are allocated in the best manner possible. 3. **Price Discovery:** Derivative products are helpful in price discovery implying that they reveal information regarding the likely future prices in the cash market. Derivative markets tend to synthesize a wide range of sentiments and information into concrete numbers, helping in making well-informed decisions.	10

4. **Price stabilization:** derivative markets **are helpful in stabilization of** prices by optimizing short term fluctuations. These instruments blunt out peaks and depths and thus smoothing the price movements.
5. **Trading Efficiency:** Financial derivatives improve market efficiency by allowing free trade of risk component. The position in derivatives may act in the similar manner as in investing in the underlying asset, without actually taking the position in the asset itself. It also helps in increasing liquidity in the market by reducing transaction costs.
6. **Speculation:** Derivatives are highly leveraged and may cause massive losses, if not dealt properly. On the other side, the proper use of these tools may result in magnified returns as well.
7. **Higher Trading Volume:** Derivatives, on account of being leveraged products, help in increasing the trading volume. This feature further helps in boosting liquidity in the market. Derivatives also attract people who have never traded in the stock market.
8. **Control Market Activities:** Speculative activities lead to more controlled market. If there is no organized derivative market, then speculators are likely to experiment in underlying cash markets. Such markets are generally more difficult to manage and control.
9. **Acts Catalyst:** Derivatives may help in boosting as entrepreneurial activities. These markets tend to attract bright and well educated people with winning attitude, providing the markets with vigor and growth.

2. a. Hedgers are the traders who aim to manage the price risk of their investments. The main objective of such traders is to keep their investments safe by managing the risk. Their motive is not to make profits but to minimize risks. Such hedgers may be looking to hedge their equity holdings or their foreign exchange reserves any other such assets. 3

b. 7

1. **Forward:** A market in which foreign exchange is bought and sold for future delivery is known as forward market. It deals with transactions which are contracted today but implemented in future.
For example, an Indian car manufacturer buys auto parts from a Japanese car maker with payment of one million yen due in 60 days. The importers in India are short of yen and suppose present price of yen is 768. Over the next 60 days, yen may rise to 70. The importer can hedge this exchange risk by negotiating a 60 days forward contract with a bank at a price of 270. According to forward contract, in 60 days the bank will give the importer one million yen and importer will give the banks 70 million to bank.

2. **Futures:** A futures market or futures exchange is a central financial exchange where people can trade standardized futures contracts; that is, a contract to buy specific quantities of a commodity or financial instrument at a specified price with delivery set at a specified time in the future.
A futures contract is an agreement between two parties to buy or sell an asset at a certain time in the future at a certain price. Futures contracts are special types of forward contracts in the sense that the former are standardized exchange-traded contracts.
A speculator expects an increase in price of gold from current future prices of 9,000 per 10gm. The market lot is 1kg and he buys one lot of future gold (9,000 x 100) 9,00,000. Assuming that there is 10% margin money requirement and 10% increase occur in price of gold the value of transaction will also increase, i.e., 79,900 per 10gm and total value will be ₹9,90,000. In other words, the speculator earns 790,000.

3. **Options:** The option market refers to the sum total of all the buying and selling of option contracts which is conducted and may be described either on a global or a regional basis. The option trading market is closely tied to the stock market, as one of the most widely traded types of option is the stock option. Options are also available based on other financial instruments, such as futures, commodities, currencies and indices.
Options is the derivative contract that give the right but not the obligation to either buy or sell a specific underlying security for a specified price (called as strike/exercise price) on or before a specific date. The option contracts are created for any type of underlying security. Equity (stock) is the most common underlying asset, but there are several other categories of non-equity options on the basis of underlying asset, such as, bonds, foreign currency, indices, or commodities, like gold

	or oil. The person who buys underlying asset through an option contract is normally known as the buyer or holder. Conversely, the seller is known as the seller or writer. 4. **Swap:** swap market is a market in which a borrower with one type of loan exchanges it with another borrower with a different type of loan. Each borrower is looking for an advantage that the original loan did not have e.g., that the loan is in a particular currency, has a particular interest rate, etc.	
c.	**Advantages:** 1. **Reflect Perception of Market Participants:** In developed and organized market, the price of the derivatives will show the view of market participants about the future course of action for the market It will also guide the price of the underlying. Towards the expiration date, the price of the derivatives and the price of the underlying tead to converge. Hence, derivatives help in price discovery. 2. **Helps to Transfer Risks:** The derivatives also help in transfer d risk from one party to another. 3. **Higher Trading Volume:** The derivatives are directly linked to their underlying cash market. With the help of derivatives, cash market experiences higher volumes, which helps in improving the liquidity in the market. 4. **Controlled Environment:** Derivative market allows for speculative trade in a more controlled manner. In the absence of this market speculation will take place in legal markets, making them more risky and harmful to the health of the markets and the economy. 5. **Attract Entrepreneurial:** Derivative market also helps generating new entrepreneurial activities. This type of trading generally attracts qualified and ambitious people and thus helps creating new products and markets. 6. **Low Transaction Costs:** Derivative contracts play a part in reducing market transaction costs since they work as risk management tools. Thus, the cost of transaction in derivative stock trading is lower as compared to other securities like debentures and shares. 7. **Market Efficiency:** Derivative trading involves the practice of arbitrage which plays a vital role in ensuring that the market reaches equilibrium and the prices of the underlying assets are correct. 8. **Determines the Price of an Underlying Asset:** Derivative contracts are often used to ascertain the price of an underlying asset. 9. **Used in Risk Management:** The value of a derivative contract has a direct relation with the price of its underlying asset. Hence, derivatives are used to hedge the risks associated with changing price levels of the underlying asset. **Limitation:** a. **Speculative and Gambling Motives:** As derivatives offer leveraged positions, it allows participants with even low capital indulge in high volume trading. While it magnifies the gains, it also leads to higher losses, if the trade goes the wrong way. Speculation has become one of the biggest motives behind the growth of derivatives market. b. **Increased Bankruptcies:** The leverage in the derivatives may cause people to take more risk than they can handle. In derivative market, one default may trigger a chain, causing high amount of loss. c. **Increase in Risk:** The derivatives were initially designed to manage risk in the market. However, since then, the tools are mainly used for the purpose of speculation. This is especially true in Over the Counter (OTC) markets. Many of the derivatives fail to provide the risk cover they are designed for. In such situations, the leveraged positions may cause severe damage. d. **Instability of Financial System:** It is claimed that the use of derivatives has led to overall increase in risk for the financial markets. The slow growth of derivatives has made the markets more liable for fluctuation threatening the stability of the market and its participants.	10
	1. **Hedgers:** Hedgers are the traders who aim to manage the price risk of their investments. The main objective of such traders is to keep their investments safe by managing the risk. Their motive is not to make profits but to minimize risks. Such hedgers may be looking to hedge their equity holdings or their foreign exchange reserves any other such assets. For example, an investor may hold Microsoft shares and may fear that the prices will decline in the	10

future. They can hedge their holding by undertaking some derivatives.

2. **Speculators:** These are the participants which are looking to make profits from their dealings in derivatives. Speculators do not have any business interest in the underlying and are merely looking to profit from price fluctuation.

   Speculators are the traders with clear profit objective. They take positions, whether long or short, to profit from price movements. They are ready to take bigger risks by betting on the likelihood of price movements. Speculators may be day traders or position traders. Day Traders aim to exploit the price movements occurring within the trading day while position traders take relatively longer positions which may last for a couple of days or longer.

   The speculator is not expected to make the full payment which is Number of futures contracts x shares under each contract x delivery price. They are only required to pay margin money, which is generally equal to 5 to 10 percent of the total transaction value. Thus, futures are highly leveraged instruments. For example, with the help of leverage, a trader can deal in 10 contracts instead of one, if the margin value is 10 percent.

3. **Arbitragers:** These participants aim to gain from mis-pricing of the instruments and other market mistakes. Arbitrage occurs when the same product has different prices in different markets. It is the process which involves simultaneous buying and selling in different markets.

   For example, if a product is available at 1,000 in the spot market and has value of ₹1,050 in the futures markets, then the arbitrageur will short the future and buy the product in spot market with a gain of 750. The main goal of such participant is to make riskless profit.

4. **Scalpers:** scalper is a type of market participant which aims to keep the position open for a very short period of time and tries to benefit from the different bid and ask prices. Scalpers derive their profit by undertaking large amount of goods or instruments in demand. These traders look for fluctuations in the market and seek to benefit from them. They do not aim to make large profits on their trade. They, instead make up for it through volume. The fast pace of trading leads to small gains margin, which is magnified through higher volume.

5. **Other Participants:** resident and non – resident Indians along with Mutual funds and FIIs are allowed to trade in Indian derivatives market. The smooth functioning of the derivatives market is dependent on the number of participants. Apart from these, mutual funds, corporate, NBFCS and financial institutions may also operate in the derivatives market.

   a. Individuals
   b. Banks
   c. Financial institutions and NBFCs
   d. Mutual funds and insurance company
   e. Corporate
   f. Trading members
   g. Clearing members

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Department of MBA

IV Semester - II Internal Assessment

Financial Derivatives (20MBAFM402)

Time: 1Hr.30Min **Date: 01/08/2023**
Max Marks: 50

Note: ***Answer all the questions.***

Q. No.		Questions	Marks	BT	CO's
1.	a.	What do you mean by MTM settlement	3M	L1	CO1
	b.	Briefly explain the features of Financial Derivatives.	7M	L2	CO1
	c.	Explain the structure of Derivative Market	10M	L2	CO1
2.	a.	Who are Arbitragers?	3M	L1	CO1
	b.	Discuss the types of Future Contract	7M	L2	CO1
	c.	Buy price – 100, selling price – 102 and lot size – 9500. Apply MTM and calculate profit or loss. Assume closing prices for 4 days are 101, 100 101.5 and 102.3 respectively.	10M	L3	CO2
3	a.	Explain the mechanics of buying and selling futures	10M	L2	CO1

Faculty Signature **HOD Signature** **Principal Signature**

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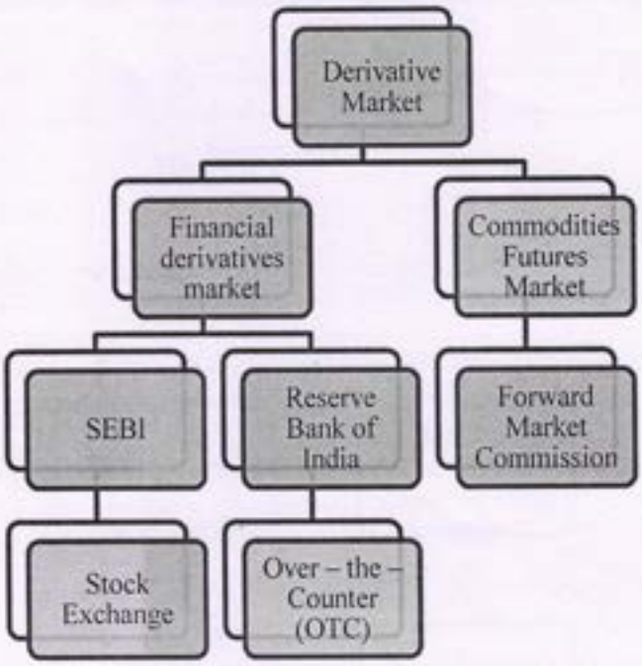
Department of MBA

IV Semester Internal Assessment Test -II

Financial Derivatives (20MBAFM402)

Q. No.	Answers	Marks
1. (a)	MTM stands for Mark-to-Market- and it is a method that allows investors to accurately value their portfolio and measure their performance in real time. MTM is used to determine the current value of an asset, such as stocks or shares, based on the current market conditions.	3
(b)	Features of Financial Derivatives are as follows: ⦿ Separate from transaction in underlying assets ⦿ Priced based on underlying asset ⦿ Variety of reasons ⦿ Online payment ⦿ Risk management ⦿ High return and risk	7
(c)		10
2. (a)	Arbitragers, often referred to as "arbitrageurs," are individuals or entities that engage in arbitrage. Arbitrage is a trading strategy that involves taking advantage of price discrepancies or differences in the value of an asset, security, or financial instrument between two or more markets. The goal of arbitrage is to profit from these price discrepancies by buying the asset at a lower price in one market and simultaneously selling it at a higher price in another market, thus exploiting the price differential.	
(b)	Types of Future Contract	3

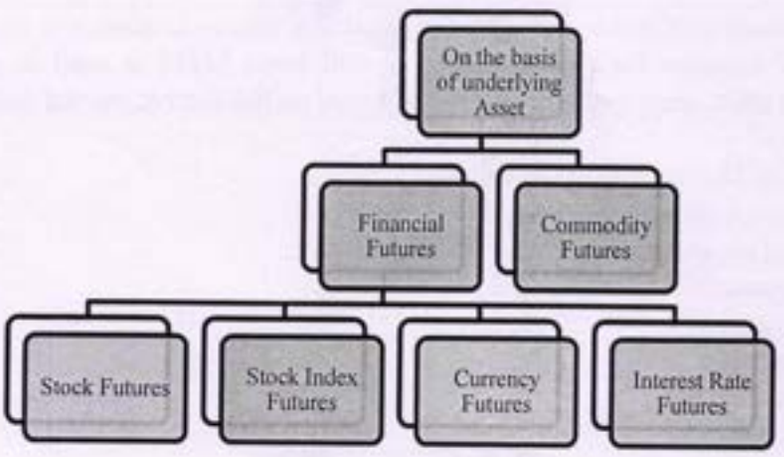
On the basis of Maturity

7

One near month futures contract

One mid- month futures contract

One far month futures contract



(c)

Day	Ref price	Closing price	Profit / loss	MTM
1	100	101	1	9500
2	101	100	-1	-9500
3	100	101.5	1.5	14250
4	101.5	102.5	0.5	4750
Total P&L				19000

3.

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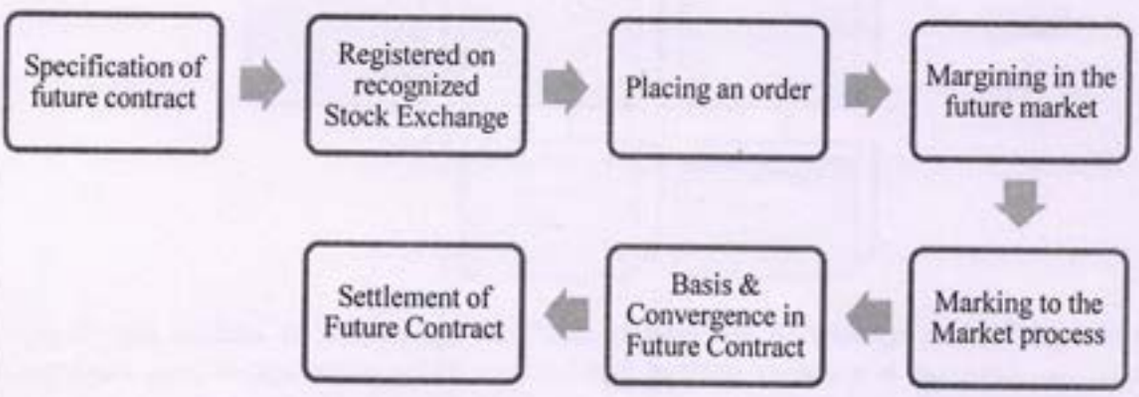

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Department of MBA

IV Semester - III Internal Assessment

Financial Derivatives (20MBAFM402)

Time: 3 hrs. **Date: 06/09/2023**
Max marks: 100

Note: 1. Answer any FOUR full questions from Q.No.1 to 7.
2. Q.No.8 is compulsory

Q.No.		Questions	Marks	BT	CO's
1	a	Differentiate between exchange traded and OTC traded financial derivatives	3M	L2	CO1
	b	What are the functions of derivatives markets?	7M	L1	CO1
	c	What is derivative? Distinguish between hedgers, speculator and arbitrageur.	10M	L2	CO1
2	a	What do you meant by marking to market?	3M	L1	CO1
	b	An investor trades grade-1 rice in the market for Rs. 1600 per quintal. A 6 months future contract on this rice is traded at Rs. 1675. The size of the contract is 1 quintal. An amount of Rs. 50 has to be paid for storing 1 quintal rice for 6 months. Calculate the price of future contracts. What position investor has to take in future market?	7M	L3	CO2
	c	Mr. Gupta took long position in five futures contracts on rice at an exercise price of Rs. 50 per kg. The initial margin on this contract is 10% and maintenance margin is 85% of the initial margin. The size of each future contract is 1000 kg. the futures prices for the first 10 days of the contract are given below:	10M	L3	CO2

Day	1	2	3	4	5	6	7	8	9	10
Price Per kg	52.50	51.25	51	51.80	51.40	51.10	49.75	50.30	50.50	50.25

Prepare a margin account assuming that all margin calls are honoured immediately and money in excess of the margin is withdrawn immediately

3	a	What is Contango and Backwardation market?	3M	L1	CO1
	b	Find out the theoretical price of a stock maturing in six months from now, which currently trading at Rs. 540. The annual risk free rate of return continuously compounded 9%. a) What would an arbitrager do if the six months future contract on this stock is trading at Rs. 600? b) What are the risks involved in the arbitrage transactions in futures contracts?	7M	L4	CO3
	c	Consider the following data about July 2020 NIFTY option (opening values of the day are taken):	10M	L3	CO2

Exercise price	Call Premium	Put Premium
9860	NA	8.70
9880	NA	9.70
9900	45.25	10.60
9920	23.40	13.25
9940	15.50	15.40
9960	12.20	24.50
9980	9.60	NA
10000	8.35	NA
10020	7.80	NA

The July NIFTY opened at 3rd July 2017. Classify each of the above options and find out intrinsic and time values of the options (NA = options are not available)

4	a	What is Triangular Swap?	3M	L1	CO1
	b	What is Financial Swap? Explain different types of Financial swap.	7M	L2	CO4
	c	Ranbaxy Ltd and Sun Pharma Ltd., requires Rs. 10 million for five years term and have been offered the following interest rates.	10M	L3	CO2

Company	Fixed	Floating
Ranbaxy Ltd	12%	MIBOR + 1.25%
Sun Pharma Ltd	15%	MIBOR + 1.75%

Ranbaxy Ltd is interested in floating and sun pharma Ltd., in fixe rate loan. How do you

<table>
<tr><td></td><td></td><td>design an interest rate swap which is equally attractive to both the firms? The swap is arranged through a swap dealer who charges 0.4%.</td><td></td><td></td><td></td></tr>
<tr><td>5</td><td>a</td><td>What is stress testing and Back testing?</td><td>3M</td><td>L1</td><td>CO1</td></tr>
<tr><td></td><td>b</td><td>What is VaR? What are the methods used for estimating VaR?</td><td>7M</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>c</td><td>The following table gives the price of bonds:
<table>
<tr><th>Bond principal</th><th>Time to maturity</th><th>Annual coupon</th><th>Bond price</th></tr>
<tr><td>100</td><td>0.5</td><td>0.0</td><td>98</td></tr>
<tr><td>100</td><td>1</td><td>0.0</td><td>95</td></tr>
<tr><td>100</td><td>1.5</td><td>6.2</td><td>101</td></tr>
<tr><td>100</td><td>2</td><td>8.0</td><td>104</td></tr>
</table>
(Held the stated coupon is assumed to be paid every 6 months)
a) Calculate the zero rates for maturities of 6 months, 18 months and 24 months
b) What are the forward rates?</td><td>10M</td><td>L3</td><td>CO2</td></tr>
<tr><td>6</td><td>a</td><td>What is commodity trading?</td><td>3M</td><td>L1</td><td>CO1</td></tr>
<tr><td></td><td>b</td><td>Create a long straddle from the given information:
Call strike price Rs. 400; call premium Rs. 15; put strike price Rs. 400; put premium Rs. 18, closing price are as following (in Rs.): 300, 350, 375, 400, 425, 450, 475, 500, 525.</td><td>7M</td><td>L3</td><td>CO2</td></tr>
<tr><td></td><td>c</td><td>The current spot rate of IOC is Rs. 380 and which is expected to rise by 4% or fall by 2% after a month. The annual continuously compounded risk free interest rate is 9%.
a) What is the value of one month European call option on the stock with strike price of Rs. 365?
b) How can option are to be traded to hedge entire risk in the portfolio under Binomial option pricing model?</td><td>10M</td><td>L4</td><td>CO3</td></tr>
<tr><td>7</td><td>a</td><td>What is covered and Naked calls?</td><td>3M</td><td>L1</td><td>CO1</td></tr>
<tr><td></td><td>b</td><td>Differentiate between stress testing and back testing.</td><td>7M</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>c</td><td>What is butterfly spread? When do the investors prefer to use this strategy? The following data is given to you about the call options on a share which is currently traded Rs. 54 with the multiplier of 800.
<table>
<tr><td>Exercise price (Rs)</td><td>50</td><td>55</td><td>60</td></tr>
<tr><td>Call price (Rs)</td><td>8</td><td>4.5</td><td>2</td></tr>
</table>
Determine the profit or loss from third strategy when the share price is Rs. 42, 55, 58 and 59 respectively.</td><td>10M</td><td>L3</td><td>CO2</td></tr>
<tr><td>8</td><td></td><td>Mr. Kairav on 1st May 2021 has constructed a portfolio consisting five shares the details of which is given below:
<table>
<tr><th>Scrips</th><th>MARKET PRICE</th><th>No. of shares</th><th>Beta</th></tr>
<tr><td>ACC</td><td>1750</td><td>5000</td><td>0.90</td></tr>
<tr><td>Cipla</td><td>550</td><td>8000</td><td>0.85</td></tr>
<tr><td>BHEL</td><td>140</td><td>10000</td><td>0.80</td></tr>
<tr><td>GAIL</td><td>390</td><td>15000</td><td>0.75</td></tr>
<tr><td>IDBI</td><td>60</td><td>10000</td><td>1.05</td></tr>
</table>
The annual cost of capital to the investor is 10% (continuously compounded) and current value of the Nifty is 9950. You are required to:
a. Calculate beta of the portfolio.
b. Calculate the fair value of the Nifty June futures.
c. In Nifty futures contract has a lot size of 75 units, find the number of contracts of Nifty futures the investor needs to short in order to get a full hedge until June for his portfolio. Assume that the Nifty futures are trading at their fair value.
Calculate the number of futures contracts the investor should trade if he desires to reduce the beta of his portfolio to 0.75.</td><td>20M</td><td>L3</td><td>CO4</td></tr>
</table>

Faculty Signature **HOD Signature** **Principal Signature**

Department of MBA

IV Semester - III Internal Assessment

Financial Derivatives (20MBAFM402)

Scheme of Valuation

Q.No.		Particulars	Marks
1	a	- Centralization of market - Standardization - Counterparty risk - Visibility - Parties involved	3M
	b	1. Prices in an organized derivatives market reflect the perception of market participants about the future and lead the prices of underlying to the perceived future level. The prices of derivatives converge with the prices of the underlying at the expiration of the derivative contract. Thus derivatives help in discovery of future as well as current prices. 2. The derivatives market helps to transfer risks from those who have them but may not like them to those who have an appetite for them. 3. Derivatives, due to their inherent nature, are linked to the underlying cash markets. With the introduction of derivatives, the underlying market witnesses higher trading volumes because of participation by more players who would not otherwise participate for lack of an arrangement to transfer risk. 4. Speculative trades shift to a more controlled environment of derivatives market. In the absence of an organized derivatives market, speculators trade in the underlying cash markets. Margining, monitoring and surveillance of the activities of various participants become extremely difficult in these kinds of mixed markets. 5. An important incidental benefit that flows from derivatives trading is that it acts as a catalyst for new entrepreneurial activity. The derivatives have a history of attracting many bright, creative, well-educated people with an entrepreneurial attitude. They often energize others to create new businesses, new products and new employment opportunities, the benefit of which are immense	7M
	c	Financial derivatives are financial instruments that are linked to a specific financial instrument or indicator or commodity, and through which specific financial risks can be traded in financial markets in their own right. **Hedger**: A hedge is a position taken in order to offset the risk associated with some other position. A hedger is someone who faces risk associated with price movement of an asset and who uses derivatives as a means of reducing that risk. A hedger is a trader who enters the futures market to reduce a pre-existing risk. **Speculators**: While hedgers are interested in reducing or eliminating risk, speculators buy and sell derivatives to make profit and not to reduce risk. Speculators willingly take increased risks. Speculators wish to take a position in the market by betting on the future price movements of an asset. Futures and options contracts can increase both the potential gains and losses in a speculative venture. Speculators are important to derivatives markets as they facilitate hedging provide liquidity ensure accurate pricing, and help to maintain price stability. It is the speculators who keep the market going because they bear risks which no one else is willing to bear. **Arbitrageur**: An arbitrageur is a person who simultaneously enters into transactions in two or more markets to take advantage of discrepancy between prices in these markets For example, if the futures price of an asset is very high relative to the cash price, an arbitrageur will make profit by buying the asset and simultaneously selling futures. Hence, arbitrage involves making profits from relative mispricing. Arbitrageurs also help to make markets liquid, ensure accurate and uniform pricing, and enhance price stability. All three types of trades and investors are required for a healthy functioning of the derivatives market. Hedgers and investors provide economic substance to this market, and without them the markets would become mere tools of gambling. Speculators provide liquidity and depth to the market. Arbitrageurs help in bringing about price uniformity and	10M Meaning 2M Difference 7M

price discovery. The presence of Hedgers, speculators and arbitrageurs, not only enables the smooth functioning of the derivatives market but also helps in increasing the liquidity of the market.

2 a The term mark to market refers to a method under which the fair values of accounts that are subject to periodic fluctuations can be measured, i.e., assets and liabilities. The goal is to provide time to time appraisals of the current financial situation of a company or institution. It is done while keeping in mind the prevailing market conditions. 3M

b Future price = 1600+50
= **1650** favorable 7M

c Margin account

Day	Price	Profit/loss	Balance	Margin call
1	52.50	2500	7500	2500 w
2	51.25	(1250)	3750	1250 c
3	51	(250)	4750	
4	51.80	800	5550	550w
5	51.40	(400)	4600	
6	51.10	(300)	4300	
7	49.75	(1350)	2950	2050c
8	50.30	550	5550	550w
9	50.50	200	5200	200
10	50.25	(250)	4750	

Initial margin = (50*1000)*10% = 5000
Maintenance margin = 4250 10M

3 a Contango and backwardation are terms used to define the structure of the forward curve. When a market is in contango, the forward price of a futures contract is higher than the spot price. Conversely, when a market is in backwardation, the forward price of the futures contract is lower than the spot price. 3M

b $S_t = S_0 \cdot e^{(r \cdot t)}$

$S_t = 540.\ E^{(0.09*0.5)}$

$S_t = 565.51$

If the six-month futures contract is trading at Rs. 600, an arbitrager would sell the futures contract at Rs. 600 and simultaneously buy the stock in the spot market at Rs. 540. At maturity, the arbitrager would deliver the stock and receive Rs. 565.51. The profit would be the difference between the futures contract price and the theoretical stock price at maturity: 600−565.51=Rs.34.49. 7M 5M calculation and 2M for explanation

Risks involved in arbitrage transactions in futures contracts include market risk, execution risk, and liquidity risk. Market risk arises from unexpected movements in stock prices, interest rates, or other relevant factors. Execution risk refers to the possibility that the arbitrage strategy may not be executed as planned, leading to potential losses. Liquidity risk is associated with the ease of buying or selling the assets involved in the arbitrage, and if the market is illiquid, it may impact the transaction's success. Additionally, there could be risks related to transaction costs and margin requirements. It's crucial for arbitragers to carefully manage these risks to ensure the success of their arbitrage strategy.

c Assume any spot price of NIFTY
- For call options:
  Intrinsic Value = max (Spot Price - Strike Price, 0)
  Time value = max(Call Premium−Intrinsic Value,0)
- For Put options: 10M

4	a	Intrinsic Value = max(Strike Price−Spot Price,0) Time Value = max(Put Premium−Intrinsic Value,0) Intrinsic Value is calculated as per the respective option type (Call or Put), and Time Value is the remaining premium after subtracting Intrinsic Value. If Intrinsic Value is negative, it is set to zero. If Time Value is negative, it is also set to zero. A financial swap arranged among three parties with three different forms of financing is called triangular swap. While the interest rate swap is arranged between two parties with two different forms of financing (ie., fixed and floating), the triangular swap involves three parties with three different forms of financing (i.e., fixed and different floating rates such as LIBOR, Prime, and MIBOR).	3M
	b	The word 'swap literally means an exchange. A financial swap may be defined as a contract whereby two parties, exchange two streams of cash flows over a defined period of time, usually through an intermediary like a financial institution. Types: - Interest rate swaps - Currency swap - Commodity swap - Equity swap - Triangular swap	7M 2M for meaning and 5M for types
	c	<table><tr><td></td><td>Particulars</td><td>Value</td></tr><tr><td>1</td><td>Difference in floating rate</td><td>0.5%</td></tr><tr><td>2</td><td>Difference in fixed rate</td><td>3%</td></tr><tr><td>3</td><td>Net difference</td><td>2.5%</td></tr><tr><td>4</td><td>Amount paid for swap</td><td>0.4%</td></tr><tr><td>5</td><td>Net gain</td><td>2.1%</td></tr><tr><td>6</td><td>Ranbaxy Ltd gain</td><td>1.05%</td></tr><tr><td>7</td><td>Sun Pharma Ltd gain</td><td>1.05%</td></tr></table>	10M
5	a	A back test is usually a test over a certain period where you simulate the past performance of a trading or an investment system. A stress test is computing the output of a certain scenario of the input of your trading system, where this input scenario is assumed to be a worst-case scenario.	3M
	b	Value at Risk (VaR) has been called the "new science of risk management," and is a statistic that is used to predict the greatest possible losses over a specific time frame. Commonly used by financial firms and commercial banks in investment analysis, VaR can determine the extent and probabilities of potential losses in portfolios. Risk managers use VaR to measure and control the level of risk exposure - historical method - variance-covariance method - Monte Carlo simulation	7M 2M for meaning and 5M for methods
	c	The 6 month bond provides a return of 2 in 6 months i.e., [2*2]/98 = 4.081 annually Continuous compounding, 2ln [1+ 0.0408/2] = 4.04 Ln[1+5/95] = 5.13 3.1e-0.0404*0.5 + 3.1e-0.0513*1 + 103.1e-R*1.5 Similarly solve for R $F = \frac{R_1 T_1 - R T}{T_1 - T}$	10M
6	a	Commodity trading involves buying and selling commodities and their derivatives products. The term commodity refers to any raw material or primary agricultural product that can be bought or sold. To start trading in commodities, first, choose a commodity broker and open a commodity trading account. Then, do your research on the commodities market, understand the risks involved,	3M

and set your investment goals. Develop a trading strategy and start trading through the exchange

b

Buy Call Option:
Strike Price: Rs. 400
Premium: Rs. 15
Buy Put Option:
Strike Price: Rs. 400
Premium: Rs. 18
If the closing price is below Rs. 385 (Rs. 400 - Rs. 15), both options expire worthless, and the maximum loss is the total premium paid (Rs. 15 + Rs. 18).
If the closing price is between Rs. 385 and Rs. 415, one option will be in the money while the other expires worthless. The total loss is the sum of both premiums.
If the closing price is above Rs. 415 (Rs. 400 + Rs. 15), both options are in the money. The profit is unlimited because the call option will gain value as the price rises, and the put option will gain value as the price falls.

7M

c

$$C = S_0 \cdot e^{-qt} \cdot N(d_1) - X \cdot e^{-rt} \cdot N(d_2)$$

In a binomial model, you would create a replicating portfolio consisting of the stock and a risk-free bond to hedge the option position. The idea is to choose the weights of the stock and the bond such that the portfolio mimics the payoffs of the option. The weights are adjusted to ensure that the portfolio value matches the option value at different nodes in the binomial tree.
In this case, the hedging strategy involves continuously adjusting the weights of the stock and bond in the portfolio based on the changing stock price. The goal is to create a portfolio whose value matches the option value at each node in the binomial tree, thereby hedging against price movements.
The specific weights and adjustments would depend on the details of the binomial model and the assumptions made regarding the stock price movements, interest rates, and other factors. The binomial model allows for a dynamic hedging strategy to minimize the risk associated with the option position.

10M

7 a

A naked call is an options strategy in which an investor writes (sells) call options on the open market without owning the underlying security.
This strategy, sometimes referred to as an uncovered call or an unhedged short call, stands in contrast to a covered call strategy, where the investor owns the underlying security on which the call options are written.
A covered call is a two-part strategy in which stock is purchased or owned and calls are sold on a share-for-share basis. The term "buy write" describes the action of buying stock and selling calls at the same time

3M

b

Load Testing	Stress Testing
1. Load testing is first step of performance testing	1. Stress testing is performed after Load testing.
2. The system verifies how the upper limit of the load is handled	2. The system verifies how the extreme load is handled.
3. The system is tested under maximum required threshold value	3. The system is tested by providing more than threshold value to find the breaking point.
4. The load is increased gradually up to the maximum load to test maximum load handling	4. The system is tested by providing high loads abruptly for a considerable duration until the server crashes.
5. The following attributes are tested: response time, server conditions, peak load performance, throughput, etc.	5. The following attributes are tested: stability beyond the system capacity, response time above the threshold value, etc.
6. A huge number of user input is provided	6. A huge number of users and high volume of data input is provided.

7M

		7. The issues like load balancing, bandwidth issues, system, capacity, throughput issues, poor response time etc. are verified in load testing	7. The issues like security loopholes, memory leakage, data corruption etc. are verified in overload situation in this type of testing
		8. Load testing is done to check out that current infrastructure is sufficient to run the application or not.	8. Stress testing is done to check whether any unexpected failures do not harm the system security.
		9. Few Load Testing tools: WebLOAD, LoadView, LoadRunner, SmartMeter.io, and LoadUI NG Pro	9. Few Load Testing tools: LoadRunner, Jmeter, NeoLoad

	c	A butterfly spread is an options trading strategy that involves using three strike prices to create a position where the investor profits from a specific range of price movements. The butterfly spread is created using either call options or put options and can be classified as a neutral strategy because it profits when the underlying asset's price remains within a certain range. The basic components of a call butterfly spread are as follows: Buy a lower strike option (in-the-money): This is typically a long call option with a lower exercise price. Sell two middle strike options (at-the-money): Two short call options with a higher exercise price. Buy a higher strike option (out-of-the-money): Another long call option with an even higher exercise price. The strategy aims to take advantage of a limited price movement in the underlying asset, and the maximum profit is achieved if the stock price is at the middle strike price at expiration. Investors prefer to use a butterfly spread when they anticipate low volatility in the underlying asset's price. It's essentially a bet that the stock price will remain relatively stable and close to the middle strike price. Calculate profit or loss for each case	10M
8	a	$\text{Portfolio Beta} = \sum_{i=1}^{n} \left(\text{Market Value of Stock}_i / \text{Total Portfolio Value} \times \text{Beta}_i \right)$ Total Portfolio Value=∑i=1nMarket Value of Stocki Portfolio beta = 0.844	20M each sub points carry 5M
	b	$\text{Fair Value of Nifty June Futures} = 9950 \times e^{(0.10 \times 121)}$ Fair value of Nifty Futures = 10074.99	
	c	Assuming lot size = 75 units, Beta of Nifty Futures Contract = 1.0 Number of Contracts for Full Hedge = $\frac{0.844 * (\text{portfolio value})}{1.0 * 75}$	
	d	Number of Contracts to Reduce Beta=$\frac{(0.844-0.75) \times (\text{Portfolio Value})}{1.0 \times 75}$	

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Department of MBA

Fourth Semester Internal Assessment Test –I

Time: 90 Minutes **20MBAHR401-Organizational Leadership** **Date: 03.07.2023**

Answer the following questions **Max marks: 50**

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Leadership?	3M	L1	CO1
	b	Differentiate Trait v/s Process Leadership	7M	L2	CO1
	c	Briefly Explain the five factor Personality Model of Leadership	10M	L2	CO2
2.	a	Leaders are born or made, what is your opinion	3M	L4	CO1
	b	Briefly explain the roles of a leader.	7M	L2	CO1
	c	Explain Trait approach of Leadership	10M	L2	CO2
3.	a	Explain different types of skill approach to Leadership	3M	L2	CO2

Bindu.R

Faculty Signature **HOD Signature** **Principal Signature**

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Department of MBA
Fourth Semester Internal Assessment Test –I
Time: 90 Minutes 20MBAHR401-Organizational Leadership Date: 03.07.2023
Answer the following questions Max marks: 50

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Leadership?	3M	L1	CO1
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	b	Briefly explain the roles of a leader.	7M	L2	CO1
	c	Explain Trait approach of Leadership	10M	L2	CO2
3.	a	Explain different types of skill approach to Leadership	3M	L2	CO2

Bindu.R

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Department of MBA

Scheme of Evaluation – Internal Assessment I

Subject : Organizational Leadership	Code: 20MBAHR401
Max marks: 50	No Choice

Sl. No	Answer script	Marks
1.a	Leadership is a process by which an executive can direct, guide and influence the behavior and work of others towards accomplishment of specific goals in a given situation. Leadership is the ability of a manager to induce the subordinates to work with confidence and zeal. Leadership is the potential to influence behavior of others. It is also defined as the capacity to influence a group towards the realization of a goal. Leaders are required to develop future visions, and to motivate the organizational members to want to achieve the visions.	03 Marks
b.	**Trait Leadership** • Leadership suggests that certain inborn or innate qualities and characteristics makesomeone a leader. • These qualities might be personality factors, physical factors, intelligence factors, and soon. • In essence, trait theory proposes that the leader and leaders' traits are central to an organization's success. • The assumption here is that finding people with the right traits will increase organizationalperformance. • Trait theory focuses exclusively on the leader and neglects the follower. **Process Leadership** • Suggests that leadership is an event that depends on the interaction between the leader andthe follower.	07 Marks

- Process theory makes leadership available to everyone, rather than restricting it to people with special qualities only.
- As a process, it can be observed, learned, and trained.

Therefore people view leadership from a trait perspective usually express statements like "Leaders are born not made". Whereas the process viewpoint makes suggests that leadership is a phenomenon that resides in the context and leadership available to everyone.

c. **The Big five personality factors are;**

A) Extraversion: that is the tendency to be, sociable and assertive and to have positive energy.

B) Openness : That is the tendency to be informed creative, insightful & curious.

C) Agreeableness: That is the tendency to be accepting and conforming, trusting and nurturing.

D) Conscientiousness - That is the tendency to be thorough organized controlled,dependable and decisive.

E) Neuroticism - That is the Tendency to be anxious, insecure, vurnerable, hostile& depressed.

10 Marks

02 marks for list and 08 marks for explanation

2.a Leaders are not born, they are made because certain skills, abilities and knowledge required for a leader and that can be adopted through their experience or by learning.

03 Marks

b. **Role of a leader are-**

07 Marks

02 marks for listing and 05 marks for explanation

c.	Trait theory, as the name gives away, is an approach to studying human personality that identifies and measures the degree to which certain personality traits—recurring patterns of thought and behavior, such as anxiousness, shyness, openness to new things—exist from individual to individual. The study involves a set number of personality traits and assigns the degree that a trait exists, which then determines the individual's personality. The trait theory of leadership focuses on identifying different personality traits and characteristics that are linked to successful leadership across a variety of situations. **Assumptions** • Leaders are born and not made. • Great leaders will arise when there is a great need.	**10 Marks**
3. a	**Three skill Approach:** Skills are what leaders Can accomplish, where as traits, are who leaders are,[i.e., their innate characteristics] Leadership skills are defined as the ability to use ones knowledge and Competencies to accomplish a set of goals or objectives. a. Technical Skill b. Conceptual Skill c. Interpersonal Skill Skill Model Approach : The Skill based Model framed by this researchers group have five components Namely 1. Competencies 2. Individual attributes 3. Leadership outcomes 4. Career experience and 5. Environmental influences	**10 Marks** **05 marks each**

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Department of MBA

Fourth Semester Internal Assessment Test –II

Time: 90 Minutes **20MBAHR401-Organizational Leadership** **Date: 31.07.2023**

Answer the following questions **Max marks: 50**

Q. No.		Questions	Marks	BT	CO's
1.	a	List out the importance of Leadership.	3M	L1	CO1
	b	Differentiate Leadership v/s Management	7M	L2	CO1
	c	Briefly Explain the Managerial Grid.	10M	L2	CO2
2.	a	What is Coercive Leadership?	3M	L1	CO1
	b	Explain the bases of Power.	7M	L2	CO1
	c	Explain Situational approach of Leadership	10M	L2	CO2
3.	a	Explain Ohio state university studies and University of Michigan Studies.	10M	L2	CO2

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Department of MBA
Fourth Semester Internal Assessment Test –II
Time: 90 Minutes 20MBAHR401-Organizational Leadership Date: 31.07.2023
Answer the following questions Max marks: 50

Q. No.		Questions	Marks	BT	CO's
1.	a	List out the importance of Leadership.	3M	L1	CO1
	b	Differentiate Leadership v/s Management	7M	L2	CO1
	c	Briefly Explain the Managerial Grid.	10M	L2	CO2
2.	a	What is Coercive Leadership?	3M	L1	CO1
	b	Explain the bases of Power.	7M	L2	CO1
	c	Explain Situational approach of Leadership	10M	L2	CO2
3.	a	Explain Ohio state university studies and University of Michigan Studies.	10M	L2	CO2

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Department of MBA

Scheme of Evaluation – Internal Assessment II

Subject : Organizational Leadership	Code: 20MBAHR401
Max marks: 50	No Choice

Sl. No	Answer script	Marks
1.a	**Importance of Leadership-** • Leadership is an important factor for making an organization successful. • Leadership is an important function of management which helps to maximize efficiencyand to achieve organizational goals. • Leadership is an important function of management which helps to maximize efficiency and to achieve organizational goals. The following points justify the importance of leadership in a concern.	03 Marks
b.	See table below	07 Marks

Basis	Leadership/Leader	Management/Manager
Meaning	Leadership is a virtue of leading people through encouraging them.	It is process of managing people and business activities.
Function	Directing-which aims to direct the behavior of employees to give their best	It coves five salient functions-Planning, Organizing, Staffing, Directing and controlling.
Concerns	People oriented	Task oriented
Style	Transformational	Transactional
Work	Doing the right things.	Doing things right.
Role	Listen and Empowerment	Instructs People
Formulation	Principles and Guidelines	Policies and Procedures
Emphasis	Inspiring people	Managing people

c.	**Black and Moutan's managerial [leadership] grid** A: Authority compliance: B: Middle of the Road Management: C: Team Management: D: Paternalism / Maternalism: D: Opportunism:	**10 Marks** **02 marks for list and 08 marks for explanation**
2.a	Coercive leaders make decisions for their employees without gathering input from them. These leaders analyze every situation that arises and makes choices based on the data they collect rather than the needs of their team. Coercive leaders take full control over the direction of projects and their team's work	**03 Marks**
b.	Table 1.1 Six Bases of Power Referent Power — Based on followers' identification and liking for the leader. A teacher who is adored by students has-referent power. Expert Power — Based on followers' perceptions of the leader's competence. A tour guide who is knowledgeable about a foreign country has expert power. Legitimate Power — Associated with having status or formal job authority. A judge who administers sentences in the courtroom exhibits legitimate power. Reward Power — Derived from having the capacity to provide rewards to others. A supervisor who gives rewards to employees who work hard is using reward power. Coercive Power — Derived from having the capacity to penalize or punish others. A coach who sits players on the bench for being late to practice is using coercive power. Information Power — Derived from possessing knowledge that others want or need. A boss who has information regarding new criteria to decide employee promotion eligibility has information power.	**07 Marks**
c.	In brief the sense of the situational approach demands that leaders match their style to the competency and commitment of the followers. Effective leadersare those who can recognise what followers need and then adopt their own style to meet those needs the dynamics of situational approach are illustrated in the situational approach model that compromised of 2 dimensions leadership styles and development levels of followers. Leadership style Development levels	**10 Marks**

3. a	**The Ohio State University studies:** A group of researchers at Ohio State believed that the results of studying leadership as a personality trait secured fruitless and decided to analyse how individuals acted when they were leading a group of an organization. This analysis was conducted by having followers complete questionnaire about their leaders. The question is follow a set to identify the number of times their leadersengaged in certain types of behaviours. Research has found that the followers response on the questionnaire clustered around 2 general types of leader behaviours namely initiating structure and consideration & initiated structure behaviours r essentially task behaviours including such acts as organising work giving structure to the quite context defining role responsibilities and scheduling work activities. **The University of Michigan studies:** Researchers at the University of Michigan were also exploring leadership behaviours giving special attention to the impact of leaders behaviours on the performance of small groups. The program of research at Michigan identify 2 types of leadership behaviours namely 1: employee orientation 2: production orientation	**10 Marks** **05 marks each**

Department of MBA

Fourth Semester *Internal Assessment Test –III*

Time: 3 Hrs **20MBAHR401-Organizational Leadership** **Date: 08.09.2023**

Note-Answer any four full questions from Q.No 1 to 7 **Max marks: 100**

Q. No 8 is compulsory

Q. No.		Questions	Marks	BT	CO's
1.	a	What is Leadership?	3M	L1	1
	b	Differentiate between Trait & Process Leadership.	7M	L2	2
	c	Explain the five factor personality model of leadership.	10M	L2	2
2.	a	Define Emotional Intelligence.	3M	L1	1
	b	Discuss about Three Skill Approach.	7M	L2	2
	c	Explain Blake and Mouton's managerial grid theory of leadership.	10M	L2	2
3.	a	Define Directive Leadership.	3M	L1	1
	b	Explain Situational Leadership styles.	7M	L2	2
	c	Explain Path Goal Theory of Leadership.	10M	L2	2
4.	a	What is Transformational Leadership?	3M	L1	2
	b	Discuss about LMX Theory.	7M	L2	2
	c	Explain the model of Transformational Leadership .	10M	L2	3
5.	a	Who is Authentic Leader?	3M	L1	2
	b	Discuss about cultural dimensions related to Leadership.	7M	L2	3
	c	Discuss about clusters of world cultures.	10M	L2	3
6.	a	What is Ethical Leadership?	3M	L1	2
	b	Explain different Ethical Theories.	7M	L2	2
	c	Explain Ohio state studies on leadership.	10M	L2	2
7.	a	List out the key dynamics of psychodynamic approach to leadership	3M	L1	2
	b	Explain the attributes of universally desirable and undesirable leadership.	7M	L2	4
	c	Discuss about successful leadership practices in Indian organizations.	10M	L2	4
8.		**Case Study:** Starbuck is recognized for treating its employees. Also known as partners, well. The coffee giant offers Insurance benefits, stock options and retirement plans. But back in 1997, Starbucks faced a crisis when tragedy struck and three employees were killed during a robbery Washington, DC. The outstanding leadership of CEO Howard Schultz was demonstrated when he flew straight to DC and spent a week with the co-workers and families of three employees.			

		While some leaders might have stayed as far away as possible from this tragic situation, Schulz's natural leadership traits prevailed with comparison, approachability and a dedication to meeting his pattern needs, he did was right. As a result, the public viewed him and starbucks more favorably. **Questions-** 1. Explain the organization leadership prevailed in star bucks and style used during the situation.	10M	L2	4
		2. Describe how Schultz's efficiency in handling situation at the time of crisis. List out the traits of a good leader in the organization.	10M	L2	4

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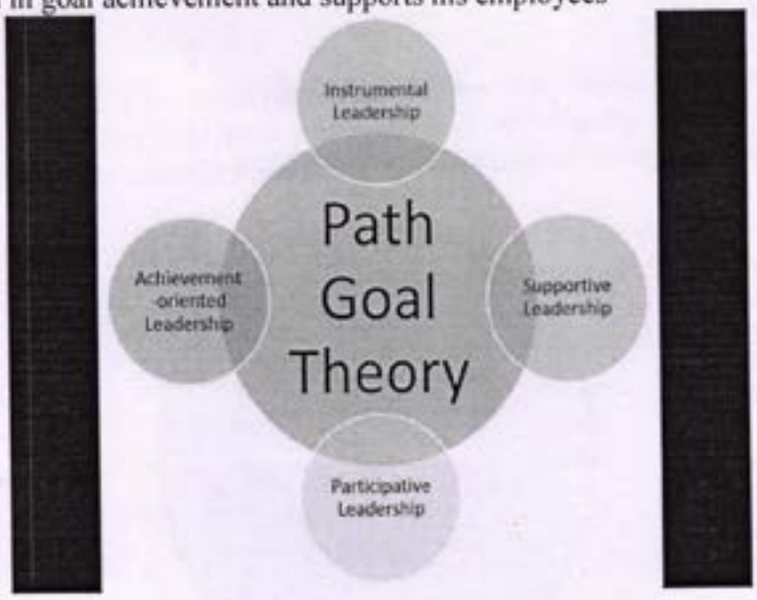
Scheme of Evaluation – Internal Assessment III

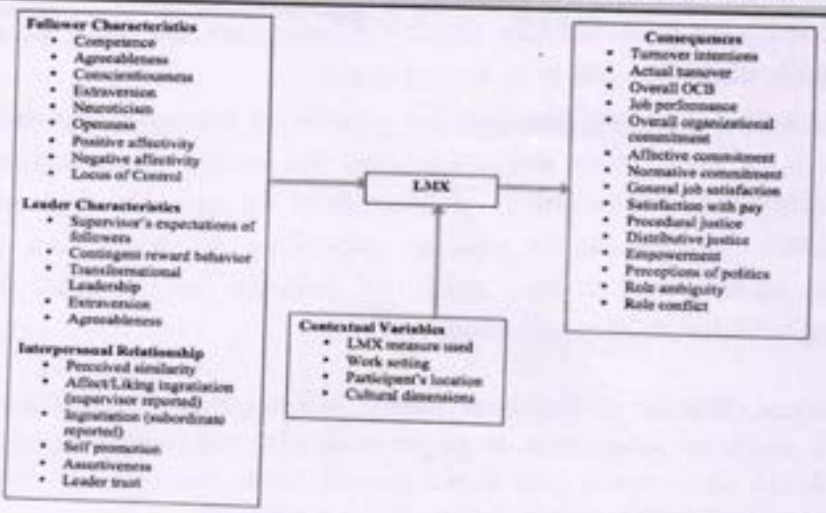
Subject : Organizational Leadership **Code: 20MBAHR401**

Max Marks-100

Sl. No	Answer script	Marks
1.a	Leadership is **the ability to continuously influence a team of individuals** and encompasses many important traits. While management is the overall direction and oversight of the work activities of a team, leadership focuses on the ongoing motivation, engagement and productivity of a team. Leaders and their leadership skills play an important role in the growth of any organization. **Leadership refers to the process of influencing the behaviour of people in a manner that they strive willingly and enthusiastically towards the achievement of group objectives.**	**03 Marks**
b.	**Trait Leadership** • Leadership suggests that certain inborn or innate qualities and characteristics make someone a leader. • These qualities might be personality factors, physical factors, intelligence factors, and so on. • In essence, trait theory proposes that the leader and leaders' traits are central to an organisation's success. • The assumption here is that finding people with the right traits will increase organisational performance. • Trait theory focuses exclusively on the leader and neglects the follower. **Process leadership** • Suggests that leadership is an event that depends on the interaction between the leader and the follower. • Process theory makes leadership available to everyone, rather than restricting it to people with special qualities only. • As a process, it can be observed, learned, and trained.	**07 Marks**
c.	**The Big five personality factors are;** **A)** Extraversion: that is the tendency to be, sociable and assertive and to have positive energy. **B)** Openness : That is the tendency to be informed creative, insightful & curious. **C)** Agreeableness: That is the tendency to be accepting and conforming, trusting and nurturing.	**10 Marks** **02 marks for listing and 08 marks for explanation**

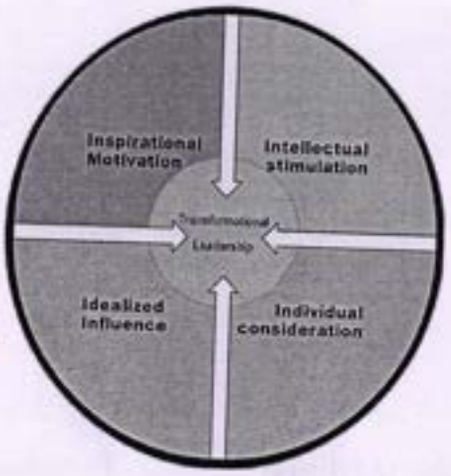
	D) Conscientiousness - That is the tendency to be thorough organised controlled, dependable and decisive. **E)** Neuroticism - That is the Tendency to be anxious, insecure, vurnerable, hostile & depressed.	
2.a	Emotional intelligence is concerned with our ability to understand emotions and apply this understanding to life's tasks. Specially emotional intelligence can be defined as the ability to perceive and reason with emotions & to effectively manage emotions within oneself and in relationship with others.	**03 Marks**
b.	Three skill Approach: Skills are what leaders Can accomplish, where as traits, are who leaders are,[i.e, their innate characteristics] Leadership skills are defined as the ability to use ones knowledge and Competencies to accomplish a set of goals or objectives. 1. Human Skill 2. Technical Skill 3. Conceptual Skill	**07 Marks**
c.	**Black and Moutan's managerial [leadership] grid** A: Authority compliance: B: Middle of the Road Management: C: Team Management: D: Paternalism / Maternalism: D: Opportunism:	**10 Marks** **02 marks for list and 08 marks for explanation**
3.a	Directive leadership is a task-oriented style in which the leader takes an active role in setting clear objectives and ensuring employees follow through on them. This type of leadership style is most effective when employees face ambiguous demands that are intrinsically satisfying the needs.	**3 Marks**
b.	Leadership style can be classified for further into 4 distinct categories of directive and supportive behaviours they are 1 high directive and low supportive: this style which is also called a directing style in this approach the leaders focuses communication on goal achievement and spends less time using supportive behaviour. 2 high directive and high supportive: in this approach the leader focuses communication on both achieving goals and meeting followers socio economic needs. 3high supportive and low directive style: in this approach the leaders does not	**7 Marks**

	focus exclusively on goals but user supportive behaviours that bring the soul followers skills around the goal to be accomplished. 4 lower supportive and lower directive: this style all are delegating approach in this approach the leader offers less goal in input and social support facilitating followers confidence and motivation in reference to the goal. The daily get if leaders lessens involvement in planning controlling of details and goal clarification. In this style it gives control of followers and reference from interviewing with unnecessary social support	
c.	Robert J. House, founder of Path-Goal theory, believes that a leader's behavior is contingent to employee satisfaction, employee motivation and employee performance. Path-Goal theory states that a good leader provides clear direction, sets high goals, gets involved in goal achievement and supports his employees  	**10 Marks 02 marks for chart and 8 marks for explanation**
4.a	Transformational leadership is defined as a leadership approach that causes change in individuals and social systems. In its ideal form, it creates valuable and positive change in the followers with the end goal of developing followers into leaders.	**3 Marks**
b.	Leader–member exchange (LMX) theory is a relationship-based, dyadic theory of leadership. According to this theory, leadership resides in the quality of the exchange relationship developed between leaders and their followers.	**7 Marks**



c. Transformational leadership is defined as a leadership approach that causes change in individuals and social systems. In its ideal form, it creates valuable and positive change in the followers with the end goal of developing followers into leaders.

10 Marks
02 marks for chart and 8 marks for explanation



5.a Authentic leadership is a type of management style in which people act in a real, genuine and sincere way that is true to who they are as individuals. Proponents of authentic leadership say this type of leader is best positioned to inspire trust, loyalty and strong performance from employees.

3 Marks

b. Hofstede's (1980) four dimensions of cross-cultural leadership: (a) power distance; (b) masculinity; (c) individualism; and (d) uncertainty avoidance contributed to House's (1993) twenty-year, cross-cultural GLOBE research project asserting that certain leadership styles such as transformational, servant and etc.

7 Marks
02 marks for list and 5 marks for explanation

c.	**Clusters of world culture-** Anglo. Latin Europe. Nordic Europe. Germanic Europe. Eastern Europe. Latin America. Middle East. Sub-Saharan Africa.	**10 Marks** **03 marks for list and 7 marks for explanation**
6.a	Ethical leadership is leadership that is directed by respect for ethical beliefs and values and for the dignity and rights of others. It is thus related to concepts such as trust, honesty, consideration, charisma, and fairness.	**3 Marks**
b.	**Ethical theories:** For the purpose of studying ethics and leadership ethical theories can be thoughtof as falling within two broad domains. Theories about leaders conduct and theories about leaders character our discussions about ethics and leadership will always fall within one of these two domains: conduct or character. Ethical theories that deal with the conduct of the leaders are in turn divided into two kinds namely theories that stress the consequences of leaders action and those that emphasise the duty or rules governing leaders actions. 1. Teleological theories 2. HEIFETZS Perspective on ethical leadership	**7 Marks**
c.	**The Ohio State University studies:** A group of researchers at Ohio State believed that the results of studying leadership as a personality trait secured fruitless and decided to analyse how individuals acted when they were leading a group of an organization. This analysis was conducted by having followers complete questionnaire about their leaders. The question is follow a set to identify the number of times their leaders engaged in certain types of behaviours. Research has found that the followers response on the questionnaire clustered around 2 general types of leader behaviours namely initiating structure and consideration & initiated structure behaviours r essentially task behaviours including such acts as organising work giving structure to the quite context defining role responsibilities and scheduling work activities.	**10 Marks**

7.a	The psychodynamic approach to leadership study and development focuses on the dynamics of human behaviour which are often the most difficult to understand. It acknowledges that people are complex, unique and paradoxical beings with rich and myriad motivational drivers, and decision-making and interaction patterns	3 Marks
b.	**Positive leader attributes:** Trustworthy, Just, Honest Foresight, Plans ahead, Encouraging Positive, Dynamic, Motgive arouser Confidence builder, Motivational, Dependable Intelligent, Decisive, Effective Bargainer Win-win problem solver, Communicative, Informed Administrative skilled, Coordinator, Team builder Excellence oriented **Negative leaders attributes** Loner, Asocial Irritable, Nonexplicit, Noncooperative Ruthless, Dictatorial, Egocentric	7 Marks
c.	Each successful leader develops a style based on their own personality, goals, and business culture based on one of these three leadership styles: autocratic, democratic, and laissez-faire. • Understanding an organization's mission, in alignment with one's strengths. • Creating a strategic plan in line with that mission. • Implementing goals and holding teams accountable for accomplishing those goals within an established timeline, and in alignment with the strategic plan	10 Marks
8. a.	Leadership styles Explanation	10 Marks
b.	Traits required for a Good Leader	10 Marks

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Department of MBA

First Semester Internal Assessment Test –I

Time: 90 Minutes 22MBA11-Principles of Management & Organizational Behaviour Date: 29.03.2023

Max marks: 50

Answer the following questions

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Management.	3M	L1	2
	b	Distinguish between Management & Administration.	7M	L2	2
	c	Explain the functions of Management.	10M	L2	2
2.	a	What is Planning?	3M	L1	2
	b	Explain the steps involved in Planning.	7M	L2	2
	c	Explain the various types of Plans.	10M	L2	2
3.	a	Explain the roles of Manager.	10M	L2	2

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DEPARTMENT OF MBA

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Answer the following questions

Q. No.		Questions	Marks	BT	CO's
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	C	Explain the functions of Management.	10M	L2	2
2.	A	What is Planning?	3M	L1	2
	B	Explain the steps involved in Planning.	7M	L2	2
	C	Explain the various types of Plans.	10M	L2	2
3.	A	Explain the roles of Manager.	10M	L2	2

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Department of MBA

Scheme of Evaluation – Internal Assessment I

Subject : Principles of Management & Organizational Behaviour	Code: 22MBA11
Max marks: 50	No Choice

Sl. No	Answer script	Marks
1.a	According to **F W Taylor**:- "Management is the art of knowing what you want to do and then seeing that it is done in the best and cheapest way." According to **Lawrence:-**"Management is the accomplishment of results through the efforts of other people."	03 Marks
b.	See table below	07 Marks

Basis	Management	Administration
Meaning	Management is an art of getting things done through others	Administration is concerned with formulation of plans
Nature/ Function	Executing Function	DecisionMaking Function
Skills	Technical & Human skills	Conceptual & Human skills
Area of operation	It works under administration.	It has full control over the activities of the organization.
Applicable to	Business concerns- Profit making organizations.	Non Business concerns- Government offices, military, clubs, business enterprises, hospitals, religious and educational organizations
Decides/ Process	Who will do the work? And How will it be done?	What should be done? And When is should be done?
Level	Middle Level and Low Level Management	TopLevel Management
Focus on	Managing work	Making best possible allocation of limited resources.

Key person	Manager	Administrator
Status	Management constitutes the employees of the organization who are paid remuneration in the form of salary and wage.	Administration represents owners of the enterprise who earn return on their capital invested and profits in the form of dividend.

c. **Functions of Management-**

Management is the process of Planning, organizing, Staffing, Directing and controlling the efforts of organizational members in utilizing all resources to achieve organizational goals and objectives. It includes-

1. Planning
2. Organizing
3. Staffing
4. Directing
5. Controlling

10 Marks

03 marks for listing and 07 marks for explanation

2.a Planning is a major and primary function of management. No organization can operate properly without planning. "Planning is deciding in advance **what to do, how to do it, when to do it and who is to do it**. It bridges the gap from where we are and to where we want to go. It is in essence the exercise of foresight".

Planning is a predetermined course of action to reach the goals and objectives of the organization.

03 Marks

b. The planning process is different from one plan to another and one organization to another. The steps generally involved in planning are as follows:

07 Marks

02 marks for listing and 05 marks for explanation

c. The process of planning may be classified into different categories on the following basis:

1. Functions
- a. Formal planning.
- b. Informal planning.

2. Duration of planning:
- a. Short term planning.
- b. Long term planning.

3. Levels of Management:
- a. Strategic planning.
- b. Intermediate planning.
- c. Operational planning.

4. Use:
- a. Standing plans
- b. Single-use plans.

10 Marks
03 marks for listing and 7 marks for explanation

3. a **MANAGERIAL ROLES or ROLES OF MANAGER**

A manager performs planning, organizing, directing and controlling to achieve the organizational objectives. It has been questioned whether these functions provide an adequate description of the management process. As against these management functions Henry Mintzberg has defined the role of managers to identify what managers do in the organizations. Mintzberg has identified ten roles of manager which are classified into three broad categories.

10 Marks
03 marks for listing and 7 marks for explanation

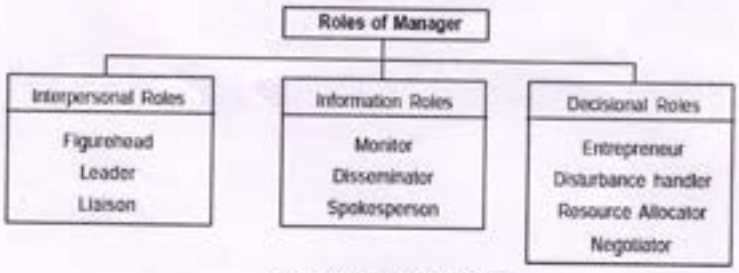

Fig. 1.1: Roles of manager

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DEPARTMENT OF MBA AY 2022-23

FIRST SEMESTER INTERNAL ASSESSMENT TEST -1

Duration: 1 ½ hours **Entrepreneurship Development -22MBA12** **Max. Marks: 50**

Answer the following questions **29/03/2023**

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Entrepreneurship.	3M	L1	1
	b	Discuss different sources of idea generation	7M	L2	1
	c	Explain the stages in entrepreneurial process.	10M	L2	1
2.	a	What is a business model	3M	L1	2
	b	Explain the importance and types of business model	7M	L2	2
	c	Illustrate Osterwalder Business model canvas with an example	10M	L2	2
3.	a	Explain the types of entrepreneurs.	10M	L2	1

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DEPARTMENT OF MBA AY 2022-23

FIRST SEMESTER INTERNAL ASSESSMENT TEST -1

Duration: 1 ½ hours Entrepreneurship Development -22MBA12 Max. Marks: 50

Answer the following questions 29/03/2023

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Entrepreneurship.	3M	L1	2
	b	Discuss different sources of idea generation	7M	L2	2
	c	Explain the stages in entrepreneurial process.	10M	L2	2
2.	a	What is a business model	3M	L1	2
	b	Explain the importance and types of business model	7M	L2	2
	c	Illustrate Osterwalder Business model canvas with an example	10M	L2	2
3.	a	Explain the types of entrepreneurs	10M	L2	1

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Scheme of Evaluation – I Internals

I Sem 22MBA12 : Entrepreneurship Development Max.Marks:50

Q.No	*Question and Answers*	*Marks*
1 a.	The concept of entrepreneurship is a complex phenomenon. Broadly, it relates to the entrepreneur, his vision and his implementation. The key player is the entrepreneur. Entrepreneurship refers to a process of action an entrepreneur (person) undertakes to establish his / her enterprise. It is a creative and innovative response to the environment.	3 marks
b.	THE VARIOUS SOURCE OF IDEAS GENUATION ARE: • Present and Potential Consumers • Exiting Companies • Raw Material Providers • Distributors and Retailers • Research and Develpopment • Existing Employees. • Existing Products and Services • Distribution Channels • Environment	7marks Listing: 2m Explana tion" 5m
C	• The process has five **distinct** phases: • Identification of the opportunity • Evaluation of the opportunity • Development of the business plan, • Determination of the required resources, • Management of the resulting enterprise.	Listing 3m Explana tion 7m
2 a	The term business model refers to a company's plan for making a profit. It identifies the products or services the business plans to sell, its identified target market, and any anticipated expenses. Business models are important for both new and established businesses. They help new, developing companies attract investment, recruit talent, and motivate management and staff. Established businesses should regularly update their business plans or they'll fail to anticipate trends and challenges ahead. Business plans help investors evaluate companies that interest them.	3 marks
B	The business model helps to target the customer base for the company. It helps in making marketing strategies, projection of revenues and expenses taking into account the type of Business models and clienteles. Models generally include information like products or services the business plans to sell, target markets, and any anticipated expenses. Every investor needs to review the business model in order to get knowledge about the company's competitive edge. Understanding the business model helps the investors to have a better sense of financial data. Evaluating the business model helps the investors to get the overall view about the company's products, its business strategies and future prospects.	7marks Listing: 2m Explana tion" 5m

C	1. Customer Segments This section contains the information related to the core target audience that you are selling towards. Simple and traditional segmentation analysis must be done to identify the top segments of the model. Start simple with questions like Which are the demographics of the major customer groups being targeted? Why are they going to be interested in the product or service? In essence, how well does the model comprehend who is being sold to? It is crucial that you identify clearly the segments as when facing reality, you will need to focus only in a few (1 or 2) to really test your model without a full operation in place. 2. Value Propositions Create a list of the unique business value propositions you will offer. Why is the idea or company valuable? What makes it stand above competitors? If there aren't any direct competitors, what gaps are being filled in given markets? This section could be extremely lengthy, depending on the business model, but should only contain the most central concepts at the heart of the model that attract customers or generate revenues. This section will contain the aspects of the business that relieves a customer pains. If you're struggling to identify what is most important, consider using a Value Proposition Canvas, another easy-to-visualize tool that helps establish your target audience with your strengths. Focus on solving a real pain for the segments identified, **3. Customer Relationships** The information of this section should refer to how to connect segments and the value proposition? During the analysis, you should be asking questions like How are customers convinced that your product or organization has the advertised special qualities? What methods are used to interact with them? How does an audience engage with each strategy in the product lifecycle? Additionally, how is customer engagement tracked? **4. Channels** Once the customer is convinced of the goods or services, how would you deliver it? This should include every step of the process it takes to make the financial transaction and value delivery possible. Is there a separate supplier? Who distributes the product? How is it displayed? Think about what the model requires from start to finish in order to make a sale. **5. Revenue Streams** If the customer connects with the product or service, and they want to proceed with doing business, then how does the actual exchange of money happen? How is the cash flow tracked? Are there any middlemen between the sale and the income to the business? **6. Key Activities** This section should include specific activities that the organization will do to create value. Unlike the Value Propositions, it's not just about a new product or business practice, but rather the day-to-day operations that each team will take. **7. Key Resources**	Listing 3m Explanation 7m

	Similar to Key Activities but focusing on assets that are used. Is there a special supplier? Is there access to any materials or a local storefront that puts you in an advantageous position? Do you have a special intellectual property or patent that introduces a new knowledge into the niche? **8. Key Partnerships** For areas that may be lacking, or areas that are too costly for the business to manage by itself, what can be outsourced to partners to focus on? Which areas would it be more cost efficient to hire from supporting businesses? Specifically, identify model strengths, maximize time and money on them, and move identified weaknesses to connected partners that can address them better or solve them altogether. **9. Cost Structure** Finally, what are the major expenses in the model? Are they a flat fee, or are they a variable cost? This may factor into previous sections, like key activities, resources, and partnerships. Additionally, how does this relate to the Revenue Streams? How will the predicted costs vs. the actual be monitored? Most importantly, what will be done if costs outweigh the incoming funds? Creating a Business Model Canvas involves analyzing each of these sections individually and as a whole, and connecting the dots between them.	
3a	**ACCORDING TO THE TYPE OF BUSINESS** 1) **Business entrepreneurs:-**who start business units after developing ideas for new products/services. 2) **Trading entrepreneurs** :-who undertake buying & selling of goods, but not engage in manufacturing. **iii)Corporate entrepreneurs**:-who establish and manage corporate form of organization which have separate legal existence. **iv)Agricultural entrepreneurs:-** who undertake activities like raising and marketing of crops, fertilizers and other allied activities. **i)First generation entrepreneurs**:-who do not possess any entrepreneurial background. They start industry by their own innovative skills. **ii)Second generation entrepreneurs**:-who inherit the family business and pass to next generation. **iii)Classical entrepreneurs**:-who aim to maximize economic returns at a level consistent with the survival of the unit with or without an element of growth. **i)Pure entrepreneurs:-**who are basically motivated to become entrepreneurs for their personal satisfaction and ego **ii)Induced entrepreneurs:-** who are induced to take up entrepreneurial role by the assistance and policy of government including incentives, subsidies etc.	3 marks

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Department of MBA

I Semester Internal Assessment Test -I

Accounting for Managers (22MBA13)

Time: 90 Minutes **Date: 30/03/2023**

Max marks: 50

Answer the following questions

Q. No.		Questions	Marks	BT	CO's
1.	a.	State different types of accounting.	3M	L1	CO1
	b.	Explain Accounting conventions in brief.	7M	L2	CO1
	c.	From the following transactions prepare in the Personal Account of Mr. Ananda and balance the amount at the end of each month. 2023 April 1 Sold goods to Mr. Anand 30000 3 Received from Mr. Anand 24550 and discount allowed him 50 12 Mr. Anand bought goods 7000 16 Received cash from Mr. Anand 5400 May - 1 Balance from last month 6000 2 Sold goods to Mr. Anand 7000 20 Received cash from Mr. Anand 5540 and discount allowed 60 30 Received cash 12950 in full settlement of account 13000	10M	L3	CO1

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2.	a.	What do you mean by accounting?	3M	L1	CO1
	b.	Explain briefly different concept of accounting.	7M	L2	CO1
	c.	Prepare a cash account from the following transactions 2023 March 2 Mr. Suman started a business with cash 50000 3 Paid into UTI Bank 20000 4 Purchased goods from Amrita for 17000 for cash 5 Sold goods for cash 23000 6 Purchased stationery for office use 8000 7 Sold goods to Aman 12000 16 Received from Aman 10000 22 Purchased furnitures for his house 5000 26 Received interest on investment 1200 29 Paid commission to Mr. Abraham 700	10M	L3	CO1
3.		Mr. Maruthy started business on Jan 1, 2023. Transactions during the month were as followes Jan 1 Invested in business 200000 Jan 2 Purchased goods from Nandan 55000 Jan 3 Sold goods to Vijay 5000 Jan 10 Paid Nandan on account 25000 Jan 15 Received from Vijay 30000 Jan 25 Withdrew cash for personal use 1200 Jan 31 Paid wages to Workers 35000 Journalise the above transaction.	10M	L3	CO1

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2.	a.	What do you mean by accounting?	3M	L1	CO1
	b.	Explain briefly different concept of accounting.	7M	L2	CO1
	c.	Prepare a cash account from the following transactions 2023 March 2 Mr. Suman started a business with cash 50000 3 Paid into UTI Bank 20000 4 Purchased goods from Amrita for 17000 for cash 5 Sold goods for cash 23000 6 Purchased stationery for office use 8000 7 Sold goods to Aman 12000 16 Received from Aman 10000 22 Purchased furnitures for his house 5000 26 Received interest on investment 1200 29 Paid commission to Mr. Abraham 700	10M	L3	CO1
3.		Mr. Maruthy started business on Jan 1, 2023. Transactions during the month were as followes Jan 1 Invested in business 200000 Jan 2 Purchased goods from Nandan 55000 Jan 3 Sold goods to Vijay 5000 Jan 10 Paid Nandan on account 25000 Jan 15 Received from Vijay 30000 Jan 25 Withdrew cash for personal use 1200 Jan 31 Paid wages to Workers 35000 Journalise the above transaction.	10M	L3	CO1

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Department of MBA

I Semester Internal Assessment Test -I

Accounting for Managers (22MBA13)

Q.No.	Answers	Marks
1.a.	• Financial Accounting • Cost Accounting • Management Accounting	3
b.	**Materiality:** The concept of materiality requires that accounting should focus on material facts. Efforts should not be wasted in recording and presenting facts, which are immaterial in the determination of income. The materiality of a fact depends on its nature and amount involved. Any fact would be considered as material if it is reasonable believed that its knowledge would influence the decision of informed user of financial statements. For example, money spent on creation of additional capacity of theatre would be a material fact as it is going to increase the future earning capacity of the enterprise. **Consistency:** The accounting information provided by the financial statements would be useful in drawing conclusions regarding the working of an enterprise only when it allows comparisons over a period of time as well as with the working of other enterprises. Thus, both inter-firm and inter-period comparisons are required to be made. This can be possible only when accounting policies and practices followed by enterprises are uniform and are consistent over the period of time. **Conservatism:** The concept of conservatism requires that profits should not to be recorded until realized but all losses; even those which may have a remote possibility are to be provided for in the books of account. Creating provision for doubtful cost or debts, discount on debtors: writing of intangible assets like goodwill, patents, etc. from the book of accounts are some of the examples of the application of account the principle of conservatism. **Full disclosure:** Information provided by financial statements are used by different groups of people such as investors, lenders, suppliers and others in taking various financial decisions. Financial statements, however, are the only or basic means of communicating financial information to all interested parties. It becomes all the more important, therefore, that the financial statements make a full, fair and adequate disclosure of all information which is relevant for taking financial decisions.	7
c.	Anand's A/c	10

Date	Particulars	JF	Amount	Date	Particulars	JF	Amount
2023				2023			
Apr. 1	To sales A/c		30000	Apr.3	By cash A/c		24550
12	To sales A/c		7000	3	By discount A/c		50
				16	By cash A/c		5400
				31	By balance c/d		7000
			37000				**37000**
May.1	To balance b/d		7000	May.20	By cash A/c		5540
2	To sales A/c		7000	20	By discount A/c		60
30	To balance c/d		4600	30	By cash A/c		12950
				30	By discountA/c		50

2.a.	Accounting is the process of systematic recording financial transactions pertaining to a business. According to **The American Accounting Association,** "Accounting is the process of identifying, measuring and communicating economic information to permit informed judgments and decisions by users of the information."	3

b.	**Business Entity Concept:** The concept of business entity assumes that business has a distinct and separate entity from its owners. It means that for the purposes of accounting, the business and its owners are to be treated as two separate entities. Keeping this in view, when a person brings in some money as capital into his business, in accounting records, it is treated as liability of the business to the owner. Here, one separate entity (owner) is assumed to be giving money to another distinct entity (business unit). Similarly, when the owner withdraws any money from the business for his personal expenses (drawings), it is treated as reduction of the owner's capital and consequently a reduction in the liabilities of the business. **Money Measurement Concept:** The concept of money measurement states that only those transactions and happenings in an organization which can be expressed in terms of money such as sale of goods or payment of expenses or receipt of income, etc., are to be recorded in the book of accounts. All such transactions or happenings which cannot be expressed in monetary terms, for example, the appointment of a manager, capabilities of Its human resources or creativity of its research department or image of the organization among people in general do not find a place in the accounting records of a firm. **Dual Aspect Concept:** This concept states that every transaction has a dual or two-fold effect and should therefore be recorded at two places. In other words, at least two accounts will be involved in recording a transaction. This can be explained with the help of an example. Ram started business by investing in a sum of 50,00,000. The amount of money brought in by Ram will result in an increase in the assets (cash) of business by 50,00,000. At the same time, the owner's equity or capital will also increase by an equal amount. It may be seen that the two items that got affected by this transaction are cash and capital account. **Assets = Liabilities + Capital** **Going Concern Concept:** The concept of going concern assumes that a business firm would continue to carry out its operations indefinitely, i.e. for a fairly long period of time and would not be liquidated in the foreseeable future. This is an important assumption of accounting as it provides the very basis for showing the value of assets in the balance sheet. **Accounting Period Concept:** Accounting period refers to the span of time at the end of which the financial statements of an enterprise are prepared, to know whether it has earned profits or incurred losses during that period and what exactly is the position of its assets and liabilities at the end of that period. The financial statements are, therefore, prepared at regular interval, normally after a period of one year, so that timely information is made available to the users. This interval of time is called accounting period. **Matching Concept:** The process of ascertaining the amount of profit earned or the loss incurred during a particular period involves deduction of related expenses from the revenue earned during that period. It states that expenses incurred in an accounting period should be matched with revenues during that period. It follows from this that the revenue and expenses incurred to earn these revenues must belong to the same accounting period. **Revenue Recognition (Realization) Concept:** The concept of revenue recognition requires that the revenue for a business transaction should be included in the accounting records only when it is realized. Revenue is assumed to be realized when a legal right to receive it arises, i.e. the point of time when goods have been sold or service has been rendered. Thus, credit sales are treated as revenue on the day sales are made and not when money is received from the buyer. As for the income such as rent, commission, interest, etc. these are recognized on a time basis. For example, rent for the month of **Cost Concept:** The cost concept requires that all assets are recorded in the book of account at their purchase price, which includes cost of acquisition, transportation installation and making the asset ready to use. **Accrual concept:** Financial position and profitability of a concern are assessed at a regular interval (i.e., on 31st March) called accounting period. While preparing Profit and Loss Account of a concern, all revenue items relating to that period are taken into consideration irrespective of the fact that whether these items are paid or payable (outstanding). **Legal aspect concept:** The accounting record should reflect the legal validity of the transaction entered in the books, where it is not possible, appropriate qualifying note should be made. For example, a firm should not say anybody as its debtors unless he is legally liable to pay to the firm.	7

c.

Cash A/c

Date	Particulars	JF	Amount	Date	Particulars	JF	Amount
2023				2023			
Mar.2	To Capital A/c		50000	Mar.3	By Bank A/c		20000
5	To Sales A/c		23000	4	By Purchase A/c		17000
16	To Aman's A/c		10000	6	By stationary A/c		8000
26	To Interest on investment		1200	22	By drawing's A/c		5000
	A/c			29	By commission A/c		700
				31	By balance c/d		33500
			82400				**84200**

10

3.

Journal Entries:

Date	Particulars	LF	Amount	Amount
2023				
Jan.1	Cash A/c		200000	
	To Capital A/c			200000
	[Being Invested in business]			
Jan.2	Purchase A/c		55000	
	To Nandan A/c			55000
	[Being Purchased goods from Nandan]			
Jan.3	Vijay A/c		5000	
	To Sales			5000
	[Being Sold goods to Vijay]			
Jan	Nandan A/c		25000	
10	To Bank A/c			25000
	[Being Paid Nandan on account]			
Jan	Cash A/c		30000	
15	To Vijay A/c			30000
	[Being Received from Vijay]			
Jan	Drawings A/c		1200	
25	To Cash A/c			1200
	[Being Withdrew cash for personal use]			
Jan	Wages A/c		35000	
31	To Cash A/c			35000
	[Being Paid wages to Workers]			

10

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Department of MBA

I Semester Internal Assessment Test -I

Statistics for Managers (22MBA14)

Time: 90 Minutes **Date: 30/03/2023**

Max marks: 50

Answer the following questions

Q. No.		Questions	Marks	BT	CO's
1.	a.	Define Statistics	3M	L1	CO1
	b.	Explain the Importance of statistics	7M	L2	CO1
	c.	Find the median for the following data	10M	L3	CO2

Mid Value (M)	115	125	135	145	155	165	175	185	195
Frequencies	6	25	48	72	116	60	38	22	3

2	a	What do you mean by arithmetic mean						3M	L1	CO1
	b.	For a certain frequency table, which has only been partly reproduced, here the mean was found to be 1.46. calculate the missing frequency, N=200						7M	L4	CO2

No.of Accidents	0	1	2	3	4	5
No.of Days	46	F1	F2	25	10	5

	c.	Calculate the mean for the following data.					10M	L3	CO2

Value	1	2	3	4	5
Frequency	10	15	10	9	5

P.T.O

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Time: 90 Minutes **Date: 30/03/2023**

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	b.	Explain the Importance of statistics	7M	L2	CO1
	c.	Find the median for the following data	10M	L3	CO2

Mid Value (M)	115	125	135	145	155	165	175	185	195
Frequencies	6	25	48	72	116	60	38	22	3

2	a	What do you mean by arithmetic mean						3M	L1	CO1
	b.	For a certain frequency table, which has only been partly reproduced, here the mean was found to be 1.46. calculate the missing frequency, N=200						7M	L4	CO2

No.of Accidents	0	1	2	3	4	5
No.of Days	46	F1	F2	25	10	5

	c.	Calculate the mean for the following data.					10M	L3	CO2

Value	1	2	3	4	5
Frequency	10	15	10	9	5

P.T.O

3.	a.	Find the 3rd quartile, 7th Decile and 84th percentile from the following data:								10M	L3	CO2
		Wages (Rs)	30-40	40-50	50-60	60-70	70-80	80-90	90-100			
		No.of persons	1	3	11	21	43	21	9			

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3.	a.	Find the 3rd quartile, 7th Decile and 84th percentile from the following data:								10M	L3	CO2
		Wages (Rs)	30-40	40-50	50-60	60-70	70-80	80-90	90-100			
		No.of persons	1	3	11	21	43	21	9			

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1

a] Define statistics.

The term statistics mean that the numerical statement as well as statistical methodology. when it is used in the sense of statistical data it refers to quantitative aspect of things and is a numerical description

The word statistics can be used in two senses i.e singular and plural. In plural sense it denotes some numerical data. In singular sense it refers to statistical method

b] Importance of statistics

✩ To collect the information and study the economic condition of people in the state

✩ To assess the resources available in states

✩ To help ~~statues~~ state to take decision on accepting or rejecting its policy based on statistics

✩ State Affairs

✩ Economics

✩ Business

✩ Education

✩ Accounts and Audits

Bagdn

Definations:

☆ "Statistics may be regarded as science of counting"
→ A L Bowley

☆ "Statistics is the science of estimates and probabilities"
→ Boddington

1
[C]

C.I	F	C.F
110- 120	6	6
120 130	25	31
130- 140	48	79
140 150	72	151
150- 160	116	267 → N/2
160-170	60	327
170- 180	38	365
180-190	22	387
190 200	3	390
	N: 390	

$\frac{N}{2} = \frac{390}{2}$ 195

$L = \frac{150 + 150}{2} = 150$

h: 116 N/2 - 195 c: 151 h: 10

median: L + h/F [N/2 - c]

: 150 + 10/116 [195-151]

: 153.8

2

A] Arithmetic mean

Arithmetic mean is also called as arithmetic average. It is most commonly used in measure of central tendency. Arithmetic average of a series is the value obtained by dividing the total value of various item by its number

C]

Value (x)	Frequency (f)	fx
1	10	10
2	15	30
3	10	30
4	9	36
5	5	25
	$\Sigma f = 49$	$\Sigma fx = 131$

$\bar{x} = \frac{\Sigma fx}{N} = \frac{131}{49} = 2.67$

3
b]

C.I	F	C.F
30-40	1	1
40-50	3	4
50-60	11	15
60-70	21	36
70-80	43	79 →
80-90	21	100 →
90-100	9	109

N: 109

3rd quartile

$L + h/f \left[\frac{3}{4} N - c\right]$

$\frac{3}{4} \times 109 = 81.75$

$80 + \frac{10}{21} [81.75 - 79]$

$= 80 + \frac{10}{21} \times 2.75$

$= 80 + 1.30$

81.30

7th Decile

$L + \frac{h}{f} \left[\frac{7}{10} N - c\right]$

$\frac{7}{10} \times 109 = 76.3$

$70 + \frac{10}{43} [76.3 - 36]$

$= 70 + 9.37$

$= 79.37$

84th percentile

$L + \frac{h}{F} \left[\frac{84}{100} N - c\right]$

$\frac{84}{100} \times 109 = 91.56$

$80 + \frac{10}{21} [91.56 - 79]$

$80 + \frac{10}{21} \times 12.56$

$80 + 5.98$

$= \underline{85.98}$

BxPb

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Department of MBA

First Semester Internal Assessment Test –I

22MBA15-Marketing management

Time: 90 Minutes **Date: 31.03.2023**

Max marks: 50

Answer the following questions

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Marketing	3M	L1	1
	b	Explain the functions of Marketing	7M	L2	2
	c	Differentiate between marketing and Selling	10M	L2	2
2.	a	What do you mean by Consumer Behaviour?	3M	L1	1
	b	Explain the evolution of Marketing	7M	L2	2
	c	Explain the factors influencing Consumer Buying behaviour	10M	L2	2
3.	a	Explain the Marketing environment	10M	L2	2

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Department of MBA

First Semester Internal Assessment Test –I

22MBA15-Marketing management

Time: 90 Minutes **Date: 31.03.2023**

Max marks: 50

Answer the following questions

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Marketing	3M	L1	1
	b	Explain the functions of Marketing	7M	L2	1
	c	Differentiate between marketing and Selling	10M	L2	1
2.	a	What do you mean by Consumer Behaviour?	3M	L1	2
	b	Explain the evolution of Marketing	7M	L2	1
	c	Explain the factors influencing Consumer Buying behaviour	10M	L2	2
3.	a	Explain the Marketing environment	10M	L2	1

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Department of MBA

First Semester Internal Assessment Test –I

22MBA16-Business Communication

Time: 90 Minutes **Date: 31.03.2023** **Max marks: 50**

Answer the following questions

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Communication?	3M	L1	1
	b	Explain the barriers of Communication	7M	L2	2
	c	Explain different types of communication	10M	L2	2
2.	a	What do you mean by oral communication?	3M	L1	1
	b	Explain different forms of oral communication?	7M	L2	2
	c	What do you mean by Conversation control? Explain the various business situation we need conversation control.	10M	L2	2
3.	a	Explain 7C's of communication?	10M	L2	2

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Department of MBA

First Semester Internal Assessment Test –I

22MBA16-Business Communication

Time: 90 Minutes Date: 31.03.2023 Max marks: 50

Answer the following questions

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Communication?	3M	L1	1
	b	Explain the barriers of Communication	7M	L2	2
	c	Explain different types of communication	10M	L2	2
2.	a	What do you mean by oral communication?	3M	L1	1
	b	Explain different forms of oral communication?	7M	L2	2
	c	What do you mean by Conversation control? Explain the various business situation we need conversation control.	10M	L2	2
3.	a	Explain 7C's of communication?	10M	L2	2

Faculty Signature HOD Signature Principal Signature

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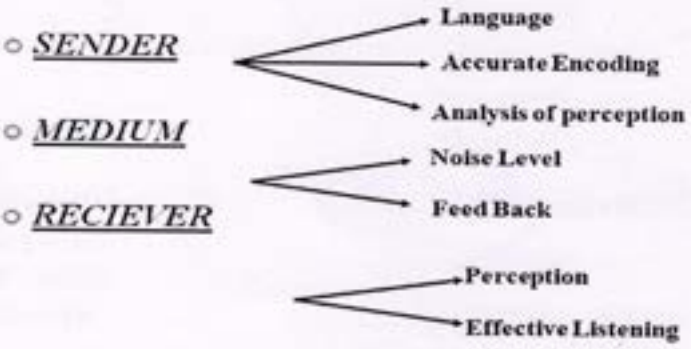
Sira Road, Tumakuru - 572 106. Karnataka. | Website: www.shridevi engineering.org

Department of MBA

Scheme of Evaluation – Internal Assessment I

Subject : Business Communication	Code: 22MBA16
Max marks: 50	No Choice
Faculty Name:	Mr. Praveen Kumar TM

Sl. No	Answer script	Marks
1.a	**Meaning of Communication**	03 Marks
b.	"Communication means to inform, tell, show, or spread information. It can be interpreted as an interchange of thought or information to bring about greater understanding and confidence".	
	BARRIERS TO COMMUNICATION	07 Marks



- Noise
- Lack of planning
- Wrong/unclarified assumptions
- Language barriers
- Socio-psychological barriers
- Emotions
- Information overload
- Loss by transmission
- Poor retention
- Poor listening

C.	**CLASSIFICATION OF COMMUNICATION** 1. Intrapersonal communication 2. Interpersonal communication 3. Group communication 4. Mass communication On the basis of the medium employed: 1). verbal communication 2). Non-verbal communication 3). Meta communication Also classified Formal or informal, upward, Downward, Lateral or diagonal communication.	**10 Marks** **03 marks for listing and 07 marks for explanation**
2.a	***Oral communication*** ❖ Oral communication also know as verbal communication, is the interchange of verbal messages between sender and receiver. ❖ More time talking than writing. ❖ Most oral communications are informal. ❖ Some are Formal i.e. meetings, telephone -conversation, dictation, speeches, oral reports.	**03 Marks**
b.	***Modes of Oral Communication*** ❖ Meetings ❖ Group discussion ❖ Seminars ,Workshops, Conferences ❖ Face to face interview ❖ Instructions ❖ Directions ❖ Demonstrations ❖ Negotiations ❖ Presentations ❖ Telephonic Conversation	**07 Marks** **02 marks for listing and 05 marks for explanation**
c.	***Conversation Control*** • The art of conversation consists in our ability to listen with concentration and reply well. • Conversation control involves skills listening and talking in a positive and meaningful way at an appropriate time. • It includes ◦ Techniques of changing the direction of conversation smoothly ◦ The ability to allow a discussion to develop along key	**10 Marks** **03 marks for listing and 7 marks for explanation**

	issues in an uninterrupted way towards the desired end ***Business situations requiring conversation control skills*** • How to sell or buy • How to negotiate • How to interview • How to participate in a meeting • How to disagree without being rude • How to protest without offending • How to compliment/praise • How to respond to personal criticism	
3. a	**Characteristics of Successful Communication/7C's of Communication** 1. Candidness 2. Clarity 3. Completeness 4. Conciseness 5. Concreteness 6. Correctness 7. Courtesy:	**10 Marks** **03 marks for listing and 7 marks for explanation**

Faculty Signature **HOD Signature** **Principal Signature**

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Department of MBA

First Semester Internal Assessment Test –II

Time: 90 Minutes 22MBA11-Principles of Management & Organizational Behaviour Date: 27.04.2023

Answer the following questions Max marks: 50

Q. No.		Questions	Marks	BT	CO's
1.	a	What is Unity of Command?	3M	L1	1
	b	Briefly Explain the types of Leadership Styles.	7M	L3	2
	c	Explain the Behavioral Theories of Leadership.	10M	L3	2
2.	a	Define Controlling.	3M	L1	2
	b	Explain the types of control.	7M	L2	2
	c	Explain the steps involved in Controlling..	10M	L2	2
3.	a	Explain the types of organizational structure.	10M	L2	2

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Department of MBA

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3.	a	Explain the types of organizational structure.	10M	L2	2

Faculty Signature HOD Signature Principal Signature

Department of MBA

Scheme of Evaluation – Internal Assessment II

Subject : Principles of Management & Organizational Behaviour	Code: 22MBA11
Max marks: 50	No Choice

Sl. No	Answer script	Marks
1.a	Unity of command means that an employee should receive orders from one superior only. In other words, it means that no employee should be subjected to the order of more than one superior. Thus, it stands for single boss for each person. Finally, the unity of command states that a person should report to only one manager. Without unity of command, conflicting demands from multiple bosses may create problems.	03 Marks
b.	**LEADERSHIP STYLES-** **Leadership styles** are the patterns of behavior which a leader adopts in influencing the behavior of his followers. ***I.* Autocratic Leadership Style/Authoritarian Leadership Style** An autocratic leader is one who dominates and drives his subordinates through coercion, command and the instilling of fear in his followers. An autocratic leader alone determines policies, plans and makes decisions. He demands strict obedience. Such leaders love power and love to use it for promoting their own ends. They never like to delegate their power for they fear that they may loose their authority. In Autocratic Leadership style where leaders makes all the decisions individually or without consulting employees. • All Decision Making powers are centralized in the leader. • They do not entertain any suggestions. • Subordinates expected to obey the orders without explanations.	07 Marks

2. Democratic Leadership Style /Participative Leadership Style

This style of leadership is also known as participative leadership. As the name itself indicates, in this style, the entire group is involved in goal setting and achieving it. A democratic leader follows the majority opinion as expressed by his group. Subordinates have considerable freedom of action. The leader shows greater concern for his people's interest, is friendly and helpful to them. He is always ready to defend their subordinates individually and collectively.

In Democratic Leadership style where a leader encourages employees to participate in Decision Making.

- Favour Decision Making by the group.
- Consultative Decisions-Process of consultation before decision is taken.
- Persuasive Decisions-Leader takes decisions and seeks to persuade others that the decision is correct.

3. Laissez Faire Leadership Style/Free-rein Leadership Style:

In this type of leadership, the leaders exercise absolutely no control. He only provides information, materials and facilities to his subordinates. This type of leadership is employee centered and the subordinates are free to establish their own goals and chart out the course of action. This type of leadership can be disaster if the leader does not know well the competence and integrity of his people and their ability to handle this kind of freedom.

In Laissez Faire Leadership style where employees are encouraged to make their own decisions with less supervision.

- A leader does not lead but leaves the group entirely to themselves.
- Allows maximum freedom to subordinates.

c. **Behavioral Theories of Leadership-**

In contrast with trait theory, behavioral theory attempts to describe leadership in terms of what leaders do, while trait theory seeks to explain

leadership on the basis of what leaders are. Leadership according to this approach is the result of effective role behavior. Leadership is shown by a person's act more than by his traits. This is an appropriate new research strategy adopted by Michigan Researchers in the sense that the emphasis on the trait is replaced by the emphasis in leader behavior (which could be measured).

Behavioral Leadership Studies-

- **The OHIO State Studies-** The Ohio State Studies sought to identify independent dimensions of leader behavior.

INITIATING STRUCTURE-The extent to which a leader is likely to define and structure his or her role and those of subordinates in the search for goal attainment.

CONSIDERATION-The extent to which a leader is likely to have job relationships characterized by mutual trust, respect for subordinates' ideas, and regards for their feelings.

- **THE UNIVERSITY OF MICHIGAN STUDIES-** The University of Michigan Studies sought to identify the behavioral characteristics of leaders related to performance effectiveness.

EMPLOYEE-ORIENTED LEADER- Emphasizing interpersonal relations; taking a personal interest in the needs of employees and accepting individual differences among members. Higher group productivity and job satisfaction.

PRODUCTION-ORIENTED LEADER- One who emphasizes technical or task aspects of the job. Lower group productivity and job satisfaction.

- **THE MANAGERIAL GRID (BLAKE AND MOUTON)-**

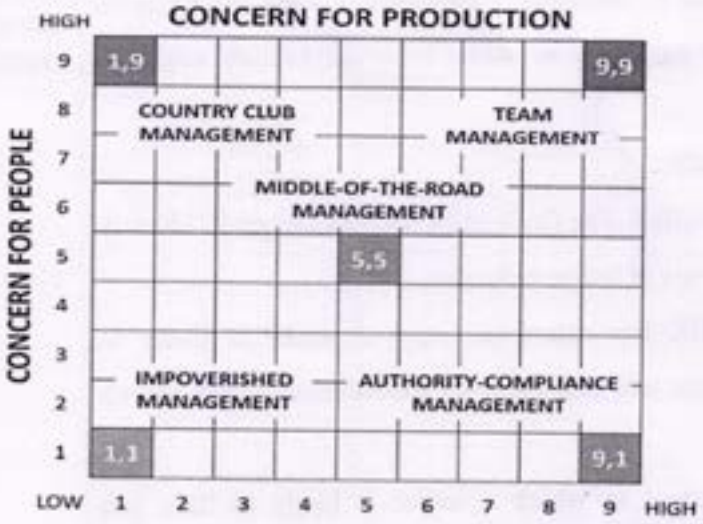
Blake and Mounton proposed a graphical portrayal of leadership styles through a managerial grid also known as leadership grid. The grid shows two dimensions-

- "concern for people" – accommodating people needs and giving them priority(on y axis)
- "concern for production"-keeping tight schedule(on x axis)

10 Marks

03 marks for chart and 07 marks for explanation

➢ The grid identifies five types of leaders: Impoverished, Produce or Perish, Middle of the Road, Country Club, and Team.



a. **Impoverished Management(1,1)-**
b. **Task Management(9,1)-.**
c. **Middle of the Road(5,5)-**
d. **Country Club(1,9)-**
e. **Team Management(9,9)-**

2.a

Meaning-The management process will be incomplete and become useless without the control function.

Control is a tool that helps an organization measures and compares its actual progress with the established plan. Thus, control ensures what is done is what is intended. It is to be exercised by everyone in the organization, from top level to bottom level.

03 Marks

b.

Types of control:

Controlling helps managers eliminate gaps between actual performance and goals. Control is the process in which actual performance is compared to company standards. Comparing this gives visibility to whether the activities are carried out according to the strategy. If this is not performed then necessary corrective action should be taken. The basic types of control are-

07 Marks

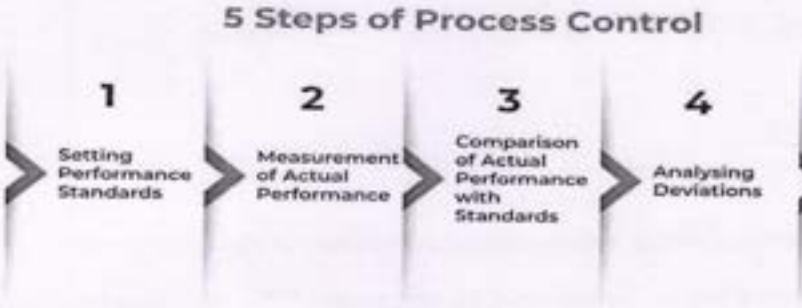
Feed forward control: the control which takes place before a work activity is done.

Concurrent control: control that takes place when a work activity is in progress.

Feedback control: control that takes place after a work activity is done.

STEPS IN A CONTROL PROCESS

c. ***There are 5 steps involved in controlling process are-***



10 Marks
02 marks for diagram and 7 marks for explanation

1. Setting Performance Standards

The first step of the process of controlling is to establish standards of performance against which the actual performance of the organisation is measured. An organisation should clearly define its standards to the employees and must establish attainable, understandable, and realistic standards to be achieved.

2. Measurement of Actual Performance

Once the organisation has established the standards, the second step of the process of controlling is to measure the actual performance in a reliable and objective manner. The actual performance of an organisation can be measured through different techniques such as sample checking, personal observation, etc., and should be measured in the same units in which the standards are fixed to make the comparison easy.

3. Comparison of Actual Performance with Standards

The third step of the process of controlling is to compare the actual performance of the organisation with the established standards (in the first step). By comparing the actual performance with the standards, an organisation can determine the deviation between them.

If the actual performance of the organisation matches with the set standards, then the controlling process ends after the third step, which means that everything is in control of the firm.

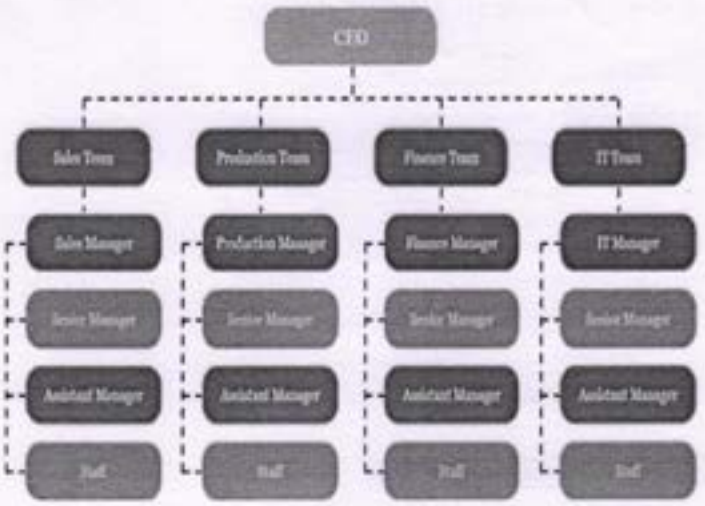
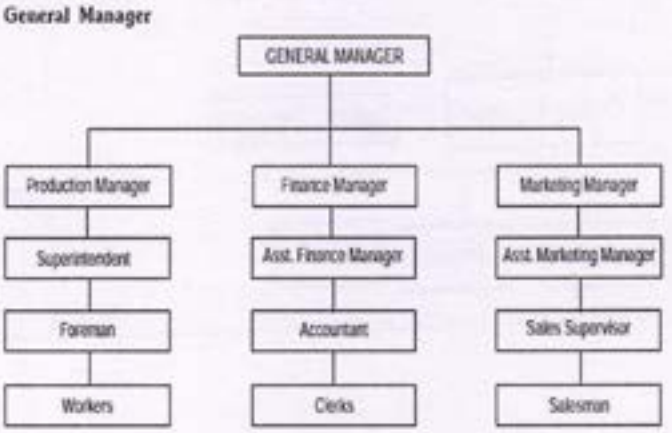
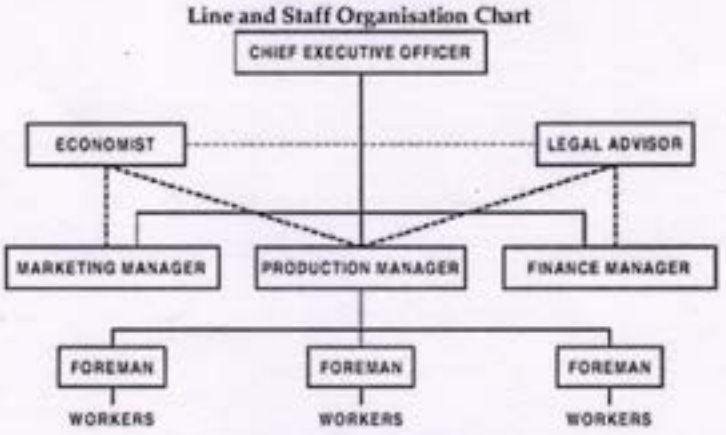
However, if the actual performance of the organisation does not matches with the set standards, then there are two more steps in the process.

4. Analysing Deviations.

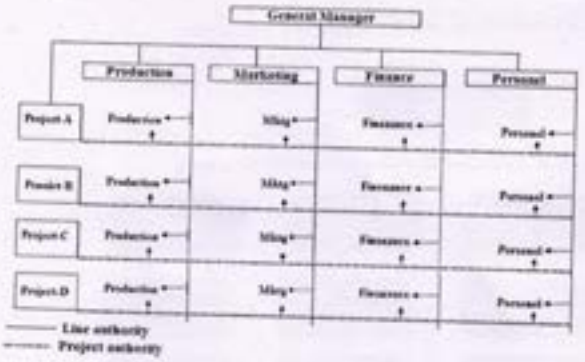
Once the organisation has identified the major deviations, it has to analyse its cause. A deviation in the performance of an organisation can be because of many reasons, such as faulty processes, unrealistic standards, business environment, etc. Therefore, it is essential for the organisation to identify the exact cause of the deviation so that proper and corrective measures can be taken for the same.

5. Taking Corrective Action

The last and final step of the process of controlling is to take corrective action. If the deviations are within the acceptable limits set by the managers, then there is no need to take corrective action. However, if the deviations go beyond the set acceptable limit in the key areas, then proper and immediate managerial actions are required. An organisation can easily rectify the defects in the actual performance through the corrective steps.

3. a	**TYPES OF ORGANIZATION STRUCTURE-** 1. Functional Organizational Structure  2. Line Organizational Structure **General Manager**  3. Line & Staff Organizational Structure **Line and Staff Organisation Chart**  *Note: Straight lines represent line and broken lines represent staff.*	**10 Marks** **02 marks each**

4. Matrix Organizational Structure



5. Committee Organizational Structure

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DEPARTMENT OF MBA AY 2022-23

FIRST SEMESTER INTERNAL ASSESSMENT TEST -2

Duration: 1 ½ hours Entrepreneurship Development -22MBA12 Max. Marks: 50

27/04/2023

Answer the following questions

Q. No		Questions	Marks	BT	CO's
1.	A	What do you mean by business angels?	3M	L1	3
	b	How an entrepreneur estimates the financial needs of a new Venture.	7M	L1	3
	C	Briefly Explain Mergers and Acquisitions as a New Venture Expansion Strategies of an entrepreneur.	10M	L2	3
2.	A	What is Incentive. Subsidy and Bounty?	3M	L1	4
	B	Explain the common incentives provided by the Government for industries	7M	L2	4
	C	Explain the support given by the government for the entrepreneurs.	10M	L2	4
3.	A	Explain how an entrepreneur prepares for the new venture launch, early management decisions and Manages early growth of the new venture	10M	L2	3

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Faculty Signature HOD Signature Principal Signature

Department of MBA

Scheme of Evaluation – II Internals

IISem22MBA26 : Entrepreneurship DevelopmentMax.Marks:50

Q.No	*Question and Answers*	*Marks*
1 a.	Business Angels An angel investor (also known as a private investor, seed investor or angel funder) is a high-net-worth individual who provides financial backing for small startups or entrepreneurs, typically in exchange for ownership equity in the company. Often, angel investors are found among an entrepreneur's family and friends. The funds that angel investors provide may be a one-time investment to help the business get off the ground or an ongoing injection to support and carry the company through its difficult early stages.	3 marks
b.	• 1. Type of Business • The amount of money you will need for a business depends to a large extent on the type of business you plan to venture into. Various businesses have different types of cost. An online business may not necessarily be as expensive as a store or production space. It's best to consider the industry you are planning to invest in. • 2. Research There is a need to make enquiries about competitors in the market. Search for financial statements of prominent brands in the industry so that you have an idea of how they started. Their costs may not exactly be similar to yours but it will be a helpful guide as to how to invest money. • 3. Determine Your Expenses • When you have educated yourself on what entails in the market, it's time to determine what you will be spending on. Starting a business comes with a lot of expenses. Some of these are one- time costs and others may be recurring expenses. Examples of one-time costs include: 4. Calculate your financial resources • When you have determined your expenses, then you can begin to calculate how much you would need to start your business. Use your research about the industry to determine the revenue you propose to generate within the starting months. Ensure you work with realistic numbers taking into consideration your own environment and expertise. Compare your findings with how much you have and how much you will need.	7marks Listing: 2m Explanation" 5m
C	**ACQUISITIONS** An acquisition is the purchase of a company or a part of it in such a way that the acquired company is completely absorbed and no longer exists. Acquisitions can provide an excellent way to grow a business and enter new markets. A key issue is agreeing on a price. • There are two basic forms of acquisitions: **Stock purchase** **Asset purchase** • **Flipkart and eBay India merger** • **Arcelor and Mittal Merger** **MERGER** • An acquisition is when a larger company acquires a smaller company, thereby absorbing the business of the smaller company. On the other hand, a merger describes two firms, of approximately the same size,	

	that join forces to move forward as a single new entity, rather than remain separately owned and operated. **Horizontal merger** **Vertical merger** **Congeneric merger** A **mixed conglomerate merger** **Market-extension merger** **Product-extension merger**	
2a	The term "incentive', generally means **encouraging productivity**. It is a motivational force, which encourages an entrepreneur to take a right decision and act upon it. **Subsidy**: Subsidy is a financial assistance or a sum of money provided by a government, to an industry for public welfare or interest. It is any financial aid, grant, or contribution. **Bounty**: The term "bounty" denotes a **bonus or financial aid** given to an industry to help it to compete with other units established in country or in a foreign market.	
B	**(i) Land: Every state offers developed plots for setting up of industries. The terms and conditions may vary. Some states don't charge rent in the initial years, while some allow payment in instalments.** **(ii) Power: Power is supplied at a concessional rate of 50%, while some states exempt such units from payment in the initial years.** **(iii) Water: Water is supplied on no-profit, no-loss basis or with 50% concession or exemption from water charges for a period of 5 years.** **(iv) Sales Tax: In all union territories, industries are exempted from sales tax, while some states extend the exemption for 5 years period.** **(v) Octroi: Most states have abolished octroi.** **(vi) Raw Materials: Units located in backward areas get preferential treatment in the matter of allotment of scarce raw materials like cement, iron and steel and so on.** **(vii) Finance: Subsidy of 10-15% is given for building capital assets. Loans are also offered at concessional rates.** **(viii) Industrial Estates: Some states encourage setting up of industrial estates in backward areas.** **(ix) Tax: Exemption from paying taxes for 5 or 10 years is given to industries established in backward, hilly and tribal areas.**	
C	• **Training:** Trainings aims at improving the entrepreneurial skills. Basic training varies from product to product but will necessarily emphasise on sharpening of entrepreneurial skills. • **Marketing Assistance** • Government and non government agencies provide marketing assistance to entrepreneurs. • Government promotes MSME products through exhibitions. • **The National Small Industries Corporation** (NSIC) directly markets the MSME products in the national and international market • **Promotional schemes**: • MSMEs are accorded highest priority.	

	For their development conducive policies and schemes are formulated and implemented
	• **Excise duty Concession**
	  • Government provides exemption to MSME units for a particular level of annual turnover from paying excise duty.
	  • The limit of turnover is variable.
	• **Credit facility**
	  • Credit to MSME sector is covered under priority sector lending by banks.
	Small industries development bank of India (SIDBI) is mainly responsible for implementing various schemes of providing financial support to small entrepreneurs	

3a	1)RECORD KEEPING 2) RECRUITING AND HIRING NEW EMPLOYEES 3) MOTIVATING AND LEADING THE TEAM 4) FINANCIAL CONTROL 5) LONG-TERM VS SHORT-TERM DEBT : 6) MANAGING COSTS AND PROFITS : 7) TAXES :- 8) RATIO ANALYSIS 9) RAPID GROWTH AND MANAGEMENT CONTROLS 10.CREATING AWARENESS OF THE NEW VENTURE	

Department of MBA

I Semester Internal Assessment Test -II

Accounting for Managers (22MBA13)

Time: 90 Minutes

Date: 28/04/2023
Max marks: 50

Answer the following questions

<table>
<tr><th colspan="2">Q. No.</th><th>Questions</th><th>Marks</th><th>BT</th><th>CO's</th></tr>
<tr><td>1.</td><td>a.</td><td>On the 1st March 2023, the books HMT discloses, the following position - Cash on hand, 20,000; Stock in hand 14,000; Premises worth 1,00,000; Creditors worth 40,000 and a Bank over draft of 11,000. You are asked to prepare Journal Proper account for HMT as on 1st of March 2023.</td><td>3M</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>Sreenivasa traders furnish the following information about their sales transactions and asked to prepare Subsidiary books.
Aug, 2020
1st goods sold to Shankar & Co., 30000
6th goods sold to Vikas and allowed 8% discount 40000
6th goods returned by Shankar due to damage 6000
16th sold goods to Amarnath subjected to 6% discount 50000
17th received a debit note from Vikas in respect of leakage of goods 1500
20th goods returned by Amarnath 1000</td><td>7M</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>c.</td><td>From the following data prepare comparative income statement and submit a report to the general manager, NSK Ltd., on your findings and suggestions.
<table>
<tr><th>Year</th><th>Net sales</th><th>Cost of goods sold</th><th>Operating expenses</th><th>Non-operating expenses</th><th>Non-operating Income</th><th>Taxes</th></tr>
<tr><td>2022</td><td>185400</td><td>78560</td><td>36450</td><td>12500</td><td>24000</td><td>12400</td></tr>
<tr><td>2023</td><td>194840</td><td>82640</td><td>38210</td><td>13800</td><td>32000</td><td>16500</td></tr>
</table></td><td>10M</td><td>L4</td><td>CO2</td></tr>
<tr><td>2.</td><td>a.</td><td>Calculate CA and CL if working capital is 240000 and Current ratio is 2.5</td><td>3M</td><td>L2</td><td>CO2</td></tr>
<tr><td></td><td>b.</td><td>From the following information, compute trend use 2020 as base amount in lakhs of Rupess for the year ended.
<table>
<tr><th>Particulars</th><th>2020</th><th>2021</th><th>2022</th><th>2023</th></tr>
<tr><td>Net sales</td><td>200</td><td>190</td><td>240</td><td>260</td></tr>
<tr><td>Cost of goods sold</td><td>120</td><td>117.8</td><td>139.2</td><td>145.6</td></tr>
<tr><td>Gross profit</td><td>80</td><td>72.2</td><td>100.8</td><td>114.4</td></tr>
<tr><td>Operating expenses</td><td>20</td><td>19.4</td><td>22</td><td>24</td></tr>
<tr><td>Net operating profit</td><td>60</td><td>52.8</td><td>78.8</td><td>90.4</td></tr>
</table></td><td>7M</td><td>L4</td><td>CO2</td></tr>
<tr><td></td><td>c.</td><td>Enter the following transactions in the three column cash book of Mr. Dev
2023 Mar.
1st Cash in hand 15,000
3rd Cash sales 3,000
4th Paid Babu 2,370 and discount received 30
8th Draw from bank for office use 1,500
15th Bought furniture and paid by cheque 3,500
20th Received commission 350
23rd Purchased from Joy and payment made by cheque 4,500
29th Received from Subir 3,950 in full settlement of debit 4,000</td><td>10M</td><td>L3</td><td>CO1</td></tr>
</table>

3		The following are the balance sheet of Archita Ltd. for the year 2022	10M	L3	CO2

Liabilities	2022	Assets	2022
Share capital	100000	Fixed assets	200000
Reserves	50000	Stocks	40000
Profit and loss	50000	Debtors	30000
8% debentures	50000	Cash	20000
Sundry creditors	40000	Prepaid	10000
Proposed dividend	10000	expenses	
	300000		300000

You are required to compute the following for the year 2022

a) Current ratio b) Acid test ratio

c) Proprietary ratio d) Fixed asset to shareholder's fund

Divya-S

Faculty Signature

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Department of MBA

I Semester Internal Assessment Test -II

Accounting for Managers (22MBA13)

Scheme of Valuation

Q. No. 1a. — Marks: 3M

Date	Particulars		LF	Debit	Credit
Mar. 1	Cash A/c	Dr		20000	
	Stock A/c	Dr		14000	
	Premises A/c	Dr		100000	
	To Creditors A/c				40000
	To Bank Overdraft A/c				11000
	To Capital A/c				83000
	(being the opening balances)				

Q. No. 1b. — Marks: 7M

Sales Book

Date	Particulars		Outward In. No.	LF	Amount
1.8.2020	Shankar & Co.				30000
6.8.2020	Vikas	40000			
	Less: Discount 8%	3200			36800
16.8.2020	Amarnath	50000			
	Less: Discount 6%	3000			47000
					113800

Sales Return Book

Date	Particulars	Credit Note No.	LF	Amount
6.8.2020	Shankar & Co.			6000
17.8.2020	Vikas			1500
20.8.2020	Amarnath			1000
				8500

Q. No. 1c. — Marks: 10M

Comparative Income Statement

Particulars	2022	2023	Increase or decrease	%
I. Revenue from Operation	106840	112200	+5360	5.02
II. Other Income:				
Non-operating income	24000	32000	+8000	33.33
III. Total Revenue (I+II)	130840	144200	+13360	10.21
a. Cost of material consumed	-	-	-	-
b. Employee benefit expenses	-	-	-	-
c. Finance Cost:				
Non-operating expenses	12500	13800	+1300	10.4
d. Depreciation and amortization	-	-	-	-
e. Other expenses:				

Operating expenses	36450	38210	+1760	4.83
IV. Total Expenses	48950	52010	+3060	6.25
V. Profit before tax	81890	92190	+10300	12.45
Less: Income tax	12400	16500	+4100	33.06
VI. Profit after tax	69490	75690	+6200	8.92

2. a. Current ratio = Current Assets / Current Liability => 2.5 = CA / CL — 3M

Working capital = CA – CL
240000 = CA – CL
240000 = 2.5CL – CL
240000 = 1.5CL
CL = 240000/1.5
Current Liability = 160000
CA = 2.5CL
CA = 2.5 * 160000
Current Assets = 400000

b. Trend Analysis — 7M

Particulars	2020	%	2021	%	2022	%	2023	%
I. Revenue from Operation	80	100	72.2	90.25	100.8	126	114.4	143
II. Other Income	-	-	-	-	-	-	-	-
III. Total Revenue (I+II)	80	100	72.2	90.25	100.8	126	114.4	143
IV. Expenses:								
a. Cost of material consumed	-	-	-	-	-	-	-	-
b. Employee benefit expenses	-	-	-	-	-	-	-	-
c. Finance Cost:	-	-	-	-	-	-	-	-
d. Depreciation and amortization	-	-	-	-	-	-	-	-
e. Other expenses:								
Operating expenses	20	100	19.4	97	22	110	24	120
Total Expenses	20	100	19.4	97	22	110	24	120
V. Profit before tax	60	100	52.8	88	78.8	131.33	90.4	150.6
Less:Tax	-	-	-	-	-	-	-	-
VI. Profit after tax	60	100	52.8	88	78.8	131.33	90.4	150.6

c. Three Column Cash Book — 10 M

Date	Particulars	R. No.	L F	Dis.	Cash	Bank	Date	Particulars	V. No.	L F	Dis.	Cash	Bank
2023							2023						
1.3	To bal B/d				15000		4	By Babu's			30	2370	
	To sales A/c				3000		8	By cash		c			1500
	To Bank A/c		c		1500		15	By furniture					3500
	To commission				350		23	By purchase					4500
	To Subir's A/c			50	3950		31	By balance				21430	
	To Balance c/d					9500		c/d					
				50	23800	9500					30	23800	9500

3. a.) Calculation of Current Ratio: — 10 M
Current ratio = CA/CL
Current Assets = Stock + debtors + cash + prepaid expenses
Current Assets = 100000
Current liabilities = creditors + proposed dividend
Current liabilities = 50000

Current ratio = 100000/50000 = 2 times

b.) Calculation of Acid test ratio
Acid test ratio = quick assets/ current liabilities
Quick assets = current assets – (stock + prepaid expenses)
Quick assets = 50000
Acid ratio = 50000/50000 = 1

c.) Calculation of fixed assets to share holder's fund ratio
Fixed assets to share holder's fund ratio = fixed assets / share holder's fund
Fixed assets = 200000
Share holder's fund = share capital + reserves + profits
Share holder's fund = 200000
Fixed assets to share holder's fund ratio = 200000/200000 = 1

d.) Calculation of proprietary ratio
Proprietary ratio = net worth / total assets
Proprietary ratio = 200000/ 300000 = 0.66:1

II nd Internal Assessment :-

1). Determine the two regression coefficients when $r = 0.8$, $\sigma x = 5$ $\sigma y = 7$.

→. $b_{xy} = r \frac{\sigma x}{\sigma y} = 0.8 \left(\frac{5}{7}\right) = 0.57$.

$b_{yx} = r \frac{\sigma y}{\sigma x} = 0.8 \left(\frac{7}{5}\right) = 1.12$

2). Explain different types of components of Time Series?

→ Components of Time Series:

This topic is about the Elements that Cause changes in a time series, also known as components of time Series.

1) Trend.
2) Seasonal Variations
3) Cyclic Variation
4) Random or Irregular movements.

1) The trend depicts the data's overall propensity to increase or decrease over a long period of time. A trend is an average, smooth, long-term tendency. It is not always necessary for the rise or drop to be in the same direction during a specific time period

Seasonal Variation: These are the rhythmic forces that work in a predictable pattern during a period of less than a year. Throughout a 12-month period, they have almost the same pattern. If the data is captured hourly, daily, weekly, quarterly, or monthly, this variable in the time series

3). Cyclic Variation: Cyclic variation are those fluctuations in a time series data that occur over a longer period of time, essentially more than a year. The cyclic action oscillates for a year. One era is made up of a cycle.

4) Irregular or Random Movements:

Another factor that contributes to the fluctuation in this variable under study. They are not regular variations. Unexpected, unmanageable, unpredictables, but erratic variations characterize these swings. Earthquakes, wars, floods, famines, and other natural disasters are examples of these forces.

3) Calculate Spearmen rank co-efficient b/w advt cost and sales for the following data.

advt cost (1000)	Sales (in lakh)	R_1	R_2	$d = R_1 - R_2$	d^2
89	47	8	10	2	4
65	53	6	8	2	4
62	58	7	7	0	0
90	86	2	2	0	0
82	62	3	5	2	4
75	68	5	4	1	1
25	60	10	6	4	16
98	91	1	1	0	0
36	51	9	9	0	0
78	84	4	3	1	1
				Σd^2	$\Sigma d^2 = 30$

$$= 1 - \frac{6\Sigma d^2}{n(n^2-1)}$$

$$1 - \frac{6 \times 30}{10((100-1)}$$

$$= 1 - \frac{180}{10(99)}$$

$$= 1 - \frac{180}{990}$$

$$= 1 - 0.1818$$

$$= -0.0182$$

2

a] Regression analysis is a statistical method that shows the relationship between two or more variable

Uses of Regression analysis

* Forecasting
* Time series modeling and finding the cause and effect relationship between variables

b]

Year	Sales	3-yr Avg
1993	102	$\frac{102+105+114}{3}$
94	105	$\frac{321}{3} = 107$
95	114	
96	110	
97	108	$\frac{108+116+112}{3}$
98	116	$= 112$
99	112	

$y = \beta + \beta_1$

or

$y = a + bx$

b: $\frac{\Delta \text{ change in sales}}{\Delta \text{ change in year}} = \frac{112 - 107}{1998 - 19994}$

$= \frac{5}{4}$

$= 1.25$

a: Base year → Avg yr

a: 107

$y = 107 + 1.25(x)$

$y = 107 + 1.25(8)$

$y = 107 + 10$

$y = 117$

∴ Sale of 2002 is "117"

c)

O.H (x)	cost (y)	$x - \bar{x}$ (120)	$y - \bar{y}$ (17)	x^2	y^2	xy
80	15	-40	-2	1,600	4	80
90	15	-30	-2	900	4	60
100	16	-20	-1	400	1	20
110	19	-10	2	100	4	-20
120	17	0	0	0	0	0
130	18	10	1	100	1	10
140	16	20	-1	400	1	-20
150	18	30	1	900	1	30
160	19	40	2	1,600	4	80
Total 1080	153			6,000	20	240

$\bar{x} = \frac{\Sigma x}{N} \quad \frac{1080}{9} = 120$

$\bar{y} = \frac{\Sigma y}{N} \quad \frac{153}{9} = 17$

$$\frac{\Sigma xy}{\sqrt{\Sigma x^2 \times \Sigma y^2}}$$

$$= \frac{240}{\sqrt{6,000 \times 20}}$$

$$= \frac{240}{\sqrt{1,20,000}}$$

$$= \frac{240}{346.41}$$

$$= 0.692$$

3 (b)

X	Y	$x = X - \bar{X}$	$y = Y - \bar{Y}$	xy	x^2	y^2
50	30	10	20	200	100	400
60	60	0	10	0	0	100
50	40	10	10	100	100	100
60	50	0	0	0	0	0
80	60	20	10	200	400	100
50	30	10	20	200	100	400
80	70	20	20	400	400	400
40	50	20	0	0	400	0
70	60	10	10	100	100	100
$\Sigma X = 540$	$\Sigma Y = 450$			$\Sigma xy = 1,200$	$\Sigma x^2 = 1,600$	$\Sigma y^2 = 1,600$

$\bar{X} = \frac{\Sigma X}{N} \quad \frac{540}{9} = 60$ | $\bar{Y} = \frac{450}{9} = 50$

$(x-\bar{x}) = b(y-\bar{y})$

$b = \frac{\Sigma xy}{\Sigma y^2} = \frac{1,200}{1,600}$

$= 0.75$

$(x-60) = 0.75(y-50)$

$(x-60) = 0.75y-37.5$

$x = 0.75y - 37.5 + 60$

$x = 0.75y + 22.5$

y on x

$(y-\bar{y}) = b(x-\bar{x})$

$(y-50) = 0.75(x-60)$

$y = 0.75x - 45 + 50$

$y = 0.75x + 5$

∴ when weekly sales is 1,000

$y = 0.75x + 5$

$y = 0.75(1,000) + 5$

$y = 750 + 5$

$y = 750$

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Department of MBA

First Semester *Internal Assessment Test –III*

Time: 3 Hrs **22MBA11-Principles of Management & Organizational Behavior** **Date: 09.06.2023**

Note-Answer any four full questions from Q.No 1 to 7 **Max marks: 100**

Q. No 8 is compulsory

Q. No.		Questions	Marks	BT	CO's
1.	a	Define Management.	3M	L1	1
	b	Distinguish between Management & Administration.	7M	L2	2
	c	Explain the functions of Management.	10M	L2	2
2.	a	What is Planning?	3M	L1	1
	b	Explain the various types of Plans.	7M	L2	2
	c	Explain the Roles of Manager.	10M	L2	2
3.	a	Define Controlling.	3M	L1	1
	b	Explain the steps involved in Controlling.	7M	L2	2
	c	Explain the types of organizational structure.	10M	L2	2
4.	a	Define Organizational Behavior.	3M	L1	2
	b	Explain the key elements of Organizational Behavior.	7M	L2	2
	c	Explain the approaches to Organizational Culture.	10M	L2	2
5.	a	What is Perception?	3M	L1	3
	b	Explain the types of Individual Behavior.	7M	L2	3
	c	Explain the MARS Model of Individual Behavior and Performance.	10M	L2	4
6.	a	Give the meaning of Personality.	3M	L1	3
	b	Explain Circumplex Model of Emotions.	7M	L2	4
	c	Explain the Theories of Motivation.	10M	L2	3
7.	a	What is Contingencies of Power?	3M	L1	2
	b	Explain the Stages of Team Development.	7M	L2	2
	c	Explain the models of Team Effectiveness.	10M	L2	4
8.		**Case Study:** Pramod is an engineer in a large design engineer's office. He hails from a poor, but disciplined family. The family has a rural background. For Pramod, it was "earn, while you learn" although till he graduated himself with architecture as his major. Pramod is intelligent, capable and hardworking. But his main fault is that, he does not want to take risks. He hesitates to make decisions by self and often brings Petty and routine problems to his boss or to peers			

		for decisions. Whenever he does a design job, he brings it in rough draft to boss for approval before finalising it. Since, Pramod is a capable person, his boss wants to motivate him to be more independent in his work. However, the boss is not sure how to go about motivating Pramod to take initiative in his work.			
		a. In the role of boss, plan how you will motivate Pramod. Give reasons.	10M	L4	3
		b. What are the conceptual issues behind this case study?	10M	L4	3

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Scheme of Evaluation – Internal Assessment III

Subject-Principles of Management and Organizational Behavior **Code-22MBA11**

Max Marks-100

Sl. No	Answer script	Marks
1.a	According to **F W Taylor**:- "Management is the art of knowing what you want to do and then seeing that it is done in the best and cheapest way." According to **Lawrence:-**"Management is the accomplishment of results through the efforts of other people."	03 Marks
b.		07 Marks

Basis	Management	Administration
Meaning	Management is an art of getting things done through others	Administration is concerned with formulation of plans
Nature/ Function	Executing Function	DecisionMaking Function
Skills	Technical & Human skills	Conceptual & Human skills
Area of operation	It works under administration.	It has full control over the activities of the organization.
Applicable to	Business concerns- Profit making organizations.	Non Business concerns- Government offices, military, clubs, business enterprises, hospitals, religious and educational organizations
Decides/ Process	Who will do the work? And How will it be done?	What should be done? And When is should be done?
Level	Middle Level and Low Level	TopLevel Management

		Management	
	Focus on	Managing work	Making best possible allocation of limited resources.
	Key person	Manager	Administrator
	Status	Management constitutes the employees of the organization who are paid remuneration in the form of salary and wage.	Administration represents owners of the enterprise who earn return on their capital invested and profits in the form of dividend.

c. **Functions of Management-** **10 Marks**

Management is the process of Planning, organizing, Staffing, Directing and controlling the efforts of organizational members in utilizing all resources to achieve organizational goals and objectives. It includes-

1. Planning
2. Organizing
3. Staffing
4. Directing
5. Controlling

02 marks for listing and 08 marks for explanation

2.a Planning is a major and primary function of management. No organization can operate properly without planning. "Planning is deciding in advance **what to do, how to do it, when to do it and who is to do it**. It bridges the gap from where we are and to where we want to go. It is in essence the exercise of foresight". **03 Marks**

Planning is a predetermined course of action to reach the goals and objectives of the organization.

b. The process of planning may be classified into different categories on the following basis: **07 Marks**

1. Functions
- a. Formal planning.
- b. Informal planning.

2. Duration of planning:
- a. Short term planning.
- b. Long term planning.

3. Levels of Management:
- a. Strategic planning.
- b. Intermediate planning.
- c. Operational planning.

4. Use:
- a. Standing plans
- b. Single-use plans

MANAGERIAL ROLES or ROLES OF MANAGER

10 Marks

c. A manager performs planning, organizing, directing and controlling to achieve the organizational objectives. It has been questioned whether these functions provide an adequate description of the management process. As against these management functions Henry Mintzberg has defined the role of managers to identify what managers do in the organizations. Mintzberg has identified ten roles of manager which are classified into three broad categories.

02 marks for chart and 08 marks for explanation

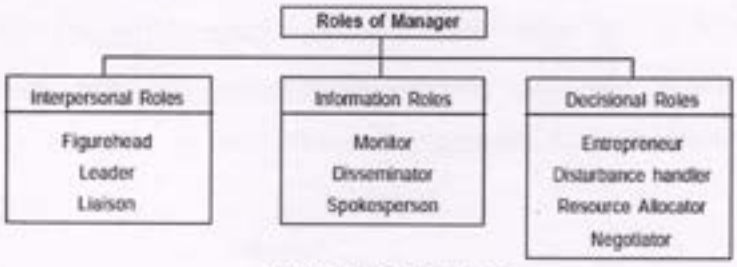


Fig. 1.1: Roles of manager

3.a **Definition** -The management process will be incomplete and become useless without the control function.

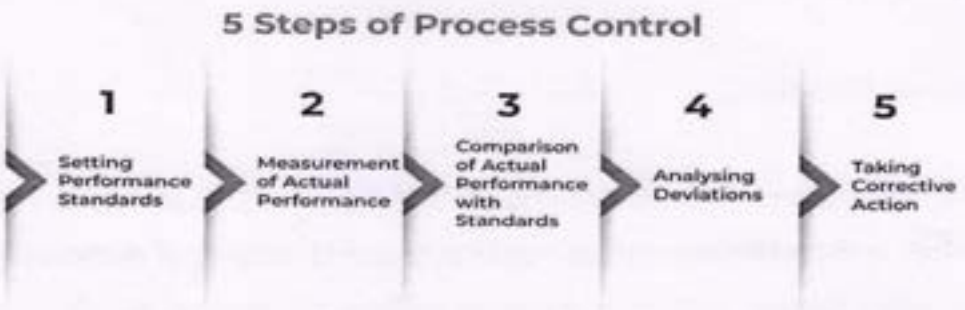
According to Knootz, "Control is a tool that helps an organization measures and compares its actual progress with the established plan. Thus, control ensures what is done is what is intended. It is to be exercised by everyone in the organization, from top level to bottom level".

3 Marks

STEPS IN A CONTROL PROCESS

There are 5 steps involved in controlling process are-

b.



7 Marks

1. Setting Performance Standards

The first step of the process of controlling is to establish standards of performance against which the actual performance of the organisation is measured. An organisation should clearly define its standards to the employees and must establish attainable, understandable, and realistic standards to be achieved.

2. Measurement of Actual Performance

Once the organisation has established the standards, the second step of the process of controlling is to measure the actual performance in a reliable and objective manner. The actual performance of an organisation can be measured through different techniques such as sample checking, personal observation, etc., and should be measured in the same units in which the standards are fixed to make the comparison easy.

3. Comparison of Actual Performance with Standards

The third step of the process of controlling is to compare the actual performance of the organisation with the established standards (in the first step). By comparing the actual performance with the standards, an organisation can determine the deviation between them.

If the actual performance of the organisation matches with the set standards, then the controlling process ends after the third step, which means that everything is in control of the firm.

However, if the actual performance of the organisation does not matches with the set standards, then there are two more steps in the process.

4. Analysing Deviations.

Once the organisation has identified the major deviations, it has to analyse its cause. A deviation in the performance of an organisation can be because of many reasons, such as faulty processes, unrealistic standards, business environment, etc. Therefore, it is essential for the organisation to identify the exact cause of the deviation so that proper and corrective measures can be taken for the same.

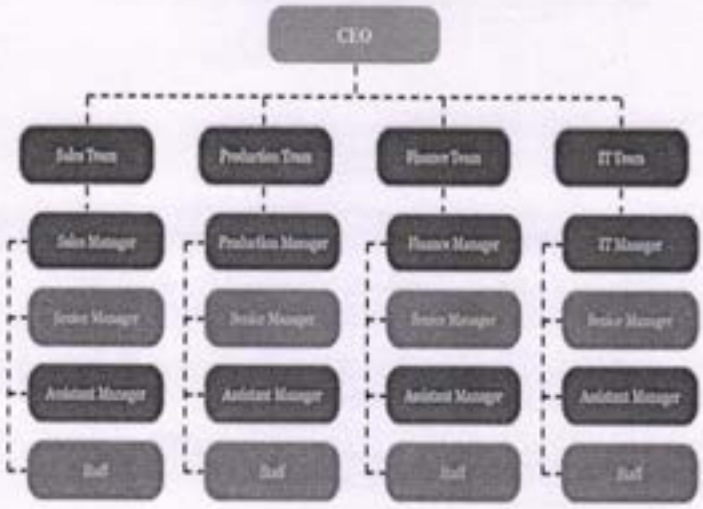
5. Taking Corrective Action

The last and final step of the process of controlling is to take corrective action. If the deviations are within the acceptable limits set by the managers, then there is no need to take corrective action. However, if the deviations go beyond the set acceptable limit in the key areas, then proper and immediate managerial actions are required. An organisation can easily rectify the defects in the actual performance through the corrective steps

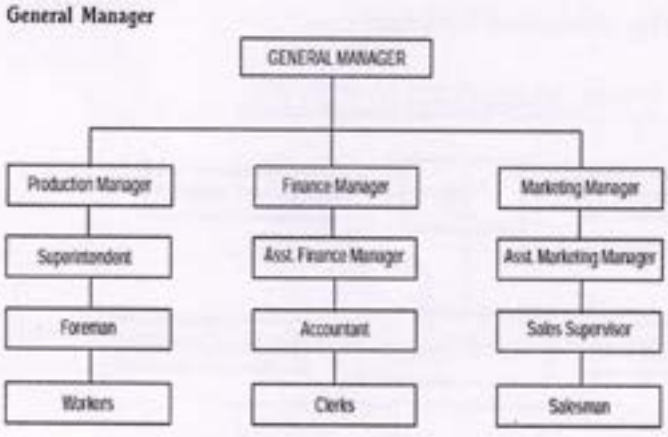
c.

TYPES OF ORGANIZATION STRUCTURE-

1. Functional Organizational Structure

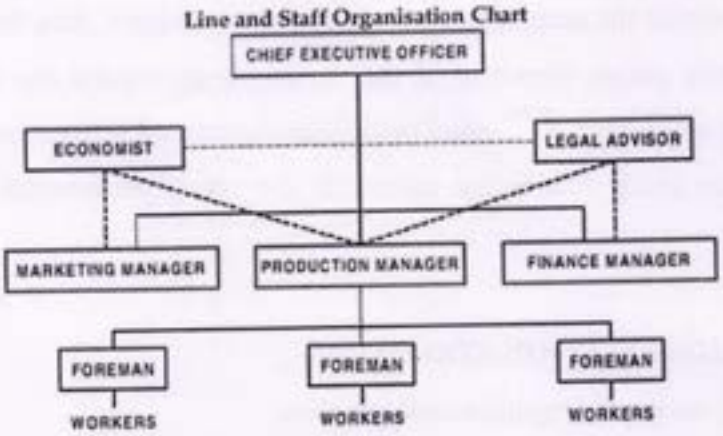


2. Line Organizational Structure



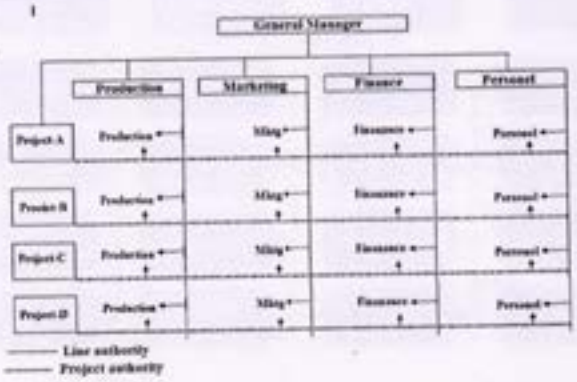
10 Marks 02 marks for diagram and 7 marks for explanation

3. Line & Staff Organizational Structure

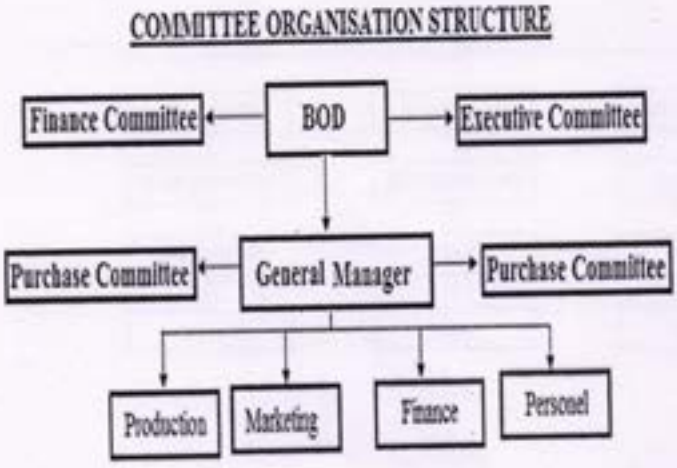


Note: Straight lines represent line and broken lines represent staff.

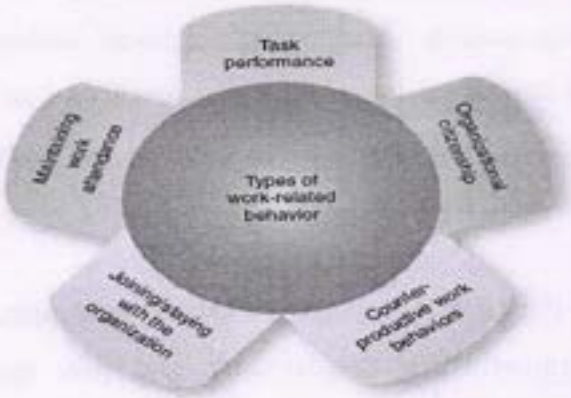
4. Matrix Organizational Structure

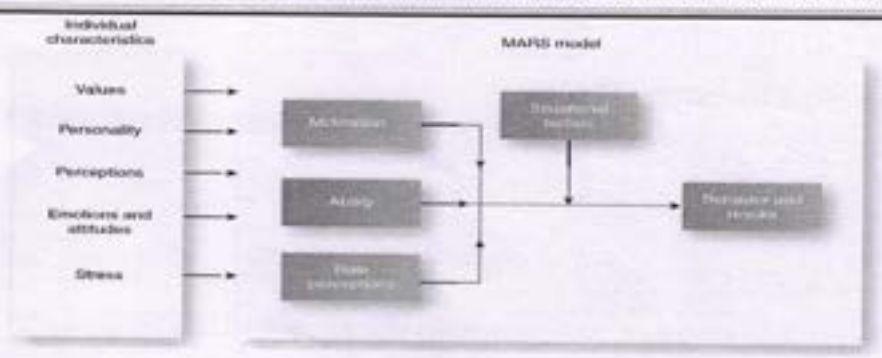


5. Committee Organizational Structure



4.a	In words of **Stephen P. Robbins,** "OB is a field of study that investigates the impact that individuals, groups and structures have on behaviour within organisations for the purpose of applying such knowledge towards improving an organisation's effectiveness." According to **L. M. Prasad,** "Organisational behaviour can be defined as the study and application of knowledge about human behaviour related to other elements of an organisation such as structure, technology and social systems."	**3 Marks**
b.	**Key Elements of organizational Behavior-** A study of organizational behavior simply involves analyzing the behavior of individuals within the organization. Management involves understanding and controlling human behavior in order to improve the performance of an organization. Through understanding organisational behavior, organisations can better understand the behavior of the people working with them. Organizational Behavior (OB) has four main elements.ie; **People, Structure, Technology and Environment.** When people come and join together in an organization to achieve or accomplish certain goals or objectives, some kind of structure is required and people use different techniques to get the job done properly. So, there is an interaction between elements; people, structure and technology which is influenced by the external environment.	**7 Marks**
c.	Approaches to Organizational Culture- 1. Action Research Approach 2. Appreciative Inquiry Approach 3. Large Group Intervention Approach 4. Parallel Learning Structure Approach.	**10 Marks 02 marks for listing and 8 marks for explanation**
5.a	**MEANING-**Perception is the process by which we organize and interpret our sensory impressions in order to give meaning to the environment.	**3 Marks**

	Perception is an intellectual process of transforming sensory stimuli to meaningful information. It is the process of interpreting something that we see or hear in our mind and use it later to judge and give a verdict on a situation, person, group etc.	
b.	**TYPES OF INDIVIDUAL BEHAVIOUR-** There are five types of individual behaviors that enable organization to interact with their environment; acquire share; and use knowledge to the best advantage and meet the needs of various stakeholder. Five type of individual behavior are Task performance, Organizational citizenship, Counterproductive work behaviors, joining and Staying with the organization, and Work attendance. 	**7 Marks**
c.	MARS Model seeks to explain individual behavior as a result of internal and external factors or influences acting together. The acronym MARS stands for Motivation, Ability, Role perceptions and Situational factors. All the above four factors are critical and influence the individual behavior and performance, if any one of them is low in a given situation the employee will perform poorly. These are seen as the four major factors in determining individual behavior and results.	**10 Marks 03 marks for diagram and 7 marks for explanation**

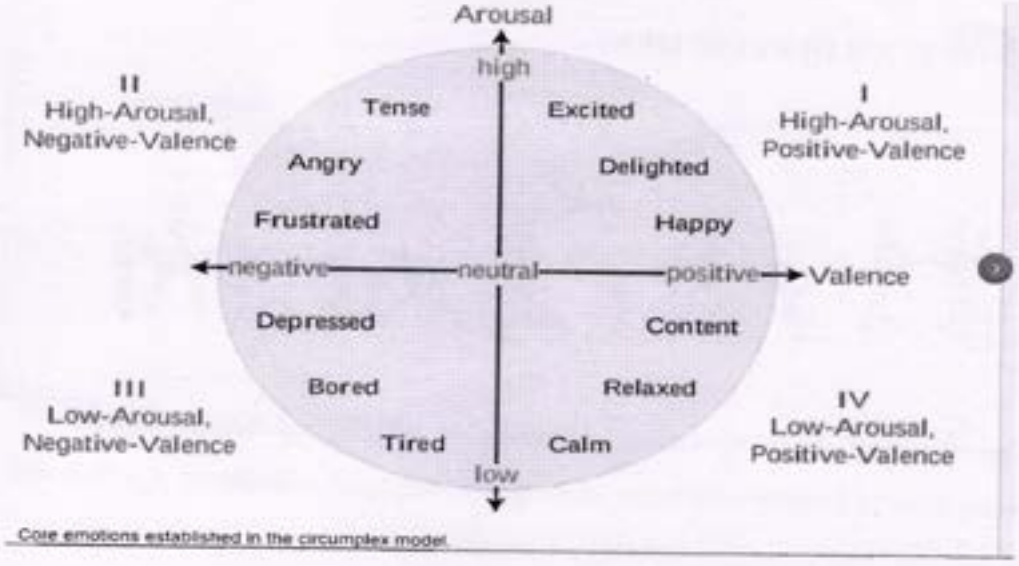


6.a Personality is the collection of all possible ways in which an individual reacts and communicates with others. **3 Marks**

Personality is the combination of characteristics or qualities that forms a person's unique identity.

b. **CIRCUMPLEX MODEL OF EMOTION-** **7 Marks**

- It is powerful tool for understanding and managing Emotions.
- By studying this model, one can identify emotions, understand their caused and regulate them.
- It was developed by Russell in 2003, by analyzing 2 fundamental dimensions-
  a. Valence(X-Axis)-The extent to which an emotion is positive or negative
  b. Arousal (Y-Axis)-A state in which the individual feel excited or very alert.
- Russell's model said that each emotion experience is the combination of Valence and Arousal.



Core emotions established in the circumplex model

c. **THEORIES OF MOTIVATION-** — **10 Marks, 5 Marks each**

1. **Maslow's Need Hierarchy Theory-**

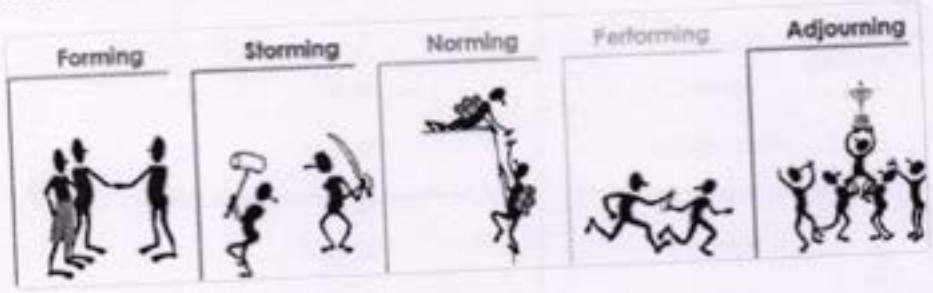
2. **Four Drive Theory of Motivation-**

- Drive A-Achieve & Acquire
- Drive B-Bond & Belong
- Drive C-Challenge & Comprehend
- Drive D-Define & Defend

7.a **CONTINGENCIES OF POWER-** — **3 Marks**

Power is translated into influence over organizational outcomes only under certain conditions called the contingencies of power, these four conditions are substitutability, centrality, discretion, and visibility.

b. **STAGES OF TEAM DEVELOPMENT-** — **7 Marks**



Team development is a procedure of bringing together different individuals, influencing them to interact with other, aiming at a team goal, working as a unit to sort out problems and lastly working towards a common target.

c.	**MODELS OF TEAM EFFECTIVENESS-** Team effectiveness models help us understand the best management techniques to get optimal performance from our teams. There are several critical factors to achieve maximum group effectiveness, as the seven models of team effectiveness- 1. Rubin, Plovnick, and Fry's GRPI Model of Team Effectiveness 2. The Katzenbach and Smith Model 3. The T7 Model of Team Effectiveness 4. The Hackman Model of Team Effectiveness 5. The LaFasto and Larson Model-	**10 Marks Each carries 2 marks**
8.	a. Roles of a Boss	**10 Marks**
	b. Conceptual Issues	**10 Marks**

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Department of MBA

First Semester Preparatory Examination **Date: 09/06/2023**

Time: 3 Hours **22MBA12-Entrepreneurship Development** **Max marks: 100**

Note: Answer any four full question from Q1 to Q7. Question No. 8 is Compulsory.

Q. No.		Questions	Marks	BT	CO's
1	a	Who is an entrepreneur?	3M	L1	1
	b	List the advantages and disadvantages of Digital Entrepreneurship.	7M	L4	6
	c	Explain the schemes provided by government of India for Indian entrepreneurs.	10M	L2	4
2	a	What is a Geographical Indication (GI)Tag?	3M	L1	5
	b	Interpret the reasons for low women Entrepreneurs in India.	7M	L2	4
	c	Identify the recent Emerging Trends in Entrepreneurship Development that has changed the way of carrying out business.	10M	L3	6
3	a	Differentiate between Business Model and Strategy.	3M	L4	2
	b	How IDBI and NABARD support the Entrepreneurs in creating their venture?	7M	L1	4
	c	Build Osterwalder Business Model Canvas with a neat sketch.	10M	L6	2
4	a	What is Digital Entrepreneurship?	3M	L1	6
	b	Illustrate the Entrepreneurial Process.	7M	L2	1
	c	Outline the procedure for obtaining Public Limited Company registration.	10M	L2	5
5	a	What do you mean by Business Angels?	3M	L1	3
	b	Discuss the Ethical Issues Faced by Entrepreneurs.	7M	L6	5
	c	Explain the Forms of business organization with its advantages and disadvantages.	10M	L2	3
6	a	What is Business Plan?	3M	L1	2
	b	What do you mean by Social Entrepreneur? Explain the types of Social Entrepreneur.	7M	L2	6
	c	Outline the steps in preparation of a financial plan.	10M	L2	3
7	a	What do you mean by Brain Storming.	3M	L2	1
	b	Explain the sources of creative ideas.	7M	L2	1
	c	Discuss the problems of rural entrepreneurship.	10M	L6	6
8		**Case Study** By July of 2011, Yun "Jack" Ma had achieved his goal of creating one of the world's leading e-commerce companies. Ma founded the Alibaba Group and took advantage of growing internet usage in China to launch the leading B2B, C2C and B2C sites in the country and capture a huge market. Despite his success, Ma had a troubled relationship with Yahoo!, the largest investor in the Alibaba Group. Ma's decision in January of 2011 to transfer Alipay (the Alibaba Group's online payment unit) from the Alibaba Group to a company under his personal control was just making matters worse.			
	a	Discuss the problem in this case.	M	L6	5
	b	What strategies could Jack Ma use to come out of the problem	7M	L1	10
	c	Bring out the recent trend in the business.	10M	L3	5

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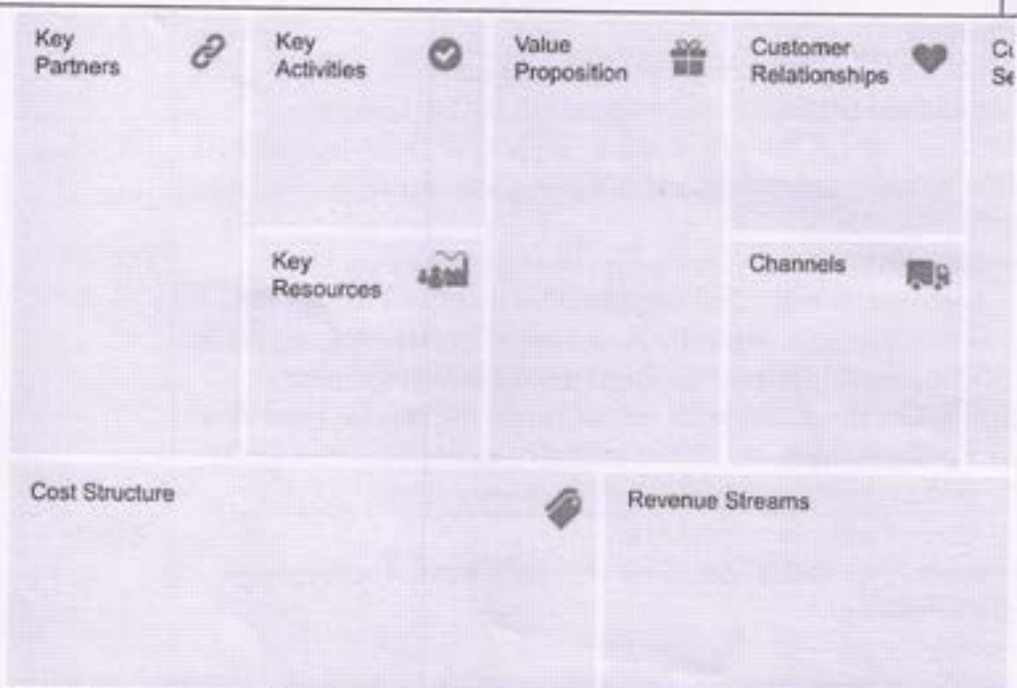
Department of MBA

Scheme of Evaluation Preparatory Examination

I Sem **22MBA12 : Entrepreneurship Development** **Max.Marks:100**

Q.No	*Question and Answers*	*Marks*
1 a	According to International Labor Organization "Entrepreneurs are people who have the ability to see and evaluate business opportunities; together with the necessary resources to take advantage of them; and to intimate appropriate action to ensure success".	3Marks
b	Advantages of Digital Entrepreneurship • Easy to Scale Business • Global Expansion • Working While Traveling Disadvantages of Digital Entrepreneurship • Adequate Skills and Training • Consumes lots of time • Tough Competition. • Privacy Problems	7Marks
c	1. Startup India Seed Fund 2. ATAL Innovation Mission 3. SAMRIDH Scheme 4. Pradhan Mantri Mudra Yojana 5. Startup India Initiative 6. ASPIRE 7 Ministry of Skill Development and Entrepreneurship 8. Drone Shakti 9. Design Clinic Scheme for Design Expertise 10. Sub-Mission on Agricultural Mechanization (SMAM)	10Marks
2a	**What is a Geographical Indication (GI)Tag?** A GI tag is a sign used on products that have a specific geographical origin and possess origin-based qualities and reputation in the region in mind that the characteristics, qualities, and popularity of the product should be essentially due to the place of origin. *Geographical indications tags are given to foodstuffs, handicrafts, industrial products, wine and spirit drinks, and agricultural products*	3Marks
b	**Reasons for low women Entrepreneurs** • Unconscious gender bias • Treated as having less Confidence in business skills • Access to finance • Networks and relationships • Family support • Child care • Safety in work and public spaces	7Marks
c	Recent trends in Entrepreneurship 1. Working from home and hybrid work	10Marks

	2. Mobile optimization 3. Increased diversity in the workforce 4. Market service 5. The rise of the gig economy 6. Long-term cash planning 7. Subscription-based businesses 8. Eco-friendly business practices and products	
3a	**Difference b/w Business Model and Strategy** • A business model is often mistaken for a business strategy. A firm must avoid using them interchangeably. • Creating value vs. capturing value – a business model aims at creating value. While it also includes how that value will be captured by the firm, a business strategy focuses on building a sustainable competitive advantage. • Business value vs. shareholder value – the business model is responsible for transformation of ideas into valuable outputs. However, the business model does not focus on delivering this value to the end customers, but a business strategy does. For example, business model does not elaborate on financing methods, but they affect the stakeholders' intentions. • Predetermined knowledge levels – the business model requires only a basic level of knowledge, whereas strategy involves application of conduct more than knowledge of the environment.	3Marks
b	IDBI was established on 1st July, 1964 under the industrial development bank of India act, as a wholly owned subsidiary of the reserve bank of India. The ownership of the IDBI has been transferred to the central govt. with effect from 16 February 1976. The IDBI has been assigned a special role to play in regard to industrial development. **OBJECTIVES AND FUNCTIONS** ➢ To serve as an apex institution for term finance for industry, to co-ordinate the working of institutions engaged in financing, promoting or developing industries & to assist in the development of these institutions. ➢ To plan, promote and develop industries to fill gaps in the industrial structure in the country. ➢ To provide technical and administrative assistance for promotion, management or expansion of industry. ➢ To undertake market and investment research & surveys as also technical & economics studies in connection with development of industry. ➢ The IDBI has been playing a significant role in the promotion of small scale industries. **National Bank for Agriculture and Rural Development** **OBJECTIVES** • More than 50% of the rural credit is disbursed by the co-operative banks and regional rural banks. NABARD is responsible for regulating and supervising the functions of co-operative banks and RRB's.	7Marks

	• Ø NABARD words towards providing a strong and efficient rural credit delivery system capable of taking care of the expanding and diverse credit needs of agriculture and rural development. **FUNCTIONS OF NABARD** CREDIT FUNCITONS • Ø Framing policy and guidelines for rural financial institutions. Ø Providing credit facilities to issuing organizations Ø Monitoring the flow of ground level rural credit. Ø Preparation of credit plans annually for all districts for identification of credit potential. DEVELOPMENT FUNCTIONS • Ø Help cooperative banks and regional rural banks to prepare department actions plans for themselves. • Help regional rural banks and the sponsor banks to enter into MOU with state governments and cooperative banks to improve the affairs of the regional rural banks. • Ø Monitor implementation of development action plans of banks. • Ø Provide financial support of the training institutes of cooperatives banks, commercial banks and regional rural banks. • Ø Provide financial assistance to cooperative banks for building improved management information system computerization of operations and development of human resources.	
c		10Marks
4a	Digital entrepreneurship can be defined as a method business owners use to change companies' working theory and practices by keeping technology in mind. It showcases the new processes that entrepreneurs can use for making their business digital. It includes a variety of things like cost-cutting, partnership opportunities, product designs, and many more.	3Marks
b	Entrepreneurial Process. **Identify of the Opportunity** **Developing a Business Plan** **Determine the Resources Required** **Manage the Enterprise**	7Marks
c	**Step 1:** It is necessary to meet all the legal requirements such as Number of	10Marks

	Directors, Number of shareholders, minimum paid-up share capital have been fulfilled. The further steps of registration will be completed only if this step is complete. **Step 2:** The next step is to obtain the DSC and DIN for the directors of the Company. Only a natural person can be a director not any individual or entities like the LLPs or Financial institutions. It is not necessary for the Director to be the shareholder of the Company. **Step 3:** To be recognized as a registered office it is necessary to have a proper address of the Company. The Registered office address has to be registered with the Registrar of Company under whose jurisdiction the office falls. This office address is to be entered correctly as all the correspondence related to business will be made to the registered office address. The registration fee will be dependent on the authorized capital of the company. **Step 4:** Before the procedure of registration, the name of the Company has to be approved by the ROC. For a Public Limited Company, the name must end with the word "Limited". This application will be filed in the RUN form of the Ministry of Corporate Affairs. It is better to provide a list of names in the order of preference, in case a particular name is not available. **Step 5:** Once the name of the Company has been approved the crucial documents of the Company that is the MoA and the AoA need to be executed. **Step 6:** Once the documents are prepared they need to be submitted to the ROC for verification. **Step 7:** Once the verification is done the ROC registers the company and issue the incorporation certificate along with the CIN of the Company. **Step 8:** The business cannot be started immediately after receiving the COI. The business has to apply for a certificate of commencement within 180 days of the COI stating that all the subscribers have paid the subscription money.	
5a	An angel investor (also known as a private investor, seed investor or angel funder) is a high-net-worth individual who provides financial backing for small startups or entrepreneurs, typically in exchange for ownership equity in the company. Often, angel investors are found among an entrepreneur's family and friends. The funds that angel investors provide may be a one-time investment to help the business get off the ground or an ongoing injection to support and carry the company through its difficult early stages	3Marks
b	• Ethical Issues Facing Entrepreneurs • Entrepreneurs face ethical questions on a daily basis. These springs from the following • relationships: • Between the company and the customers; • Between the company and its personnel and employees; • Between the company and its business associates; and • Between the company and the investors and the financial community.	7Marks
c	**Forms of business organization** **Sole Proprietorship** **Partnerships** 3. **Joint Venture** **Corporations** **Limited Liability Company (LLC)** **Cooperative Society**	10Marks

6a	Business plan is a road map for starting & running a business. Well crafted business plan identifies opportunities, scan the external& internal environment to access the feasibility of business & allocates resources in the best possible way, which finally leads to the success of the plan. It provides info to all concerned people like the venture capitalists and other financial institutions, the investors, the employer. It provides info about functional requirements (HR, MKTing, Operations, finance)	3Marks
b	Social Entreprenuers provide a solution to the problems of the society by their product or service. Pull Social Entrepreneur Push Rural	7Marks
c	**Preparation of a financial plan** **1) Operating And Capital Budgets** 2) Pro Forma Income Statements 3) Pro Form A Cash Flow	10Marks
7a	. A good brainstorming session starts with problem statement that is neither too broad (which would diversify ideas too greatly so that nothing specific would engage) nor too narrow(which would tend to confine responses), once the problem statement is prepared 6 to 12 individuals are selected to participate to avoid inhibiting responses, no group members should be recognized expert in the field of the problem, all ideas no matter how illogical must be recorded with participants probhibited from criticizing or evaluating during the brainstorming session	3Marks
b	The Various Source of Ideas: 1. Present and Potential Consumers 2. Exiting Companies 3. Raw Material Providers 4. Distributors And Retailers 5. Research And Develpopment 6. Existing Employees. 7. Existing Products And Services 8. Distribution Channels 9. Environment	7Marks
c	**Problems of rural entrepreneurship** 1.Financial Constraints 2.Lack of technical know-how 3.Lack of training services 4.Management problems 5.Lack of quality control 6.Lack of communication and marketing information 7.Poor quality of raw materials 8. Lack of storage and warehousing facilities 9.Lack of latest technology 10.Lack of promotional strategy	10Marks
8a	Marks will be based on justification and analysis of the case	20marks

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Department of MBA

I Semester Preparatory Exam

Accounting for Managers (22MBA13)

Time: 3 Hours **Date: 08/06/2023**
Max marks: 100

Note: 1. ***Answer any FOUR full questions from Q. No. 1 to Q. No. 7***
2. ***Question No. 8 is compulsory***

Q. No.		Questions	Marks	BT	CO's
1.	a.	What do you mean by Forensic Accounting?	3M	L2	CO3
	b.	From the following transactions prepare purchase returns book. 6th July 2021 — Returned goods worth 10,000 to Mahima & Co., 12th July 2021 — Allowances claimed from Binoy, Calicut for damage of goods 9,000 19th July 2021 — Returned goods to Prakash worth 4,000 24th July 2021 — Allowances claimed from Ajaykumar 20,000	7M	L3	CO1
	c.	Journalise the following transactions in the books of Mr. Sudhir January 2023 1st Mr. Sudhir started business with capital 500000 5th Paid into Bank 60,000 7th Brought goods from Prashanth 50,000 12th Sold goods to Raman 90,000 15th Drew for office use 12,000 20th Bought office furniture 15,000 22th Paid rent 3,500 27th Returned goods to Prashanth 1,000 30th Bank charges 500 31st Bank allowed interest on deposit 600	10M	L3	CO1
2.	a.	What is comparative statement?	3M	L2	CO2
	b.	From the following transactions, prepare Cash Book 2021 July 1st Balance of Cash at the beginning 20,000 5th Sold goods worth of 14,000 to Mr. Asok for cash. 6th Sold goods worth of 20,000 to Mr. Bisu for credit. 10th Purchased goods 16,000 from Mr. Teetu on credit 16th Purchased goods 10,000 from Mr. Daud. 20th Paid Commission 1,200 20th Received Commission 1,400 25th Paid Rent 2,000 28th Paid to Mr. Emon on Account 17,000	7M	L3	CO1
	c.	The following are the balance sheet of Archita Ltd. for the year 2022 and 2023	10M	L4	CO2

Liabilities	2022	2023	Assets	2022	2023
Share capital	100000	100000	Fixed assets	200000	230000
Reserves	50000	50000	Stocks	40000	60000
Profit and loss	50000	100000	Debtors	30000	60000
8% debentures	50000	80000	Cash	20000	30000
Sundry creditors	40000	50000	Prepaid	10000	20000
Proposed dividend	10000	20000	expenses		
	300000	400000		300000	400000

You are required to compute the following for the year 2022 and 2023
a) Current ratio
b) Acid test ratio
c) Proprietary ratio
d) Fixed asset to shareholder's fund

3	a.	State different types of Accounting.	3M	L1	CO1
	b.	Distinguish between tax planning and tax evasion.	7M	L2	CO3
	c.	Explain briefly different concepts of Accounting.	10M	L2	CO1
4	a.	Calculate current assets and current liabilities, when current ratio is 3:1 and working capital is 50000	3M	L2	CO2
	b.	Following is the details of M/s BSL as on 31-03-2022. You are required to prepare the common size income statement for the year ending 31-3-2022 and 31-3-2023 and comment on the financial position of the concern.	7M	L3	CO2
	c.	From the following transactions prepare BRS as on 31.08.2023 a. Bank balance as per cash book 8000 b. Cheques of 1000, 2000 and 3000 issued on 8th, 10th and 13th of August of these a cheque issued on 10th only presented for payment till 31st August c. Interest and dividend collected by the banker on 25th August and informed the customer on 1st of September 500 d. Cheques of 3300 deposited into bank of which a cheque of 2300 only collected in August. e. A cheque of 2000 received and deposited in cash book but not sent to bank till 31st f August f. The following entries found in pass book only i. Interest on bank balance 250 ii. Electricity bill paid 400 iii. Commission charged 50	10M	L4	CO2
5	a.	State the meaning of IFRS.	3M	L1	CO1
	b.	What is window dressing? Mention various ways of window dressing	7M	L2	CO3
	c.	From the following transactions prepare in the Personal Account of Mr. Ananda and balance the amount at the end of each month.	10M	L3	CO1
6	a.	State the steps of accounting process.	3M	L1	CO1
	b.	From the following ledger balances, prepare trial balance as on 31st March 2023	7M	L3	CO1

Particulars	31-3-2022	31-3-2023
Sales	350000	450000
Cost of goods sold	275000	400000
Operating expenses	11000	22500
Office expenses	4500	15000
Selling expenses	2500	3000
Distribution expenses	1250	1000
Financial expenses	10000	12500
Tax rate	35%	35%

2023 April	1	Sold goods to Mr. Anand 30000
	3	Received from Mr. Anand 24550 and discount allowed him 50
	12	Mr. Anand bought goods 7000
	16	Received cash from Mr. Anand 5400
May -	1	Balance from last month 6000
	2	Sold goods to Mr. Anand 7000
	20	Received cash from Mr. Anand 5540 and discount allowed 60
	30	Received cash 12950 in full settlement of account 13000

Cash in hand	1700
Capital	23000
Furniture	13000
Telephone charges	1800
Sales	15500
Advertisement	6800
Purchases	10000
Office equipment	1500
Creditors	34600
Drawings	1450
Discount	100
Salaries	1200
Rent	3600

		Discount allowed 50 Commission earned 300 Sundry debtors 33400 Interest on investment 1000			
	c.	Prepare income statement of Srinivas Ltd. for the period of 31st March 2023, from the following information Revenue from sales 878240 Cost of goods sold 597400 Operating expenses : Selling expenses 104600 Administrative expenses 49000 Interest 9400 Tax 52000	10M	L3	CO3
7	a.	What do you mean by accounting?	3M	L1	CO1
	b.	Glory Co. Ltd. had profits of 360000 for the year ended 31.3.2023 after adjusting the following: a. Depreciation on machinery 30000 b. Goodwill written off 10000 c. Loss on sale of buildings 5000 d. Details of current assets and current liabilities	7M	L4	CO2
	c.	On 1-4-2007, a firm bought a machinery costing 80,000 and spent 20,000 for its Carriage and Installation Charges. On 1-4-2009, another additional machinery costing 40,000 was purchased and spent 10,000 for transportation. On 1-10-2009, the firm sold the machinery purchased on 1-4-2009 for 80,000. On 1-4-2010, the firm purchased machinery for 50,000. Depreciation is charged at 10% per annum under diminishing balance method. Prepare the necessary ledger accounts for 5 years.	10M	L3	CO1
8	a.	The following is the trail balance of Ramson Limited as on March 31, 2023.	20M	L4	CO3

Particulars	2022	2023
Stock	140000	170000
Cash	130000	100000
Debtors	110000	90000
Creditors	90000	100000
O/s rent	10000	5000
Bills Receivable	90000	110000
Bills payable	80000	70000

Calculate cash from Operating activity.

Particulars	Debit	Credit
Stock	125000	
Sales		400000
Purchases	345000	
Wages	50000	
Discount	7000	5000
Salaries	7500	
Rent	4950	
General expenses including insurance	17050	
Profit and loss account		15030
Dividend paid	9000	
Capital (10000 shares of 10 each)		100000
Debtors and creditors	37500	17500
Machinery	29000	
Cash in hand	16200	
Reserve fund		115500
Bad debts	4830	
Total	653030	653030

Prepare income statement for the year ended 31.03.2023 and a balance sheet on that date after taking into account the following:

a. Stock – 300000

		b. Purchases include 5000 for machinery purchase on 1.10.2022 c. On 31.03.2023 goods worth 30000 were sold to a customer. E has taken away the goods but the transaction was not entered in the sales book. d. Directors want to provide 1) 10% final dividend 2) income tax 30000 3) reserve fund 20000			

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ESTD: 2002

Department of MBA

I Semester Preparatory Exam

Accounting for Managers (22MBA13)

Scheme of Valuation

Time: 3 Hours

Date: 08/06/2023
Max marks: 100

Q. No. 1.a.

Answers

When all Journal entries have been posted into Ledger, the every transaction has been entered twice in the Ledger. This statement is called the Trial Balance. If the accounts are properly maintained, then no error is committed in totaling. Thus, Trial balance may be the total balance of a list of debit and credit of all the Ledger Accounts which prepared on any particular period.

According to J. R. Batliboi, "Trial Balance is a statement, prepared with the debit and credit balance of ledger account to test the arithmetical accuracy of the books".

Marks: 3

b.

Date	Particulars	Debit note No.	LF	Amount
6th July	Mahima & Co.			10000
12th July	Binoy			9000
19th July	Prakash			4000
24th July	Ajya Kumar			20000
	Total			43000

Marks: 7

c. **Journal Entries:**

Date	Particulars	LF	Amount	Amount
2023 Jan.1	Cash A/c			
	To Capital A/c		500000	
	[Being Invested in business]			500000
Jan.5	Bank A/c			
	To Cash A/c		60000	
	[Being amount paid to Bank]			60000
Jan.7	Purchase A/c			
	To Prashanth A/c		50000	
	[Being purchase of goods from Prashanth]			50000
Jan 12	Raman A/c			
	To Sales A/c		90000	
	[Being goods sold to Raman]			90000
Jan 15	Cash A/c			
	To Bank A/c		12000	
	[Being draw for office use]			12000
Jan 20	Furniture A/c			
	To Cash A/c		15000	
	[Being purchase of Furniture]			15000

Marks: 10

Jan 22	Rent A/c To Cash A/c [Being Paid rent]			3500	3500	
Jan 27	Prashanth A/c To purchase return A/c [Being goods returned]			1000	1000	
Jan 30	Bank Charges A/c To Bank A/c [Being bank charges]			500	500	
Jan 31	Bank A/c To interest A/c [Being bank allowed interest on deposit]			600	600	

2.a. Under this method the financial statements of the different period of the same concern will be compared in order to derive significant change in the financial and profitability position of the concern. It denotes the changes (i.e. increase or decrease) in the financial figures between two or more years, in terms of money value and as well as in term of percentages. In other words, they are those financial statements which summarizes and present relative accounting data for a number of years, incorporating therein the changes in individual items of accounting figures. **3**

b. **7**

Cash Book

Date	Particulars	R. No.	L F	Amount	Date	Particulars	V. No.	L F	Amount
2020 July					2020 July				
1	To balance b/d			20000	20	By purchase			10000
5	To sales A/c			14000	25	By commission			1200
20	To commission			1400	28	By rent			2000
					31	By Emon's			17000
						By balance c/d			5200
				35400					35400

c. **10**

a.) Calculation of Current Ratio:
Current ratio = CA/CL
Current Assets = Stock + debtors + cash + prepaid expenses
Current Assets = 100000
Current liabilities = creditors + proposed dividend
Current liabilities = 50000
Current ratio (2022)= 100000/50000 = **2 times**
Current ratio (2023) = **2.43 times**

b.) Calculation of Acid test ratio
Acid test ratio = quick assets/ current liabilities
Quick assets = current assets – (stock + prepaid expenses)
Quick assets = 50000
Acid ratio(2022) = 50000/50000 = **1**
Acid ratio(2023) = **1.28**

c.) Calculation of fixed assets to share holder's fund ratio
Fixed assets to share holder's fund ratio = fixed assets / share holder's fund
Fixed assets = 200000

	Share holder's fund = share capital + reserves + profits Share holder's fund = 200000 Fixed assets to share holder's fund ratio (2022)= 200000/200000 = **1** Fixed assets to share holder's fund ratio (2023)= **0.92** d.) Calculation of proprietary ratio Proprietary ratio = net worth / total assets Proprietary ratio(2022) = 200000/ 300000 = **0.66:1** Proprietary ratio (2023)= **0.62**	
3.a.	• Financial Accounting • Cost Accounting • Management Accounting	**3**
b.	**Materiality:** The concept of materiality requires that accounting should focus on material facts. Efforts should not be wasted in recording and presenting facts, which are immaterial in the determination of income. The materiality of a fact depends on its nature and amount involved. Any fact would be considered as material if it is reasonable believed that its knowledge would influence the decision of informed user of financial statements. For example, money spent on creation of additional capacity of theatre would be a material fact as it is going to increase the future earning capacity of the enterprise. **Consistency:** The accounting information provided by the financial statements would be useful in drawing conclusions regarding the working of an enterprise only when it allows comparisons over a period of time as well as with the working of other enterprises. Thus, both inter-firm and inter-period comparisons are required to be made. This can be possible only when accounting policies and practices followed by enterprises are uniform and are consistent over the period of time. **Conservatism:** The concept of conservatism requires that profits should not to be recorded until realized but all losses; even those which may have a remote possibility are to be provided for in the books of account. Creating provision for doubtful cost or debts, discount on debtors: writing of intangible assets like goodwill, patents, etc. from the book of accounts are some of the examples of the application of account the principle of conservatism. **Full disclosure:** Information provided by financial statements are used by different groups of people such as investors, lenders, suppliers and others in taking various financial decisions. Financial statements, however, are the only or basic means of communicating financial information to all interested parties. It becomes all the more important, therefore, that the financial statements make a full, fair and adequate disclosure of all information which is relevant for taking financial decisions.	**7**
c.	**Business Entity Concept:** The concept of business entity assumes that business has a distinct and separate entity from its owners. It means that for the purposes of accounting, the business and its owners are to be treated as two separate entities. Keeping this in view, when a person brings in some money as capital into his business, in accounting records, it is treated as liability of the business to the owner. Here, one separate entity (owner) is assumed to be giving money to another distinct entity (business unit). Similarly, when the owner withdraws any money from the business for his personal expenses (drawings), it is treated as reduction of the owner's capital and consequently a reduction in the liabilities of the business. **Money Measurement Concept:** The concept of money measurement states that only those transactions and happenings in an organization which can be expressed in terms of money such as sale of goods or payment of expenses or receipt of income, etc., are to be recorded in the book of accounts. All such transactions or happenings which cannot be expressed in monetary terms, for example, the appointment of a manager, capabilities of Its human resources or creativity of its research department or image of the organization among people in general do not find a place in the accounting records of a firm. **Dual Aspect Concept:** This concept states that every transaction has a dual or two-fold effect and should therefore be recorded at two places. In other words, at least two accounts will be involved in	**10**

recording a transaction. This can be explained with the help of an example. Ram started business by investing in a sum of 50,00,000. The amount of money brought in by Ram will result in an increase in the assets (cash) of business by 50,00,000. At the same time, the owner's equity or capital will also increase by an equal amount. It may be seen that the two items that got affected by this transaction are cash and capital account.

Assets = Liabilities + Capital

Going Concern Concept: The concept of going concern assumes that a business firm would continue to carry out its operations indefinitely, i.e. for a fairly long period of time and would not be liquidated in the foreseeable future. This is an important assumption of accounting as it provides the very basis for showing the value of assets in the balance sheet.

Accounting Period Concept: Accounting period refers to the span of time at the end of which the financial statements of an enterprise are prepared, to know whether it has earned profits or incurred losses during that period and what exactly is the position of its assets and liabilities at the end of that period. The financial statements are, therefore, prepared at regular interval, normally after a period of one year, so that timely information is made available to the users. This interval of time is called accounting period.

Matching Concept: The process of ascertaining the amount of profit earned or the loss incurred during a particular period involves deduction of related expenses from the revenue earned during that period. It states that expenses incurred in an accounting period should be matched with revenues during that period. It follows from this that the revenue and expenses incurred to earn these revenues must belong to the same accounting period.

Revenue Recognition (Realization) Concept: The concept of revenue recognition requires that the revenue for a business transaction should be included in the accounting records only when it is realized. Revenue is assumed to be realized when a legal right to receive it arises, i.e. the point of time when goods have been sold or service has been rendered. Thus, credit sales are treated as revenue on the day sales are made and not when money is received from the buyer. As for the income such as rent, commission, interest, etc. these are recognized on a time basis. For example, rent for the month of

Cost Concept: The cost concept requires that all assets are recorded in the book of account at their purchase price, which includes cost of acquisition, transportation installation and making the asset ready to use.

Accrual concept: Financial position and profitability of a concern are assessed at a regular interval (i.e., on 31st March) called accounting period. While preparing Profit and Loss Account of a concern, all revenue items relating to that period are taken into consideration irrespective of the fact that whether these items are paid or payable (outstanding).

Legal aspect concept: The accounting record should reflect the legal validity of the transaction entered in the books, where it is not possible, appropriate qualifying note should be made. For example, a firm should not say anybody as its debtors unless he is legally liable to pay to the firm.

4.a.

$$\text{Current ratio} = \frac{\text{Current Assets}}{\text{Current Liability}} \Rightarrow 3 = \frac{CA}{CL}$$

Working capital = CA – CL

50000 = CA – CL

50000 = 3CL – CL

50000 = 2CL

CL = 50000/2

Current Liability = 25000

CA = 3CL

CA = 3 * 25000

Current Assets = 75000

3

b.

Particulars		2022	%	2023	%
I.	Revenue from operations	75000	21.43	50000	11.11
II.	Other Incomes	-	-	-	-
III.	Total Revenue (I+II)	75000	21.43	50000	11.11
IV.	Expenses				
	a) Cost of raw material consumed	-	-	-	-
	b) Employees benefit expenses	-	-	-	-
	c) Finance cost	10000	2.86	12500	2.78
	d) Depreciation and amortization	-	-	-	-
	e) Other expenses				
	Operating expenses	11000	3.14	22500	5.00
	Office expenses	4500	1.29	15000	3.33
	Selling expenses	2500	0.71	3000	0.67
	Distribution expenses	1250	0.36	1000	0.22
	Total Expenses (a+b+c+d+e)	29250	8.36	54000	12
V.	Profit Before Tax (III – IV)	45750	13.07	-4000	-0.89
	Less: Tax	16012.5	4.58		
	Profit for the year	29737.5	8.50	-4000	-0.89

c. Bank Reconciliation Statement

Particulars	Amount	Amount
Balance as per cash book		8000
Add:		
- Cheque issues but not presented	4000	
- Interest collected only credited in pass book	500	
- Interested on bank balance	250	
		4750
		12750
Less:		
- Cheques deposited	1000	
- Cheques received but not sent	2000	
- Electricity bills paid	400	
- Commission charges	50	
Balance as per pass book		3450
		9300

10

5.a. International Financial Reporting Standards (IFRS) are a set of international accounting standards stating how particular types of transactions and other events should be reported in Financial Statements. IFRS are issued by the International Accounting Standards Board. The goal with IFRS is to make international comparisons as easy as possible. This is difficult because, to a large extent, each country has its own set of rules. For example, U.S. GAAP is different from Canadian GAAP Synchronizing accounting standards across the globe is an ongoing process in the international accounting community.

3

b. Trend Analysis

Particulars	2020	%	2021	%	2022	%	2023	%
I. Revenue from Operation	80	100	72.2	90.25	100.8	126	114.4	143
II. Other Income	-	-	-	-	-	-	-	-
III. Total Revenue (I+II)	80	100	72.2	90.25	100.8	126	114.4	143
IV. Expenses:								
a. Cost of material consumed	-	-	-	-	-	-	-	-
b. Employee benefit expenses	-	-	-	-	-	-	-	-
c. Finance Cost:	-	-	-	-	-	-	-	-
d. Depreciation and	-	-	-	-	-	-	-	-

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c. Finance Cost:	-	-	-	-	-	-	-	-
d. Depreciation and amortization	-	-	-	-	-	-	-	-
e. Other expenses:								
Operating expenses	20	100	19.4	97	22	110	24	120
Total Expenses	20	100	19.4	97	22	110	24	120
V. Profit before tax	60	100	52.8	88	78.8	131.33	90.4	150.6
Less:Tax	-	-	-	-	-	-	-	-
VI. Profit after tax	60	100	52.8	88	78.8	131.33	90.4	150.6

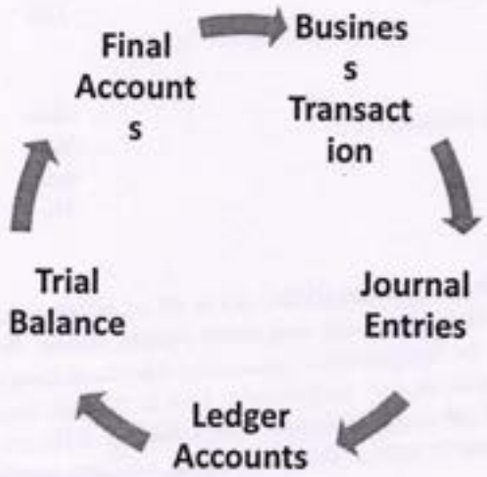
c.

Anand's A/c

Date	Particulars	JF	Amount	Date	Particulars	JF	Amount
2023				2023			
Apr. 1	To sales A/c		30000	Apr.3	By cash A/c		24550
12	To sales A/c		7000	3	By discount A/c		50
				16	By cash A/c		5400
				31	By balance c/d		7000
			37000				**37000**
May.1	To balance b/d		7000	May.20	By cash A/c		5540
2	To sales A/c		7000	20	By discount A/c		60
30	To balance c/d		4600	30	By cash A/c		12950
				30	By discount A/c		50
			18600				18600

10

6.a.



3

b.

Particulars	Debit	Credit
Cash in hand	1700	-
Capital		23000
Furniture	13000	
Telephone charges	1800	
Sales		15500
Advertisement	6800	
Purchases	10000	
Office equipment	1500	
Creditors		34600
Drawings	1450	
Discount		100

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	Discount allowed	50				
	Commission earned		300			
	Sundry debtors	33400				
	Interest on investment		1000			
	Total	74500	74500			
	Particulars					
c.	I. Revenue from operations			**Amount**	**Amount**	**10**
	II. Other Incomes				878240	
	III. Total Revenue (I+II)					
	IV. Expenses				878240	
	a) Cost of raw material consumed:			597400		
	b) Employees benefit expenses					
	c) Finance cost			9400		
	d) Depreciation and amortization					
	e) Other expenses					
	Selling expenses			104600		
	Administrative expenses			49000		
	Total Expenses (a+b+c+d+e)				760400	
	V. Profit Before Tax (III – IV)				117840	
	Less: Tax				52000	
	VI. Profit for the year				65840	
7.a.	According to **The American Accounting Association,** "Accounting is the process of identifying, measuring and communicating economic information to permit informed judgments and decisions by users of the information." **The American Institute of Certified Public Accounts (AICPA)** has defined accounting as, "The art of recording, classifying and summarizing, in a significant manner and in terms of money, transactions and events which are, in part at least, of financial character and interpreting the results thereof".					**3**
b.	Cash flow statement					
	Particulars			Amount	Amount	**7**
	Net profit				360000	
	Add:					
	- Depreciation			30000		
	- Goodwill w/o			10000		
	- Loss on sale of building			5000		
	- Debtors x			20000		
	- Creditors			10000	75000	
					435000	
	Less:					
	- Stock			30000		
	- Outstanding rent			5000		
	- Bills payable			1000		
	- Bills receivable			2000	65000	
	Cash flow from operations				370000	
c.	Machinery A/c					**10**
	Date Particulars	Amount	Date	Particulars	Amount	
	1.4.07 To cash A/c	100000	31.3.08	By depreciation A/c	10000	
			31.3.08	By balance c/d	90000	
		100000			**100000**	

		100000			**100000**		
1.4.08	To balance b/d	90000	31.3.09	By depreciation A/c	9000		
			31.3.09	By balance c/d	81000		
		90000			**90000**		
1.4.09	To balance b/d	81000	1.10.09	By bank A/c	80000		
1.4.09	To bank	50000	1.10.09	By depreciation	4050		
1.10.09	To P/L	3050	31.3.10	By depreciation	5000		
			31.3.10	By balance c/d	45000		
		134050			**134050**		
1.4.10	To balance b/d	45000	31.3.11	By depreciation	9500		
1.4.10	To bank	50000	31.3.11	By balance c/d	85500		
		95000			**95000**		
1.4.11	To balance b/d	85500	31.3.12	By depreciation	8550		
			31.3.12	By balance c/d	76950		
		85500			**85500**		

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Three Column Cash Book

Date	Particulars	L F	Dis.	Cash	Bank	Date	Particulars	L F	Dis.	Cash	Bank
2023						2023					
1.3	To bal B/d			15000		4	By Babu's		30	2370	
	To sales A/c			3000		8	By cash	c			1500
	To Bank A/c	c		1500		15	By furniture				3500
	To commission			350		23	By purchase				4500
	To Subir's A/c		50	3950		31	By balance c/d			21430	
	To Balance c/d				9500						
			50	23800	9500				30	23800	9500

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Department of MBA

Third Semester Internal Assessment Test I 26th December 2022

Time: 1 ½ hr. **20MBA301: Emerging Exponential Technologies** **Max. Marks: 50**

Answer the following Questions:

1. a.	Define Industrial revolution..	**03 Marks**
b.	Explain Benefits of Adopting an Industry 4.0.	**07 Marks**
c.	Explain the Future Trends in Emerging Technologies.	**10 Marks**
2. a.	What is data and information?.	**03 Marks**
b.	Explain the different data types and its representation.	**07 Marks**
c.	Explain the process of Data science.	**10 Marks**
3. a.	Explain human to machine interaction with examples..	**10 Marks**

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3. a. Explain human to machine interaction with examples. 10 Marks

Department of MBA

Scheme of Evaluation – I Internal Assessment Test

III Sem **20MBA301 : Emerging Exponential Technologies** **Max.Marks:50**

Q.No	Question and Answers	Marks
1 a.	• Britannica dictionary defines revolution as "in social and political science, a major, sudden, and hence typically violent alteration in government and in related associations and structures". • The term is used by analogy in such expressions as the Industrial Revolution, where it refers to a radical and profound change in economic relationships and technological conditions.	3 marks
b.	It makes you more competitive, especially against disruptors like Amazon It makes you more attractive to the younger workforce It allows you to address potential issues before they become big problems. It allows you to trim costs, boost profits, and fuel growth.	7marks Listing 2m Explanation 5m
c	• Artificial Intelligence (AI) and Machine Learning • Robotic Process Automation (RPA) • Edge Computing • Quantum Computing • Virtual Reality and Augmented Reality • Block chain • Internet of Things (IoT) • Cyber Security	Listing 3m Explanation 7m
2 a	**Data** Data comes from a latin word datum which originally means something given. The use of this term dates back to the 16thcentuary. Data is the pural form "datum" • Data is raw, unorganised facts that needs to be processed. Data can be something useless until it is organised **Information** • Information is the result of processing data. Data on its own has no meaning. It only takes on meaning and becomes information when it is interpreted. Data consists of raw facts and figures. When that data is processed into sets according to context, it provides information.	
b	**Data types and representation** • **Integer (int)** • It is the most common numeric data type used to store numbers without a fractional component (-707, 0, 707). • **Floating Point (float)** • It is also a numeric data type used to store numbers that may have a fractional component, like monetary values do (707.07, 0.7).	

	• Please note that *number* is often used as a data type that includes both *int* and *float* types. • **Character (char)** • It is used to store a single letter, digit, punctuation mark, symbol, or blank space. • **String (str or text)** • It is a sequence of characters and the most commonly used data type to store text. Additionally, a string can also include digits and symbols, however, it is always treated as text. • **Boolean (bool)** • It represents the values *true* and *false*. When working with the boolean data type, it is helpful to keep in mind that sometimes a boolean value is also represented as 0 (for false) and 1 (for true). • **Enumerated type (enum)** • It contains a small set of predefined unique values (also known as elements or enumerators) that can be compared and assigned to a variable of enumerated data type. • **Date** Needs no explanation; typically stores a date in the **YYYY-MM-DD** format (ISO 8601 syntax). • **Time** • Stores a time in the **hh:mm:ss** format. Besides the time of the day, it can also be used to store the time elapsed or the time interval between two events which could be more than 24 hours. • **Datetime :**Stores a value containing both date and time together in the **YYYY-MM-DD hh:mm:ss** format. • Blob : Binary large objects to store both resume and image	
c	• Step 1: Frame the problem • Step 2: Collect the raw data needed for your problem • Step 3: Process the data for analysis • Step 4: Explore the data • Step 5: Perform in-depth analysis • Step 6: Communicate results of the analysis	
3a	• The Association for Computing Machinery (ACM) defines human–computer interaction as "a discipline concerned with the design, evaluation an implementation of interactive computing systems for human use and with the study of major phenomena surrounding them". An important facet of HCI is user satisfaction (or simply End User Computing Satisfaction). "Because human–computer interaction studies a human and a machine in communication, it draw from supporting knowledge on both the machine and the human side. Due to the multidisciplinary nature of HCI, people with different backgrounds contribute to its success. HCI is also sometimes termed human–machine interaction (HMI), man-machine interaction (MMI) or computer-human interaction (CHI). Humans interact with computers in many ways; the interface between humans and computers is crucial to facilitate this interaction. Desktop applications, internet browsers, handheld computers, and computer kiosks make use of	

	the prevalent graphical user interfaces (GUI) of today. • HMI is all about how people and automated systems interact and communicate with each other. That has long ceased to be confined to just traditional machines in industry and now also relates to computers, digital systems or devices for the IoT. More and more devices are connected and automatically carry out tasks. Operating all of these machines, systems and devices needs to be intuitive and must not place excessive demands on users. • Smooth communication between people and machines requires interfaces. The place where or action by which a user engages with the machine. Simple examples are light switches or the pedals and steering wheel in a car. However, a system can also be controlled by text being keyed in, a mouse, touch screens, voice or gestures. Voice user interfaces (VUI) are used for speech recognition and synthesizing systems. • Poorly designed human-machine interfaces can lead to many unexpected problems. A classic example is the	

Department of MBA
III Semester I Internal Assessment Test, December, 2022
Subject: Technology & Operational Strategy (20MBA302)

Time: 90 Minutes **Max. Marks: 50**

Answer the following Questions:

1. a. Define Operations Management? 03 Marks
   b. Explain the Scope and Functions of Operations Management? 07 Marks
   c. Explain the types of Cause & Effect diagram? 10 Marks

2. a. What do you mean by Process Mapping? 03 Marks
   b. Explain the advantages and disadvantages of Ishikawa diagram? 07 Marks
   c. Explain the Theory Z approach? 10 Marks

3. a. Differentiate between Production and Operations Management? 03 Marks
   b. Explain the role and functions of Operations Manager? 07 Marks

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Department of MBA
III Semester I Internal Assessment Test, December, 2021
Subject: Technology & Operational Strategy (20MBA302)
Scheme of Evaluation **Max. Marks: 50**

1.a. Joseph G. Monks defines Operations Management as "the process whereby resources, flowing within a defined system, are combined and transformed by a controlled manner to add value in accordance with policies communicated by management." **03 Marks**

1.b 1. Facility Location: The option of the venue is a crucial factor in the making of a plant and other facilities. The inappropriate position of the plant can contribute to an incorrect location of the plant causing a huge wastage of time, money, and resources. After this, the position of the plant focuses on the growth of the business project. Moreover, it also centers on various other sectors. For instance, strategy, commodity diversification program, shifting sources, raw materials, and a number of other considerations.

2. **Material handling:** Material handling refers to the 'moving of materials from the storeroom to the machine and from one machine to the next during manufacture.' This activity is specialized for modem manufacturing concern. Firstly, minimization of costs by proper segment and process. Secondly, maintenance of facilities for treating goods. Thirdly, material handling facilities increases performance, efficiency, and hence, speeds up distribution. And lastly, reduces the cost of development and production. Stock management is also a prime concern in the construction of a new plant and maintenance of current plants.

3. **Product design:** Each company enterprise will plan, produce, and execute new products as a strategy for sustainability and development. Developing and launching new products on the market is the greatest challenge facing organizations. The whole cycle of recognition of the need for physical processing of the goods requires three functions. Firstly, Branding and promotion. Secondly, plant and creation. Lastly, manufacturing. Product design and creation offer a connection between marketing, consumer demands and preferences. It also offers activities needed for the manufacture of the product.

4. **Process design:** Product design and creation offer a connection between marketing and consumer demands and preferences. The relevant decisions in the process design stand important. In addition, it evaluates the workflow for transforming the raw material to the finished product. And in the end, to pick the workstation for each one used in the workflow.

5. **Plant Layout:** As the name signifies, plant layout is the grouping and arrangement of the personnel, machines, equipment, storage space, and other facilities, which are used in the production process, to economically produce the desired output, both quality wise and quantity wise.

6. **Production Planning and Control:** Planning and management of output is the planning process of pre-production. It specifies the exact route of each object, fixes the starting and finishing dates for every product. In addition, it also includes sending orders for output shops. It also tracks the production of goods according to orders.

7. **Quality control:** Quality Control is 'a system that maintains a desired level of quality in a product or service'. It is a systematic control of various factors that affect the quality of the product. Quality Control aims at the prevention of defects at the source. It also relies on an effective feedbacksystem and corrective action procedure.

(3+4=7 Marks)

1.c) Each fishbone diagram starts the same: a central problem or effect is placed on the far right of the diagram. Then a line, which is called the "spine", is drawn straight to the left and branches are added off shooting both above and below it. These branches become known as "affinities" or types of causes from the spine of the central problem or effect. Then specific causes are added to each of the affinities while you are actively brainstorming. This continues until your brainstorming session is complete and you feel satisfied with your fishbone diagram.

Since nearly everyone can use a fishbone diagram to help them brainstorm and there are so many industries and uses, there are a few types different types of fishbone diagrams available.

(3*3+1=10Marks)

- **5 M & 1 E-Suitable for manufacturing industry.**
- **4 S-Suitable for problem resolution in the service industry.**
- **8 P -Suitable for problem resolution in the product marketing domain.**

2.a) A process is structured set of activities designed to accomplish a specific objective. A process takes inputs and turns them into defined outputs. **3 Marks**

The process map gives a pictorial representation of the process as it really is i.e., current state. Process Mapping is the technique of using flowcharts to illustrate the flow of a process, proceeding from the most macro perspective to the level of detail required to identify opportunities for improvement. Process mapping focuses on the work rather than on job titles or hierarchy.

Process mapping allows a team to picture the work itself outside of the organization's hierarchy. In other words, process maps help us picture the work itself, not the organization.

2.b) Advantages of Ishikawa diagram

Help identify cause and effect relationships with underlying problems,

- Help facilitate joint brainstorming discussions.
- The brainstorming process encourages broad thinking, keeping teams from limited thinking patterns that can lead to getting stuck,
- The process of asking why something happened repeatedly at each stage helps drill down to one or more root causes,
- Help prioritize relevant causes, so underlying root causes are addressed first.

Disadvantages of Ishikawa diagram (4+3=7Marks)

The brainstorming process can produce irrelevant potential causes along with relevant ones, which can result in confusion and a time drain.

- Complex diagrams with multiple factors can lead to a jumbled mess that is too difficult to display in a fishbone diagram.
- Fishbone diagrams can lend themselves to the *divergent approach* -the temptation to identify and fix everything that might be causing the problem. This usually leads to a low success rate because hardly any team has the resources to fix every potential cause.

2.c)

THEORY Z APPROACH

Theory Z is an approach to management based upon a combination of American and Japanese management philosophies and characterized by, among other things, long-term job security, consensual decision making, slow evaluation and promotion procedures, and individual responsibility within a group context. Proponents of Theory Z suggest that it leads to improvements in organizational performance.

Theory Z was first identified as a unique management approach by William Ouchi. Ouchi contrasted American types of organizations (Type A) that were rooted in the United States' tradition of individualism with Japanese organizations (Type J) that drew upon the Japanese heritage of collectivism. He argued that an emerging management philosophy, which came to be called Theory Z, would allow organizations to enjoy many of the advantages of both systems.

Theory Z represents a humanistic approach to management. Although it is based on Japanese management principles, it is not a pure form of Japanese management. Instead, Theory Z is a hybrid management approach combining Japanese management philosophies with U.S. culture. In addition, Theory Z breaks away from McGregor's Theory Y. Theory Y is a largely psychological perspective focusing on individual dyads of employer-employee relationships while Theory Z changes the level of analysis to the entire organization.

According to Professor Ouchi, Theory Z organizations exhibit a strong, homogeneous set of cultural values that are similar to clan cultures. The clan culture is characterized by homogeneity of values, beliefs, and objectives. Clan cultures emphasize complete socialization of members to achieve congruence of individual and group goals. Although Theory Z organizations exhibit characteristics of clan cultures, they retain some elements of bureaucratic hierarchies, such as formal authority relationships, performance evaluation, and some work specialization. Proponents of Theory Z suggest that the common cultural values should promote greater organizational commitment among employees.

The primary features of Theory Z are summarized in the paragraphs that follow:

1. **Long-term employment:** Traditional US organizations are plagued with short-term commitments by employees, but employers using more traditional management perspective may inadvertently encourage this by treating employees simply as replaceable cogs in the profit-making machinery. In the united states, employment at will, which essentially means the employer or the employee can terminate the employment relationship at any time, has been among the dominant forms of employment relationships. Conversely, type **J** organizations generally make life-long commitments to their employees and expect loyalty in return, but type J organizations set the conditions to encourage this. This promotes stability in the organization and job security among employees.
2. **Consensual decision making:** The type Z organization emphasizes communication, collaboration, and consensus in decision making. This marks a contrast from the traditional type A organization that emphasizes individual decision-making.
3. **Individual responsibility:** Type A organizations emphasize individual accountability and performance appraisal. Traditionally, performance measures in type J companies have been oriented to the group. Thus, type Z organizations retain the emphasis on individual contributions that are characteristic of most American firms by recognizing individual achievements, albeit within the context of the wider group.
4. **Slow evaluation and promotion:** The type A organization has generally been characterized by short-term evaluations of performance and rapid promotion of high achievers. The type J organization, conversely, adopts the Japanese model of slow evaluation and promotion.
5. **Informal control with formalized measures:** The type Z organization relies on informal methods of control, but does measure performance through formal mechanisms. This is an attempt to combine elements of both the type A and type J organizations.
6. **Moderately specialized career path:** Type A organizations have generally had quite specialized career paths, with employees avoiding jumps from functional area to another. Conversely, the type J organization has generally had quite non-specialized career paths. The type Z organization adopts a middle-of-the-road posture, with career paths that are less specialized than the traditional US model but more specialized than the traditional Japanese model.
7. **Holistic concern:** The type z organization is characterized by concern for employees that goes beyond the workplace. This philosophy is more consistent with the Japanese model than the US model.

3.a) DIFFERENCE BETWEEN PRODUCTION AND OPERATIONS MANAGEMENT

BASIS	PRODUCTION MANAGEMENT	OPERATIONS MANAGEMENT
Definition	Production Management connotes the administration of the range of activities belonging to the creation of products.	Operations Management refers to the part of management concerned with the production and delivery of goods and services.

Objective	The objective of production management is to produce the best goods or services that are of the right quality, right quantity at the right time.	Its objective of operations management is to utilize resources, to the extent possible so as to satisfy customers wants.
Occurrence	Production management occurs on outputs after manufacturing raised in the market.	Operations management occurs on input during manufacturing.
Decision making	Production management decision making is related to the aspects of production.	Operations management decision making is related to the regular business activities.

3.b) Operations managers in almost any business are key personnel in upper-level management that make sure the company is performing to its best potential. They keep their eyes on multiple areas within the company, assuring productivity and efficiency while seeking to reduce costs. They manage other key leaders within several departments and guide groups of people to complete their individual tasks in order to achieve company-wide goals.

A Big-Picture Perspective

Because they are responsible for the overall well-being of the company's operations, these types of managers tend to have a big-picture perspective. They are able to determine needs within the company and connect groups to work together to solve problems as they arise. They need to be critical thinkers who can analyze situations and make decisions geared toward the company's best interests rather than those of a single department. This may mean that they also need to resolve conflicts as they arise between employees and set policies and guidelines for how to complete tasks.

Oversight of Financial Information and Budgets

A large part of an operations manager's job is to oversee the creation and administration of budgets within each area of the company. Strong leaders will regularly monitor expenses and curtail a department's spending if necessary to keep the company on budget. They will also engage in cost-benefit analysis, seeking to obtain the best price for materials and oversee production methods so that output is at peak efficiency levels.

Supervise Supply Chain and Inventory

Another area of oversight is the management of supply chain procedures and inventory tracking. In order for the production teams to operate effectively they need to have a steady supply of materials. Similarly, once their job is completed, finished products must be properly inventoried and then sent out the door and up the supply chain to retailers or direct customers. While each department is busily doing its specific job, operations managers have their eyes on the entire process and can intervene and make adjustments as needed.

Workflow and Staffing

Operations managers also have a good handle on the staffing requirements of the organization. They work with HR to hire and train new employees and handle disciplinary issues. Because they are aware of the needs in each department, they can adjust the workflow and reassign tasks to improve efficiency in the operation. **(3+4=7Marks)**

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Department of MBA

Third Semester Internal Assessment Test -I

Time: 90 Minutes **20MBAHR303 RECRUITMENT & SELECTION DATE: 27.12.2022**

Max marks: 50

Answer the following questions:

1. a. Define Recruitment? **(3 marks)**
   b. Explain the factors affecting Recruitment. **(7 marks)**
   c. Explain the strategies of Recruitment. **(10 marks)**

2. a. Define Job Analysis? **(3 marks)**
   b. Explain the process of Job Analysis. **(7 marks)**
   c. Explain the methods of collecting Job Analysis data. **(10 marks)**

3. Define Job Design and explain the techniques of Job Design. **(10 marks)**

**************ALL THE BEST**************

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   b. Explain the process of Job Analysis. **(7 marks)**
   c. Explain the methods of collecting Job Analysis data. **(10 marks)**

3. Define Job Design and explain the techniques of Job Design. **(10 marks)**

**************ALL THE BEST**************

Department of MBA

Recruitment and Selection

Assignment 1

1. What is workforce planning?
2. Explain the types of Millennial.
3. Explain the factors affecting Recruitment.
4. Define Recruitment?
5. Differentiate between Job Description and Job Specification.
6. Define Job Analysis?
7. Explain the strategies of Recruitment.
8. Explain the process of Job Analysis.
9. Explain Competency Ice Berg Model.
10. Explain the different steps of Job Search.
11. Write a short notes on-
    1. Employer Branding
    2. Social Media
12. Define Job Design and explain the techniques of Job Design.
13. Explain the methods of collecting Job Analysis data.

****

Recruitment and Selection

Third Semester I Internal Assessment Scheme 20MBAHR303

Answer the following Questions →

1] a. According to Edwin B. Flippo "Recruitment is a process of searching for prospective candidates and stimulate them to apply for Jobs.

"Recruitment is a process of attracting large no of qualified applicants who are ready to take up the job if it offered." -3M-

b. Factors affecting Recruitment →

Recruitment is the process of locating and Encouraging potential applicants to apply for Existing Job openings. (2M)

Recruitment is mainly affected by 2 types of Factors namely →

1] External Factors

2] Internal "

I External Factors

* Supply & Demand
* unEmployment Rate
* Image / Good will
* political. Social & Legal Environment

II Internal Factors

* Human Resource planning
* Recruitment policy
* Size of the firm
* Cost.

[5M] for Explanation -3M-

c. Recruitment is a process of attracting large no of qualified applicants who are ready to take up the job if it offered. (2M)

The two main Recruitment strategies are →

I An Internal Approach

II An External -11-

Internal Approach	External Approach
a] Transfer & promotion	a] Campus Recruitment
b] Present Employees	b] Third Party Consulta -nts
c] Retired -11-	c] Scouting
d] Employee referrals	d] Walk-in
e] Dependents of Deceased Employees.	e] Head Hunting
	f] E- Recruitment

8M for Explanation

-10M-

9] a. According to Edwin B. Flippo → "Job Analysis is a process of Studing and Collecting information relating to operations & responsibilities of specific Job."

J.A is a formal and detailed Examination of Jobs It is a systematic investigation of the tasks, duties and responsibilities necessary to do a Job. -3M-

---

b. Process of Job Anoalysis →

Job Analysis is a process of Collecting information about duties, responsibilities and KSA's required to do Particular Job. (2M)

J. Analysis process includes →

organisational Analysis

↓

Selection of representative position to be Analysed

↓

Collection of J.A. Data

↓

Preparation of Job Description

↓

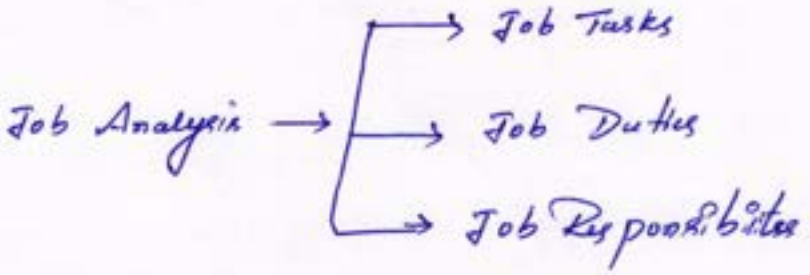
Preparation of Job Specification

5M for Explanation

- 7M -

c. Methods of Collecting Job Analysis data →

Job Analysis is a formal and detailed Examination of Jobs, it is a systematic investig -ation of the tasks, duties and responsibilies necessary to do a Job. (2M)



Job Analysis - Methods of Collecting J.A. Data are →

1] Interview

2] Direct observation

3] Maintainance of Long Records

4] Questionnaire Method

5] Panel of Experts

6] Critical Incident Technique

3M for Explanation

-10M

3] According to Davis " Job Design is the specification of the Content, methods and relationship of Jobs in order to satisfy technological and orgnal requirements as well as the social & personal requirements of the Job Holder." (2M)

Techniques of Job Design are :-

1] Job or Work Specification

2] Job Enlargement

3] Job Enrichment

4] Job Rotation.

8M for Explantion

-10M-

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Third Semester Internal Assessment Test I **28th December 2022**

Time: 1 ½ **20MBAHR304: Human Resource Analytics** **Max. Marks: 50**

Answer the following Questions:

1. a. Define Business analytics.	**03 Marks**
b. Briefly explain Business analytics tools.	**07 Marks**
c. Explain the advantages of business analytics.	**10 Marks**
2. a. List the 3 skills gained from a business analytics.	**03 Marks**
b. Explain briefly the different levels of business analytics.	**07 Marks**
c. Explain the application of business analytics.	**10 Marks**
3. a. Explain the different challenges of business analytics.	**10 Marks**

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Third Semester Internal Assessment Test I 28th December 2022

Time: 1 ½ 20MBAHR304: Human Resource Analytics Max. Marks: 50

Answer the following Questions:

1. a. Define Business analytics. 03 Marks
b. Briefly explain Business analytics tools. 07 Marks
c. Explain the advantages of business analytics. 10 Marks

2. a. List the 3 skills gained from a business analytics. 03 Marks
b. Explain briefly the different levels of business analytics. 07 Marks
c. Explain the application of business analytics. 10 Marks

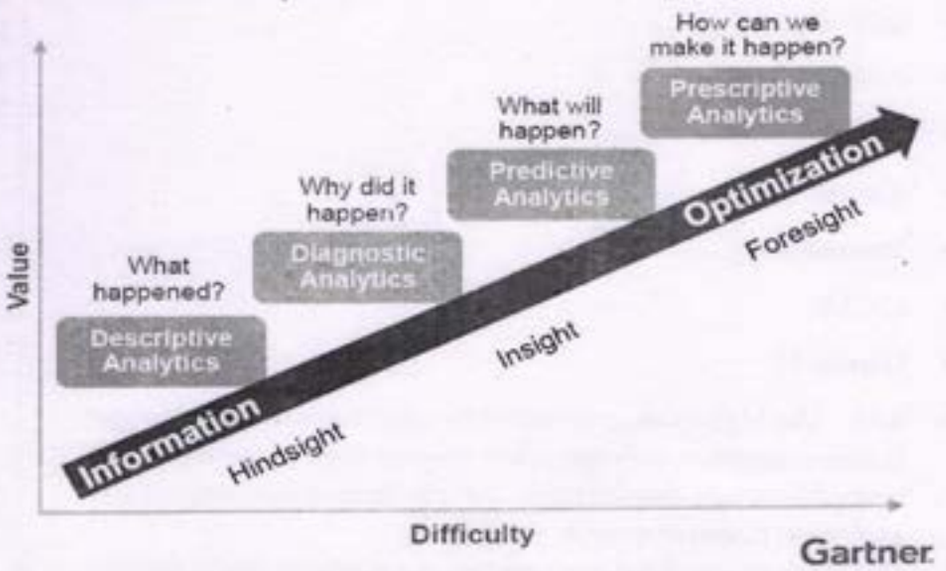
3. a. Explain the different challenges of business analytics. 10 Marks

Department of MBA

Scheme of Evaluation – I Internal Assessment Test

III Sem **20MBAHR304 :HR ANALYTICS** **Max.Marks:50**

Q.No	Answers	Marks
1 a.	• Business Analytics (BA) is a decision support and analysis tool that provides users with a range of visibility, both detailed to aggregated, into different aspects of their business. It allows users to quickly get to the information they are looking for at the desired level of detail.	3 marks
b.	**BA Tools are** • SAS Business Analytics (SAS BA) • QlikView • Board • Splunk • Sisense • Microstrategy • KNIME • Dundas BI • SAS : The high-grade text analytics capabilities of the SAS-based business analytics software allow users to inspect and transform unorganized text data into relevant information that analysts can explore to discover meaningful insights. • QlikView is one of the most preferred tools for business analytics because of its unique features, such as patented technology and in-memory processing, facilitating the delivery of ultra-fast business analytics reports. • Board features in the list of top-rated business analyst software tools because of its industry-leading business analytics model that permits users to create interactive and intuitive business analytics reports and dashboards. • Splunk • Splunk is one of the most widely used business analytics tools in small and medium scale industries.	7marks Listing 2m Explanation 5m
c	**Advantages of Business Analytics** Helps you monitor the progress of your mission Helps increase efficiency Helps you be updated	10marks Listing 3m Explan

	Personalize the customer experience Inform business decision-making Streamline operations Mitigate risk and handle setbacks Enhance security	ation 7m
2 a	Problem Solving Analytical Communication	
b	Levels of business analytics  	7marks Listing 2m Explanation 5m
c	Application of Business analytics 1. Agriculture Business Analytics 2. Stock Marketing 3. Finance Marketing 4. Manufacturing Industry 5. Medical Methodology 6. Customer Relation Management 7. Bond Marketing 8. Human Resources	10marks Listing 3m Explanation 7m

3a	Challenges of Business Analytics The amount of data being collected Collecting meaningful and real-time data Visual representation of data Data from multiple sources Inaccessible data Poor quality data Pressure from the top Lack of support Confusion or anxiety	10marks Listing 3m Explanation 7m

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III Semester Internal Assessment Test -I

Direct Taxation 20MBAFM304

Time: 90 Minutes **Date: 28/12/2022**

Max marks: 50

Answer the following questions:

1. a. Define person u/s 2(37) (3 marks)
   b. What do you me by capital receipts and revenue receipts? Explain the difference between capital receipts and revenue receipts. (7 marks)
   c. Explain the residential status of an individual under Income Tax Law along with its exceptions (10 marks)

2. a. List out the cases in which income of the previous year is assessed in the same year. (3 marks)
   b. Explain the difference between tax planning and tax evasion. (7 marks)
   c. Explain the income from the house property. (10 marks)

3. Mr. Raghav is a foreign citizen (not being a person of Indian origin). Since 1981, he visits India every year in the month of April for 100 days. Find out the residential status of Mr. Raghav for the assessment year 2021-22. (10 marks)

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III Semester Internal Assessment Test -I

Direct Taxation scheme of valuation

Sl. No	Answers	Marks
1. a.	✓ Individual means a natural person ✓ HUF (Hindu Undivided Family) ✓ Firm Including LLP ✓ Company ✓ Association of firm (AOP) or Body of Individual (BOI) ✓ Local Authority ✓ Artificial Juridical Person (AJP) if person not covered in any of above	3
b.	Capital receipts are the income received, which is non-recurring in nature. They are part of the financing and investing activities rather than operating activities. The capital receipts either reduce an asset or increases a liability. The receipts can be generated from the following sources: ❖ Issue of Shares ❖ The issue of debt instruments such as debentures. ❖ Loan taken from a bank or financial institution. ❖ Government grants. ❖ Insurance Claim. ❖ Additional capital introduced by the proprietor.	1.5
	Revenue Receipts Revenue Receipts are the receipts which arise through the core business activities. These receipts are a part of normal business operations that is why they occur again and again however its benefit can be enjoyed only in the current accounting year as its effect is short term. The income received from the day to day activities of business includes all the operations that bring cash into the business like: ❖ Revenue generated from the sale of inventory ❖ Services Rendered ❖ Discount Received from the creditors or suppliers ❖ Sale of waste material/scrap. ❖ Interest Received ❖ Receipt in the form of dividend ❖ Rent Received	1.5
	Difference between capital receipts and revenue receipts:	4

Capital Receipts	Revenue Receipts
Receipts generated from investing and financing activities are capital receipts.	Receipts from operating activities are revenue receipts.
Capital Receipts do not frequently occur, as it is non-recurring and irregular	Revenue receipts do not occur again and again they are recurring and regular.
The benefit of capital receipt can be enjoyed for more than one year.	The benefit of revenue receipt can be enjoyed only in the current year.
Capital Receipts appears on the liabilities side of the Balance Sheet	Revenue Receipts appears on the credit side of the Profit and Loss Account as income for the financial year.
Capital receipt is received in exchange for the source of income.	Revenue receipt is received in substitution of income.
Capital receipt either decreases the value	Revenue receipt neither increases nor

	of an asset or increases the value of liability.	decreases the value of asset or liability.	

c.

RESIDENTIAL STATUS OF INDIVIDUAL 10

The residential status of an individual is determined on the basis of rules stated further:

1. Primary / Condition - Section 6(1)
2. Secondary Basic / Additional Condition – Section 6(6)

Basic Condition – Sec 6(1)

a. He is in India in the previous year for a period of 182 days or more.
b. He is in India for a period of 60 days or more during the previous year and 365 days or more during 4 years immediately preceding the previous year

Additional Conditions – Sec 6(6):

a. He has been resident in India at least 2 years out of 10 previous years immediately preceding the relevant previous year.
b. He has been in India for a period of 730 days or more during 7 years immediately preceding the relevant previous year.

Resident in India: Under section 6(1) if an individual satisfies at least any one of the basic condition in any previous year. He is said to be Resident in India.

Resident & Ordinarily Resident: An individual must satisfy any one of the basic condition (a) or (b) and both the additional conditions (a) & (b). Then he is said to be resident & ordinarily resident.

Resident but Not Ordinarily Resident: An individual must satisfy any one of the basic condition (a) or (b) and one or none of the additional conditions (a) or (b). Then he is said to be resident & not ordinarily resident. Non-Resident in India: If an individual does not satisfy any basic condition he is said to be non-resident in India.

Exceptions for 60 Days (For Basic Condition - b)

1. Indian citizen, who leaves India during the relevant previous year as a member of the crew of an Indian ship or for purposes of employment outside India, the period of 60 days will be extended to 182 days.
2. In case of an individual being a citizen of India, who has been in abroad or outside India. If he comes on visit to India in any previous year the period of 60 days will be extended to 182 days.

2. a.

Exception to general rules: 3

This is the general rule that income of the previous year of an assessee is charged to tax in the immediately following assessment year. However, in the following cases, income of the previous year is assessed in the same year.

- AOP / BOI formed for Short duration
- NR shipping Business
- Transfer of property to Avoid Tax
- Closure of Business
- Person leaving India Permanently

In this case, the Assessing Officer has the discretionary power i.e. he may assess the income in the same previous year or may wait till the Assessment year.

b.

Tax planning	Tax evasion
It is a way to reduce tax liability by taking full advantages provided by the Act through various exemptions, deductions, rebates & relief.	It is the illegal way to reduce tax liability by deliberately suppressing income or sale or by increasing expenses, etc., which results in reduction of total income of the assessee.

7

Tax planning is a practice to follow the provisions of law within the moral framework.	Tax evasion is illegal, both in script & moral.
Objective is to reduce tax liability by applying script & moral of law.	Objective is to reduce tax liability by applying unfair means.
It is futuristic and positive in nature. The planning is made today to avail benefits in future.	It is concerned with past and applied after the liability of tax has arisen. It is done with negative approach to avail benefits by killing the moral of law.
Generally, arises in long run.	Generally, benefits do not arise but it causes penalty and prosecution.
It uses benefits of the law.	It overrules the law.
It is tax saving	It is tax concealment.
It is desirable	It is objectionable
It is moral in nature.	It is illegal.

c.

Condition – 1:
Property should consist of any BUILDING or land appurtenant (means land connected with the building like garden, garage etc.) thereto.
Building means a permanent structure made of bricks, stones, concrete etc. and which has a foundation, walls and doors. It does not include temporary structures.

10

Condition – 2:
The assessee should be owner of the property. Assessee need not to be a Registered owner. The word "owner" includes a legal owner as well as deemed owner.

- ✓ Ownership includes both leasehold and freehold rights and also includes deemed ownership. [Section 27]
- ✓ Assessee must be owner of the property during the previous year. It is not material whether he is the owner in the Assessment Year.
- ✓ If the title of the ownership of the property is under dispute in a court of law, the decision as to who will be the owner chargeable to income tax under section 22 will be of the Income-tax Department till the court gives its decision to the suit filed in respect of such property.

Condition – 3:
The property should not be used by the owner for the purpose of any business or profession carried on by him, the profits of which are chargeable to income-tax

Composite rent:
Where composite rent includes rent of building and charges for different services (lifts, security etc.), the composite rent is has to be split up in the following manner-

(a) The sum attributable to use of property is to be assessed under section 22 as income from house property;
(b) The sum attributable to use of services is to be charged to tax under the head "Profits and gains of business or profession" or under the head "Income from other sources", as the case may be.

House property situated outside India:

(i) In case of a resident in India (resident and ordinarily resident in case of individuals and HUF), income from house property situated outside India is taxable, whether such income is brought into India or not.
(ii) In case of a non-resident or resident but not ordinarily resident in India, income from a property situated outside India is taxable only if it is received in India.

EXCEPTIONS:

1. Income from letting out a vacant land is chargeable to tax under the head "Income From Other Sources"
2. Income earned by an assessee who is engaged in the business of letting out properties on rent, would be chargeable to tax under the head "Profits / Gains from Business / Profession"

PROPERTY SHOULD NOT BE OCCUPIED BY THE OWNER FOR HIS OWN BUSINESS OR PROFESSION:

Annual value of a house property is not charged to tax under the head "income from house property", if the owner uses the property for carrying on his business or profession.

3. Mr. Raghav is a foreign citizen. He visits India every year in the month of April for 100 days.

Assessment Year: 2021-22
Previous Year: 2020-21 (01-04-2020 to 31-03-2021)

Year	Presence in India	Residential status
2020-21	100 days	Resident
2019-20	100 days	Resident
2018-19	100 days	Resident
2017-18	100 days	Resident
2016-17	100 days	Resident
2015-16	100 days	Resident
2014-15	100 days	Resident
2013-14	100 days	Resident
2012-13	100 days	Resident
2011-12	100 days	Resident
2010-11	100 days	Resident

10

Basic Condition Sec 6(1):

He is in India for a period of 60 days or more during the previous year and 365 days or more during 4 years immediately preceding the previous year.
Mr. Raghav is in India for 100 days and 400 days (i.e. 2016-17 to 2019-20). Thus he satisfies 2nd basic condition and becomes resident in India.

Additional Conditions – Sec 6(6):

a) He has been resident in India at least 2 years out of 10 previous years immediately preceding the relevant previous year.
   Every year Mr. Raghav satisfies 2nd basic condition, as he is in India for 100 days and 400 days. Thus he satisfies this condition.
b) He has been in India for a period of 730 days or more during 7 years immediately preceding the relevant previous year.
c) He is present in India for 700 Days. Thus, he does not satisfy this additional condition.

Mr. Raghav satisfies one of the basic conditions and one of the two additional conditions. He is, therefore, resident but not ordinarily resident in India for the assessment year 2021-22.

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III Semester Internal Assessment Test -I

Investment Management 20MBAFM303

Time: 90 Minutes **Date: 27/12/2022**

Max marks: 50

Answer the following questions:

1. a. write the meaning of investment (3 marks)
   b. Explain the features of good investment (7 marks)
   c. Write a short note on Dow Theory (10 marks)

2. a. Give the meaning of option (3 marks)
   b. List out the parties involved in the secondary market (7 marks)
   c. Explain EIC analysis (10 marks)

3. a. Briefly explain money market instruments (5 marks)
   b. Explain the investment process (5 marks)

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III Semester Internal Assessment Test -I

Investment Management scheme of valuation

Sl. No.	Answers	Marks
1. a.	Investment is the allocating resources, usually money, with the expectation of generating an income or profit. In other words, investment is the employment of funds on assets with the aim of earning income or capital appreciation. In simple to put money into a scheme, stock or other financial item or to buy something with the expectation that it will increase in value.	3
b.	Every investor has certain specific objectives to achieve through his long term/short term investment. Such objectives may be monetary/financial or personal in character. The objectives include safety and security of the funds invested (principal amount), profitability (through interest, dividend and capital appreciation) and liquidity (convertibility into cash as and when required). 1. **Maximization of return**: Investor always expect a good rate of return from their investments. The rate of return comprises of 2 parts, namely the annual income and the capital gain or loss. 2. **Minimization of risk**: The risk of an investment refers to the variability of the rate of return. To explain further, it is the deviation of the outcome of an investment from its expected value. Risk is a normal feature of every investment as an investor has to part with his money immediately and has to collect it back with some benefit in due course. The risk may be more in some investment avenues and less in others. The risk in the investment may be related to non-payment of principal amount or interest thereon. It is always desirable to select an investment avenue where the risk involved is minimum/comparatively less. 3. **Liquidity:** The liquidity depends upon the marketing and trading facility. If a portion of the investment could be converted into cash without much loss of time, it would help the investor meet the emergencies. Stocks are liquid only if they command good market by providing adequate return through dividends and capital appreciation. 4. **Hedging against inflation:** The rate of return should ensure a cover against inflation to protect against a rise in prices and fall in purchasing value of money. The return rate should be higher than the rate of inflation, otherwise the investor will have loss in real terms. Growth stocks would appreciate in their values overtime and provide a protection against inflation. The return thus earned should assure the safety of the principal amount, regular flow of income and be a hedge against inflation. 5. **Safety:** The degree of risk varies across investment types, all investments bear risk. It is important to determine how much risk is involved in an investment. The average performance of an investment normally provides a good indicator. However, past performance is merely a guide to future performance - not a guarantee. 6. **Saving tax:** tax is unavoidable. Different income levels and investment options attract different tax rates. The tax rate may vary with the period of investment for a specific option. Certain investment offer tax incentives. The investor tries to minimize the tax outflow and maximize tax returns. 7. **Duration**: Investments typically have a longer horizon than cash and income options. The duration of an investment - particularly how long it may take to generate a healthy rate of return- is a vital consideration for an investor. The investment horizon should match the period that your funds must be invested for or how long it would take to generate a desired return. A good investment has a good risk-return trade-off and provides a good return-duration trade-off as well.	7

c.	Dow developed his theory to explain the movement of the indices of Dow Jones Averages. The theory is based on certain hypothesis: ➢ The first hypothesis is that no single individual or buyer can influence the major trend of the market. ➢ The second hypothesis is that market discounts everything. ➢ The third hypothesis is that the theory is not infallible. According to Dow theory the trend is divided into: - Primary - Intermediate/Secondary - Short term/Minor Markets experience primary trends which can last a year or more, such as a bull or bear market. Within the broader trends, secondary trends make smaller movements, such as a pullback within a bull market or a rally within a bear market; these secondary trends can last a few weeks to a few months. Finally, minor trends can last a few days to a few weeks. These small fluctuations are considered market noise. **Primary Trend** The security price trend may be either increasing or decreasing. When the market exhibits the increasing trend, it is called 'bull market' and when it exhibits a decreasing trend it is called 'bear market'. **Bull Market:** ✓ The bull market shows three clear-cut peaks. ✓ Each peak is higher than the previous peak. ✓ The bottoms are also higher than the previous bottoms. **Bear Market** ✓ The market exhibits falling trend. ✓ The peaks are lower than the previous peaks. ✓ The bottoms are also lower than the previous bottoms. **The Secondary Trend** ✓ The secondary trend or the intermediate trend moves against the main trend and leads to correction. ✓ The correction would be 33% to 66% of the earlier fall or increase. ✓ Compared to the time taken for the primary trend, secondary trend is swift and quicker. **Minor Trends** ✓ Minor trends or tertiary moves are called random wriggles. ✓ They are simply the daily price fluctuations. ✓ Minor trend tries to correct the secondary trend movement. **Support level** ✓ In the support level, the fall in the price may be halted for the time being or it may result even in price reversal. ✓ In this level, the demand for the particular scrip is expected. **Resistance level** ✓ In the resistance level, the supply of scrip would be greater than the demand. ✓ Further rise in price is prevented. ✓ Selling pressure is greater and the increase in price is halted for the time being.	10
2. a.	**Options:** Options may be defined as a contract between two parties — a buyer and a seller — whereby the buyer of the option has the right but not the obligation, to buy or sell a specified currency at a specified exchange rate, on or before a specified date, from the seller of the option. There are two types of options: ✓ **Call option** - gives the buyer the right to buy a specified currency at a specified exchange rate, at or before a specified date. ✓ **Put option** - gives the buyer the right to sell a specified currency at a specified exchange rate, at or before a specified date.	3
b.	There are different types of buyers and sellers in the market who act through authorized brokers only. Brokers represent their clients who may be individuals, institutions like	7

companies, banks and other financial institutions, mutual funds, trusts etc.

i. Client brokers - These do simple broking business by acting as intermediaries between the buyers and sellers and they earn only brokerage for their services rendered to the clients.
ii. Bulls - These are the optimistic people who expect prices to rise and as a result keep on buying. Also called ' Tejiwalas'
iii. Bears - These are the pessimistic people who expect the prices to fall and as a result keep on selling. Also called 'Mandiwalas.'
iv. Arbitragers: Arbitragers are those brokers who buy securities in one market and sell in another market to take advantage of price differences prevailing in different markets for the same scripts.
v. Jobbers - A jobber is a professional independent broker who deals in securities on his own behalf. they are wholesalers doing both buying and selling of selected scrip's. They earn from the margin between buying and selling rates. In other words he purchases and sells securities in his own name his main aim is to earn a margin of profit due to price variation of securities.
vi. Stags - They are those members who neither buy nor sell securities in the market. They simply apply for subscription to new issues expecting to sell them at higher prices later when these issues are quoted on the stock exchange.
vii. Badla Financiers /Badliwallas: Badla Financiers are those members whose main function is to give finance for carry forward deals in specified securities, in return for interest. This interest rate is called badla rate.
viii. Wolves - They are fast speculators. They perceive changes in the trends of the market and trade fast and make a fast buck.
ix. Lame Ducks - These are slow bears who lose in the market as they sell securities without having shares.
x. Investors-Retail Investors, Institutional Investors, Foreign Institutional Investors
xi. Stock Exchange Members/ Brokers

c. **Economic Analysis:** The level of economic activity has an impact on investment in many ways. If the economy grows rapidly, the industry can also be expected to show rapid growth & vice versa. When the level of economic activity is low, stock prices are low & when the economic activity is high, stock prices are high reflecting the prosperous outlook for sales & profits of the firms. 10

1. Gross Domestic Product
2. Saving & Investment
3. Inflation
4. Interest rates
5. Budget
6. The tax structure
7. The balance of payment (BOP)
8. Monsoon & Agriculture
9. Infrastructure facilities
10. Demographic factors
11. Economic indicators
12. Coincidental indicators
13. Lagging indicators
14. Diffusion index

Investment Analysis: It is used to analyze the performance of the industries over the years. An industry is a group of firms that are engaged in the production of similar goods and services. An investor must analyze the following factors:

- Growth of the industry
- Cost structure and profitability
- Nature of the product
- Nature of Competitors
- Government policy

Company Analysis: In company analysis, the growth of the company is analyzed by the investor so that the present and future value of the shares can be known. The present and future value of shares is affected by a following number of factors such as:

		✓ Competitive edge of the company ✓ Earnings of the company ✓ Capital Structure ✓ Market share ✓ Growth of sales ✓ Financial performance ✓ Management ✓ Operating efficiency	
3.	a.	1. **Treasury Bills (T-Bills):** Treasury Bills are one of the safest money market instruments as they are issued by Central Government. They are zero-risk instruments, and hence returns are not that attractive. The Central Government issues T-Bills at a price less than their face value and the difference between the buy price and the maturity value is the interest earned by the buyer of the instrument. The buy value of the T-Bill is determined by the bidding process through auctions. Treasury bills are the short term promissory note issued by the RBI on behalf of the government, in order to meet the temporary deficit of the government. They are issued with three-month, six-month and one-year maturity periods which may also be referred as 91-day, 182-day and 364-day treasury bills. 2. **Certificate of Deposits (CDs):** Certificate of Deposit is like a promissory note issued by a bank in form of a Certificate entitling the bearer to receive interest. It is similar to bank term deposit account. The certificate bears the maturity date, fixed rate of interest and the value. These certificates are available in the tenure of 3 months to 5 years. The returns on certificate of deposits are higher and restrict the holders to withdraw funds on demand. However, on payment of certain penalty the money can be withdrawn on demand also. 3. **Commercial Papers (CPs):** Commercial Paper is the short term unsecured promissory note issued by corporate and financial institutions at a discounted value on face value. They come with fixed maturity period ranging from 1 day to 270 days. These are issued for the purpose of financing of accounts receivables, inventories and meeting short term liabilities. It is a low-cost alternative to bank loans. 4. **Call / notice money market:** Call/Notice money is the money borrowed or lent on demand for a very short period. When money is borrowed or lent for a day, it is known as Call (Overnight) Money. Intervening holidays and/or Sunday are excluded for this purpose. Thus money, borrowed on a day and repaid on the next working day, (irrespective of the number of intervening holidays) is "Call Money". When money is borrowed or lent for more than a day and up to 14 days, it is "Notice Money". No collateral security is required to cover these transactions. 5. **Repurchase Transactions (REPOs or reverse REPO):** Repurchase Agreements which are also called as Repo or Reverse Repo are short term loans that buyers and sellers agree upon for selling and repurchasing. Repo or Reverse Repo transactions can be done only between the parties approved by RBI and allowed only between RBI-approved securities such as state and central government securities, They are usually used for overnight borrowing. Repurchase agreements are sold by sellers with a promise of purchasing them back at a given price and on a given date in future. On the flip side, the buyer will also purchase the securities and other instruments with a promise of selling them back to the seller. 6. **Commercial bills**: It is a short term credit investment created by a non financial firm and guaranteed by a bank to make payment. It is simply a bill of exchange drawn by a person and accepted by a bank. It is a buyer's promise to pay to the seller a certain specified amount at certain date. The same is guaranteed by the banker of the buyer in exchange for a claim on the goods as collateral. The most common term for these instruments is 90 days. However, they can vary from 30 days to180 days.	5
	b.	1. **Investment policy:** The government or the investor before proceeding into investment formulates the policy for the systematic functioning. The essential ingredients of the policy are the investible funds, objectives and the knowledge about the investment alternatives and market. • **Investible funds:** The entire investment procedure revolves around the availability	5

of investible funds. The fund may be generated through savings or from borrowings. If the funds are borrowed, the investor as to be extra careful in the selection of investment alternatives. The return should be higher than the interest pays. Mutual funds invest their owners' money in securities.

- **Objectives:** The objectives are framed on the premises of the required rate of return, need for regularity of income, risk perception and the need for liquidity. The risk taker's objective is to earn high rate of return in the form of capital appreciation, whereas the primary objective of the risk averse is the safety of principal.
- **Knowledge:** The knowledge about the investment alternatives and markets plays a key role in the policy formulation. The investment alternatives range from security to real estate. The risk and return associated with investment alternatives differ from each other. Investment in equity is high yielding but has more risk than the fixed income securities. The tax sheltered schemes offer tax benefits to the investors.

2. **Analysis:** After formulating the investment policy, the securities to be bought have to be scrutinized through the market, industry and company analysis.
   - **Market analysis:** The stock market mirrors the general economic scenario. The growth in gross domestic product and inflation are reflected in the stock prices. The recession in the economy results in a bear market. The stock prices may be fluctuating in the short run but in the long run they move in trends i.e. either upwards or downwards. The investor can fix his entry and exit points through technical analysis.
   - **Industry analysis:** The industries that contribute to the output of the major segments of the economy vary in their growth rates and their overall contribution to economic activity. Some industries grow faster than the GDP and are expected to continue in their growth. The economic significance and the growth potential of the industry have to be analyzed.
   - **Company analysis:** The purpose of company analysis is to help the investors to make better decisions. The company's earnings, profitability, operating efficiency, capital structure and management have to be screened. These factors have direct bearing on the stock prices and the return of the investors. Appreciation of the stock value is a function of the performance of the company. Company with high product market share is able to create wealth to the investors in the form of capital appreciation.

3. **Valuation:** The valuation helps the investor to determine the return and risk expected from an investment in the common stock.
   - **Intrinsic value:** The intrinsic value of the share is measured through the book value of the share and price earnings ratio. Simple discounting models also can be adopted to value the shares. The stock market analysts have developed many advanced models to value the shares. The real worth of the share is compared with the market price and then the investment decisions are made.
   - **Future value:** Future value of the securities could be estimated by using a simple statistical technique like trend analysis. The analysis of the historical behaviour of the price enables the investor to predict the future value.

4. **Construction of portfolio:** A portfolio is a combination of securities. The portfolio is constructed in such a manner to meet the investor's goals and objectives. The investor should decide how best to reach the goals with the securities available. The investor tries to attain maximum return with minimum risk. Towards this end he diversifies his portfolio and allocates funds among the securities.
   - **Diversification:** The main objective of diversification is the reduction of risk in the loss of capital and income. A diversified portfolio is comparatively less risky than holing a single portfolio there are several ways of diversifying the portfolio:
     i. Debt and equity diversification
     ii. Industry diversification

iii. Company diversification

- **Selection & Allocation:** Based on the diversification level, industry and company analyses the securities have to be selected. Funds are allocated for the selected securities. Selection of securities and the allocation of funds seal the construction of portfolio.

5. **Evaluation:** The portfolio has to be managed efficiently. The efficient management calls for evaluation of the portfolio. This process consists of portfolio appraisal and revision.
   - **Appraisal:** The return and risk performance of the security vary from time to time. The variability in returns of the securities is measured and compared. The developments in the economy, industry and relevant companies from which the stocks are bought have to be appraised. The appraisal warns the loss and steps can be taken to avoid such losses.
   - **Revision:** Revision depends on the results of the appraisal. The low yielding securities with high risk are replaced with high yielding securities with low risk factor. To keep the return at a particular level demands investor to revise the components of the portfolio periodically.

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Department of MBA

First Semester Internal Assessment Test-I — **27th June 2022**

Time: 1 ½ hr. — **20MBAMM303: Services Marketing** — **Max. Marks: 50**

Answer the following Questions:

1. a. What do you mean by Services? — **03 Marks**
   b. Explain the reasons for growth of service industry — **07 Marks**
   c. Differentiate between services and goods — **10 Marks**

2. a. what do u mean by tangibility spectrum? — **03Marks**
   b. Explain the characteristics of services — **07 Marks**
   c. Explain 7Ps of service marketing — **10 Marks**

3. a. "Services has become competitive advantage for companies", Comment — **10 Marks**

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Department of MBA

Scheme of Evaluation – Internal Assessment I

Subject : Services Marketing	Code: 20MBAMM303
Max marks: 50	No Choice

Sl. No	Answer script	Marks
1.a	**According to Philip Kotler** "A service is an act or performance that one party can offer to another that is essentially intangible and does not result in the ownership of anything". Thus service is any value adding process which is essentially customer centric, intangible and heterogeneous in nature. Further production, quality and such activity may well connect with source but without registering inventory elsewhere.	**03 Marks**
b.	***Reasons for growth of SM*** ***(A) GOVERNMENT POLICIES:*** 1. Changes in regulations 2. Privatization and economic liberalization 3. New Rules to Protect Customers, Employees and the Environment 4. New agreements on trade in services ***(B) SOCIAL CHANGES:*** 1. Rising Customer's Expectations 2. More Affluence 3. Rising ownership of computers and mobile phones 4. Increased immigration ***(C) BUSINESS TRENDS:*** 1. Manufacturers Add Value to Service and Sell Services 2. Marketing Emphasis by Nonprofits 3. Relaxation of Professional Association Standards 4. Emphasis on Productivity and Cost-Saving 5. Quality Movement ***(D) ADVANCES IN INFORMATION TECHNOLOGY:*** ***(E) GLOBALIZATION*** 1. More companies operating on transnational basis 2. Increased international travel 3. International mergers and alliances 4. "Offshoring" of customer service 5. Foreign competitors invade domestic markets	**07 Marks** **02 marks for listing and 05 marks for explanation**
1. c.	**Difference between Goods and Services**	

Difference between Services and Physical Goods

Services	Physical goods
1. Services are intangible and of non-physical nature.	1. Physical goods are tangible having physical objects and can be created and transferred.
2. Services are not taken home.	2. Goods can be carried home.
3. Services cannot be stored.	3. Goods can be stored.
4. Services don't have any existence.	4. Goods have existence over a long time.
5. Services are of perishable nature	5. Goods are of non-perishable nature.
6. Services cannot be standardized.	6. Goods can be standardized
7. In services consumer involve is very high	7. In goods consumer involve is very low
8. Services cannot be kept stock.	8. Goods can be kept in stock
9. Core value produced in buyer –seller interaction.	9. Core value produced in factory.
10. Production and distribution are simultaneous process	10. Production and distribution are separated from consumption.

10 Marks

02 marks for listing and 08 marks for explanation

2. a. Services tend to be more intangible than manufactured products, and manufactured products tend to be more tangible than services. A useful way to distinguish a service from a product is to place them on a scale from tangible-dominant to intangible-dominant.

03 Marks

b. Characteristics of Services:

Characteristics of Services-Summary	
1. Intangibility	Services cannot be seen, tasted, felt, heard, or smelled before purchase.
2. Inseparability	Services cannot be separated from their providers.
3. Perishability	Services cannot be stored for later sale or use.
4. Heterogeneity	Quality of services depends on who provides them and when, where, and how.
5. Lack of Ownership	Does not result in the ownership of anything.

c. **7Ps of Service Marketing**

1. **Product**
2. **Place**

07 Marks

	3. Price 4. Promotion 5. People 6. Process 7. **Physical evidence**	**02 marks for listing and 05 marks for explanation**
3. a	"Services has become competitive advantage for companies" It is an application oriented question students need to explain how services has become one the differentiating factor to gain competitive advantage over their competitors in terms of serving their customers. Students need to explain how services are different when they are rendering to their customers. They need to mention the concept of uniqueness in serving customers	**10 Marks** **03 marks for listing and 7 marks for explanation**

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Department of MBA

3rd Semester Internal Assessment Test-I — **29th Dec 2022**

Time: 1 ½ hr. — **20MBAMM304: Marketing Research & Analytics** — **Max. Marks: 50**

Answer the following Questions:

1. a. How do you marketing research — **03 Marks**
   b. Explain the need/importance of marketing research — **7 Marks**
   c. Explain Marketing research process — **10 Marks**

2. a. Why do you mean by Marketing intelligence? — **03Marks**
   b. Explain the components of market intelligence — **07 Marks**
   c. Explain threats to market research — **10 Marks**

3. a. Explain the ethical issues in market research — **10 Marks**

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3. a. Explain the ethical issues in market research — 10 Marks

Department of MBA

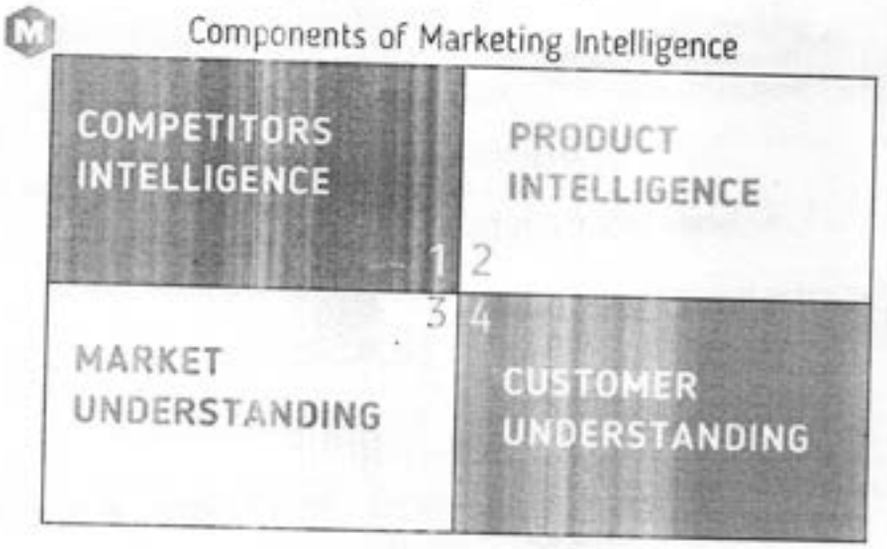
Scheme of Evaluation – Internal Assessment I

Subject : Marketing Research & Analytics	Code: 20MBAMM304
Max marks: 50	No Choice

Sl. No	Answer script	Marks
1.a	**Research is defined** as a "systematic inquiry aimed at providing information to solve managerial problems." The term systematic is related to the scientific method, the idea being that research is the process of inquiry conducted in the best, or at least, most appropriate way.	**03 Marks**
b.	***Need/Importance of Marketing Research SM*** 1. Identifying problem and opportunities in the market: 2. Formulating market strategies: 3. Determining consumer needs and wants 4. For effective communication mix 5. Improving selling activities: 6. For sales forecasting 7. To revitalize brands 8. To facilitate smooth introduction of new products 9. Determine export potentials *10.* Managerial decision-making	**07 Marks** **02 marks for listing and 05 marks for explanation**
c.	***Marketing Research Process*** ***Steps in Marketing Research Process*** 1. Problem Definition 2. Statement of Objectives, Scope and Hypotheses 3. Research Design Choices 4. Identifying Data sources 5. Selecting a Data Collection Method 6. Sampling 7. Data Preparation and Analysis 8. Report Preparation and Presentation	**10 Marks** **02 marks for listing and 08 marks for explanation**
2. a.	Market intelligence is defined as the information or data that is derived by an organization from the market it operates in or wants to operate in, to help determine market segmentation, market penetration, market opportunity, and existing market metrics.	**03 Marks**

b.

Components/Domains of Marketing Intelligence



07 Marks

02 marks for listing and 05 marks for explanation

1. **Competitors Intelligence:** Competitors' intelligence gathers all relevant data of one's competitors to use it in devising a marketing strategy.
2. **Product intelligence:** After analyzing one's competition in the market, it is essential to look into one's own product or service. The purpose is to optimize the product quality to meet the customer's expectations.
3. **Market understanding:** For the successful operation of a company, it is important to understand the market. After the production of the product, the company should analyze whether it will be profitable in the target market.
4. **Customer understanding:** Understanding the customer is the main aspect of establishing and expanding the business.

c.

Threats to Marketing Research

1. Non - Availability of Data
2. Lack of Trained Enumerators
3. Problems of Primary Data
4. Non Cooperation of Respondents
5. Lack of Trust (fear of personal data misuse)
6. Abuse of Respondents Information
7. Lack of Professionalism (Companies are not willing to invest in Marketing Research)
8. Lack of Integrated Approach
9. Expensive
10. It Involves Precious Time & Money

10 Marks
03 marks for listing and 7 marks for explanation

Ethical issues in Marketing Research

3. a	1. Deceptive Practices 2. Invasion of Privacy 3. Breaches of Confidentiality 4. Objectivity 5. Allowing Subjectivity into the Research 6. Selling Unnecessary Research 7. Violating Client Confidentiality 8. Client Ethics 9. Requesting Bids to obtain free Advice and Methodology Making False Promises	**10 Marks** **03 marks for listing and 7 marks for explanation**

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Department of MBA

Third Semester Internal Assessment Test II **6th February 2023**

Time: 1 ½ hr. **20MBA301: Emerging Exponential Technologies** **Max. Marks: 50**

Answer the following Questions:

1. a.	What is Artificial Intelligence(AI)?	**03 Marks**
b.	Explain types of Artificial Intelligence.	**07 Marks**
c.	Explain the application of AI in education.	**10 Marks**
2. a.	What is Internet of Things?	**03 Marks**
b.	Describe the history of IoT.	**07 Marks**
c.	Explain the advantages of IoT.	**10 Marks**
3. a.	Explain the application of IoT in Smart cities	**10 Marks**

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c.	Explain the advantages of IoT.	**10 Marks**
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Department of MBA- AY 2022-23

Scheme of Evaluation – II Internals

III Sem **20MBAHR304 : HR ANALYTICS** **Max.Marks:50**

Q.No	Answers	Marks
1 a.	HR metrics are a vital method for quantifying the impact and cost of HR processes and employee programs. It is also a strategy for measuring the progress or collapse of HR actions. HR metrics can uncover a business's strengths and vulnerabilities and facilitate an understanding of the areas requiring focus or improvement as well as those ready for capitalization. From fundamental HR capability to revealing the precise value of each new worker, HR metrics are priceless for evaluating your business and devising future approaches.	3 marks
b.	DASHBOARD • An Excel Dashboard can be an amazing tool when it comes to tracking KPIs, comparing data points, and getting data-backed views that can help management make decisions. • An Excel dashboard is one-pager (mostly, but not always necessary) that helps managers and business leaders in tracking key KPIs or metrics and take a decision based on it. It contains charts/tables/views that are backed by data. FEW KEY EXCEL ADD-INS/FUNCTIONS TO HELP CREATE DASHBOARDS, • . NAME RANGE SUMIF AVERAGEIF function COUNTIF INDEX	7marks Listing 2m Explanation 5m
c	**HR METRICS MEASURING EFFICIENCY** **1. TIME TO FILL OR HIRE :** **2. OFFER ACCEPTANCE RATE** **3. CAREER PATH RATIO** **4. COST PER HIRE** **5. HR HEADCOUNT RATIO** **6. DIRECT LABOUR COST**	10marks Listing 3m Explanation 7m
2 a	Correlation refers to the statistical relationship between two entities. In other words, it's how two variables move in relation to one another. Correlation can be used for various data sets, as well. In some cases, you might have predicted how things will correlate, while in others, the relationship will be a surprise to you. It's important to understand that correlation does not mean the relationship is causal.	
b	**Positive correlation:** **A positive correlation would be 1. This means the two variables moved either up or down in the same direction together.**	7marks Listing

	• Here are some examples of positive correlations: • 1. The more time you spend on a project, the more effort you'll have put in. • 2. The more money you make, the more taxes you will owe. **Negative correlation:** • A negative correlation is -1. This means the two variables moved in opposite directions. • Here are some examples of negative correlations: • 1. The more payments you make on a loan, the less money you'll owe. • 2. As the number of your employees decreases, the more job positions you'll have open. **Zero or no correlation:** • A correlation of zero means there is no relationship between the two variables. In other words, as one variable moves one way, the other moved in another unrelated direction. • Here are some examples of entities with zero correlation: • 1. The nicer you treat your employees, the higher their pay will be. • 2. The smarter you are, the later you'll arrive at work.	2m Explanation 5m
c	**The Case of Outlier** • A value that "lies outside" (is much smaller or larger than) most of the other values in a set of data. • An *outlier* is an observation that lies an abnormal distance from other values in a random sample from a population. • In statistics, an outlier is **a data point that differs significantly from other observations**. An outlier may be due to variability in the measurement or it may indicate experimental error; the latter are sometimes excluded from the data set. For example in the scores **25,29,3,32,85,33,27,28** both 3 and 85 are "outliers". **Sorting Your Datasheet to Find Outliers** Sorting your datasheet is a simple but effective way to highlight unusual values. Simply sort your data sheet for each variable and then look for unusually high or low values. Graphing Your Data to Identify Outliers Boxplots, histograms, and scatterplots can highlight outliers. Histograms also emphasize the existence of outliers. Look for isolated bars, as shown below. Our outlier is the bar far to the right. The graph crams the legitimate data points on the far left.	10marks Listing 3m Explanation 7m
3a	**What is Open Source Software ?** **Open source software** is a type of software application which provides users with a source code which is free to modify. In the recent years the open source software has been so popular, especially in the IT industry. **Advantages of Open Source Software** **1. Cost Effective** Generally an open source software is free to use. The users does not require to pay for the usage. It can be installed free of cost without any upfront expenses. Nevertheless the quality is not compromised. Especially for businesses with tight budget, using open source software can lead to significant amount of cost savings. **2. Reliability** High reliability can be ensured when using an open source software. The	

open source software is created by expert developers and guided by them. Therefore, there is very less chance that someone will identify flaws in the software.

3. Flexibility

Unlike in proprietary software, users in open source software does not experience vendor lock-ins. Even if there are irrelevant features, the users can effectively remove them. This is because the source code is free to modify.

4. Scalability

Similar to a Linux operating system, an open source software can also be scaled easily. According to the needs, an open source software can be scaled up and down so that businesses could achieve their desired results.

5. Licensing

Open source software offers convenient license schemes. Thus, the users do not need to worry about monitoring and tracking. And regardless of the location, an open source software could also be used.

6. Error Free

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Once a user identifies a bug, they could report it to the community so that the community could fix it as soon as possible.

Disadvantages of Open Source Software

1. User Friendly

Not all the open source applications are easy to use. The Graphical User Interface may not be user friendly for the users to understand. Only tech savvy people will be able to understand this interface.

If used in an organization, the employees must be trained accordingly to operate it.

2. Security

As mentioned earlier, the source code present in an open source software is free to edit. The problem comes when someone misuses the code for their own benefits. While many of them use it for improving the software, others could invite vulnerabilities such as identity theft and malicious transfers.

3. Compatibility

Some applications cannot support both open source software and proprietary software. If proprietary hardware needs to run on an open source machine, it requires third party drivers. However, that cannot guarantee that the hardware will work on the host machine. **4. Maintenance**

Even though an open source software does not contain any upfront costs, still it is equipped with some hidden costs. Especially with maintenance. If you face any problems in the implementation process, a third party support may be needed which could charge additionally.

5. Drivers

Finding required drivers for hardware components is not an easy task because the respective driver must be supporting the current operating system you use. Hence, a new hardware component that is installed could fain to provide its functionalities.

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Department of MBA
III Semester II Internal Assessment Test, February, 2023
Subject: Technology & Operational Strategy (20MBA302)

Time: 90 Minutes **Max. Marks: 50**

Answer the following Questions:

1. a. What do you mean by Lean Manufacturing? 03 Marks
   b. Explain the types of Waste? 07 Marks
   c. Briefly explain the "5S" Technique for eliminating waste? 10 Marks

2. a. What do you mean by Production process? 03 Marks
   b. Write a note on lean operations in service sector? 07 Marks
   c. Explain the Concept of JIT in detail? 10 Marks

3. a. Explain the types of Production process? 10 Marks

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Department of MBA
III Semester II Internal Assessment Test, February, 2023
Subject: Technology & Operational Strategy (20MBA302)
Scheme of Evaluation

1.a) **3 Marks**

- Lean Manufacturing is all about making a product in the most efficient and effective manner, while looking for ways to continuously improve.
- Continuous Improvements:
  - Decrease Cycle Time
  - Eliminate sources of waste in a process
  - Increase Throughout

1.b) **(3+4=7 Marks)**

- Overproduction
- Delays (waiting)
- Transportation
- Process
- Inventories
- Motions
- Defective Products
- Untapped Resources
- Misused Resources

1.c) **(3+7=10 Marks)**

5 "S"	Japanese	English
1 S	Seiri	Sort out unnecessary items in the workplace and discard them.
2 S	Seiton	Arrange necessary items in good order.
3 S	Seiso	Clean your workplace thoroughly so that there is no dust on floors, machines and equipment.
4 S	Seiketsu	Maintain high standards of housekeeping at workplace at all times.
5 S	Shitsuke	Train people to follow good housekeeping disciplines.

3 Marks

2.a)

A production process is the method of using economic input or resources, like labor, capital equipment or land, to provide goods and services to consumers. The production process typically covers how to efficiently and productively manufacture products for sale to reach customers quickly without sacrificing the quality of the product. There are many different types of production processes businesses can follow, according to their manufacture goals, production numbers and technology tools or software systems.

(2+5=7 Marks)

2.b) Define Value
Value Stream Mapping
Creating Flow
Build Pull
Seek Maturity

2.c) The Just-In-Time (JIT) concept is a manufacturing workflow methodology aimed at reducing flow times and costs within production systems and the distribution of materials. The prime goal of JIT is for zero inventories across the organization and its supply chain.
There are seven principles under the umbrella of the JIT concept. These are: elimination of waste, kanban/pull system, uninterrupted work flow, total quality control, top management commitment and employee involvement, supplier relations and continuous improvement.
(3+7=10 Marks)

(2.5*4=10 Marks)

3.a) Types of Production system

- Unit or Job type of production.
- Batch type of Production.
- Mass Production or Flow production.
- Continuous production or Process production

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Department of MBA

Third Semester Internal Assessment Test -II

Time: 90 Minutes **20MBAHR303 RECRUITMENT & SELECTION DATE: 07.02.2023**

Max marks: 50

Answer the following questions:

1. a. Define Job Evaluation? **(3 marks)**
   b. Explain the Job Evaluation Process.. **(7 marks)**
   c Explain Hay Group-Process in Job Evaluation. **(10 marks)**

2. a. Define Selection & Interview? **(3 marks)**
   b. Explain the process of Selection. **(7 marks)**
   c. Briefly explain the techniques of Interview for Selection purpose **(10 marks)**

3. Write a short note on Assessment centre and Simulation. **(10 marks)**

**************ALL THE BEST**************

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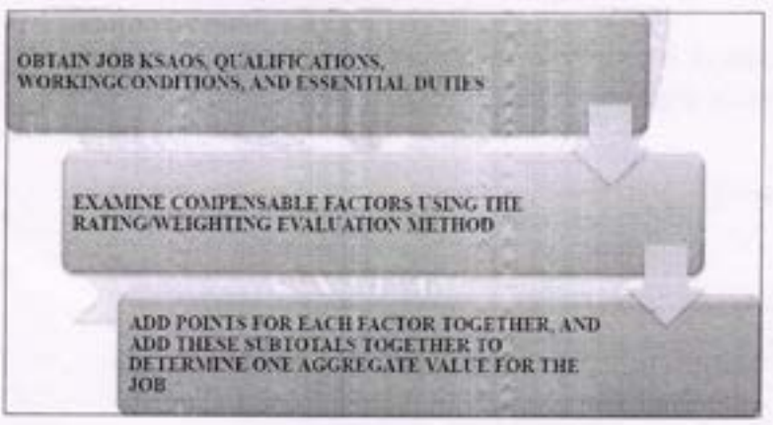
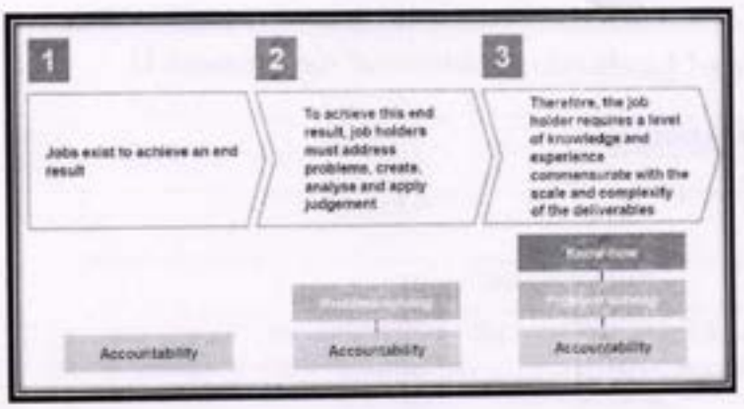
Department of MBA

Scheme of Evaluation – Internal Assessment II

Subject : Recruitment and Selection	Code: 20MBAHR303
Max marks: 50	No Choice

Sl. No	Answer script	Marks
1.a	1. **Edwin B. Flippo defines job evaluation as** "a systematic and orderly process of determining the worth of a job in relation to other jobs". 2. **Dale Yoder described job evaluation as** "a practice which seeks to provide a degree of objectivity in measuring the comparative value of jobs within an organization and among similar organizations".	**03 Marks**
b.	**THE JOB EVALUATION PROCESS:**  	**07 Marks** **02 marks for listing and 05 marks for explanation**
c.	**HAY GROUP—PIONEER IN JOB EVALUATION** Hay Group was founded by Edward Hay, a senior personnel manager, in 1943. Even back in the 1940s, Edward Hay believed "the most successful companies of the future will be the ones that take full advantage of improved personnel techniques" (Capitalism 2.0 Inc., 2018). His vision was to provide credible, accurate, and reliable data, tools, and advisory services for organizations to use to effectively leverage the talent and skills of their employees and to foster motivation and performance. Hay's point-factor methodology was based on a foundation for effective job assessment that included the following components for ascertaining a job's	**10 Marks** **03 marks for chart and 07 marks for explanation**

value to the organization:
1. Job-required knowledge
2. Problem-solving and analytical ability
3. Level and scope of essential job responsibilities
4. A job's working conditions



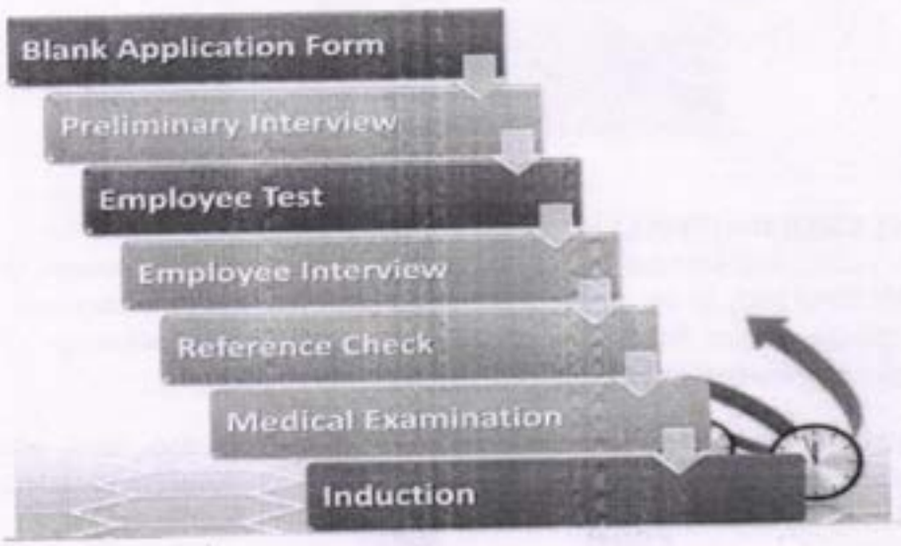
2.a **Selection** is defined as process of selecting the right candidate for right job.

Selection is **a process of identifying and hiring the applicants for filling the vacancies in an organization**. Employee selection is a process of matching organization's requirements with the skills and the qualifications of individuals.

Interview is a process of direct interaction takes place between interviewer and interviwee

03 Marks

b. ***Process of Selection-***



07 Marks

02 marks for listing and 05 marks for explanation

c.	**Techniques of Interview for Selection Purpose-** 1. Preliminary Interview 2. Core Interview- • Stress Interview • Panel Interview • Job & Probing Interview • Depth Interview 3. Decision Making Interview	**10 Marks** **03 marks for listing and 7 marks for explanation**
3. a	**Short Note on Simulation & Assessment Centre-** **Simulation-** A job related activity designed to assess a job candidate's proficiency and ability to perform specific job task. 1. Simulations, as part of a selection strategy, may include real hands-on or hypothetical job-related exercises and activities designed to assess a candidate's proficiency and ability to perform relevant tasks. 2. It is one of the most valuable methods for witnessing candidate perform actual job tasks without yet having that individual employed in the job. The hands-on type of simulation exercise may also be referred to as a work sample assessment, and this is indeed a major category of simulation exercise 3. Job simulations are **employment tests that ask candidates to perform tasks that they would perform on the job**. By using job simulations, employers can evaluate whether a job candidate can do the job, rather than guess based on interview answers and personality questionnaires. **Assessment Center** 1. An assessment center is a multimodal selection strategy that integrates an array of methods that comprise an assessment center are typically a combination of high- and methods and techniques to evaluate job candidates independently and/or in a group. 2. Assessment centers are often used for jobs that are senior level in an organization as may also be implemented for managerial and non managerial jobs that have complete performance dimensions and certain elements of criticality, high risk, and/or a high level of financial responsibility. Because the assessment center is designed to measure multiple and often complete performance dimensions, an array of exercises will be developed that target different performance dimensions and	**10 Marks** **05 marks each explanation**

	behavioral competencies to form an overall picture. 3. An assessment center will often use multiple assessors to enable multiple rounds of exercises to happen simultaneously with all the candidates, which ensures efficiency the process and having all the candidates move through the entire schedule together.	

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Department of MBA

Third Semester Internal Assessment Test II **08th February 2023**

Time: 1 ½ **20MBAHR304: Human Resource Analytics** **Max. Marks: 50**

Answer the following Questions:

1. a. What do mean by metrics?. **03 Marks**
   b. What is dashboard. Explain key Excel Add-ins functions to help create dashboard **07 Marks**
   c. Briefly explain HR Metrics measuring efficiency. **10 Marks**

2. a What correlation? **03 Marks**
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   c. What is case of Outlier. Explain the ways to find an outlier in the dataset. **10 Marks**

3. a. Explain the process of Storyboarding-connecting dots and integrating findings. **10 Marks**

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Department of MBA- AY 2022-23

Scheme of Evaluation – II Internals

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In the design thinking process, the 'customer's needs are first determined through an iterative process and a question is defined, then creative solutions and ideas are generated through brainstorming and visualized via prototypes for user feedback.

Mind-Mapping

Mind-Mapping Is A Useful Creative Problem-Solving Process. A Mind Map Is A Graphic Representation Of Ideas And Concepts. It Is A Visual Tool For Creativity And Problem-Solving. Mind Maps Help You Categorize And Structure Information. They Aid Comprehension, Analysis, And Help Generate Innovative Ideas. Seeing The Problem And Possible Solutions Represented In Visual Form Helps Many Of Us See The Bigger Picture And Connect The Dots.

Counterfactual Thinking

Counterfactual Thinking Is One Of The Smartest Examples Of Creative Problem-Solving At Work. However, It Is Important Not To Channel Negative Emotions While Going Down The Counterfactual Thinking Route. Use Your Past Experiences To Ensure You Don't Repeat Mistakes, Seize Opportunities, And Measure How Far You've Come. Be Present And Future-Focused, And Don't Use Counterfactual Thoughts To Get Trapped In The "What Ifs" Of Your Past.

Abstraction

Abstraction Is A Great Booster For Creativity And Problem-Solving. When A Creative Director In An Advertising Agency Has To Design A Campaign For A Brand Of Fruit Drinks Or Evening Wear,He Uses Abstraction. He Thinks About The Emotions Associated With The Drink Or The Evening, Such As Camaraderie, Romance, Taste, Health, Joy, And So On.

Seen

	• Here are some examples of positive correlations: • 1. The more time you spend on a project, the more effort you'll have put in. • 2. The more money you make, the more taxes you will owe. **Negative correlation:** • A negative correlation is -1. This means the two variables moved in opposite directions. • Here are some examples of negative correlations: • 1. The more payments you make on a loan, the less money you'll owe. • 2. As the number of your employees decreases, the more job positions you'll have open. **Zero or no correlation:** • A correlation of zero means there is no relationship between the two variables. In other words, as one variable moves one way, the other moved in another unrelated direction. • Here are some examples of entities with zero correlation: • 1. The nicer you treat your employees, the higher their pay will be. • 2. The smarter you are, the later you'll arrive at work.	2m Explanation 5m
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Value chain

Value is personal prospective of a person's willingness to pay for the performance delivered By product process or project

Value=desired performance/overall cost

value analysis is a step by step approach to identify the function of a product ,process system or a service to establish a monetary value for that function and then provide the desired function at an overall minimumcost without affecting any of the existing parameters like quality, maintainance,productivity, safety and other performance characteristics.

A cost reduction and problem solving technique that analyzes existing product or services in order to reduce or eliminate any costs that do not constitute to value or performance. value analysis usually focuses on design issues relating to the function of a product or services looking at the prospectives that make it work or which are unique selling points.

Other techniques

Creative Thinking: Coming up with ideas, especially innovative ideas, needs creativity and can be supported by certain creativity techniques. The creativity process is usually applied through a person, product, process, and place. Thus, creativity means that a creative person develops great ideas and novel products through a creative process in a creative environment.

Creativity processes use these influencing factors as they support the search for ideas, problem solving and evaluation, and selection of ideas via rules, a group of people, and a creative process. The workshops are therefore based on creative idea generation techniques that follow individual steps.

Design thinking: Design thinking is an approach to problem-solving and ideation process that works through four key elements.

- The user as the starting point
- Interdisciplinary team
- Iterative process
- Creative environment.

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with some unknown dynamics. To understand the dynamics, they taped thousands of hours of product development meetings and turned their observations into methods that mirrored the techniques of successful entrepreneurs and inventors.

Gordon established three maxims of synectics theory: when people become aware of the psychological processes that affect their behavior, creative output increases; the emotional part of creative behavior overshadows the intellectual component; and the emotional and irrational components should be understood and employed as tools to boost creative output.

Like design thinking, synectics draws on both right brain (the dreamer) and left brain (the reasoner) strengths and requires team members to be comfortable living with complexity and apparent contradiction. The approach involves mentally taking things apart and reassembling them to gain new insight and seeking to discover the links that connect seemingly unrelated elements through analogy and metaphor; this helps make something that is strange familiar and vice versa.

To ensure that a planning session is productive, the facilitators prepare by identifying the problem owners, defining their expectations and ensuring they have the power to implement new solutions. Various brainstorming techniques or exercises may be used in the solution-generating process. For example, the problem owner may be asked to depict the problem in terms of wishes; that is, expressed as, "I wish..." The group would then generate as many solution approaches, or springboards, as possible and the problem owner would select the most promising springboards to explore. During the idea-generation session, the facilitator is responsible for cultivating and maintaining an atmosphere of speculative thinking and open-ended contribution to draw out diverse ideas and shield participants from criticism.

Example: imagine a restaurant with no waiters and servents

---- It's Mac donalds

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Department of MBA

III Semester II Internal Assessment Test, February, 2023

Subject: Investment Management (20MBAFM303)

Time: 90 Minutes **Max. Marks: 50**

Answer the following Questions:

1. a. Define Bond? **03 Marks**
   b. Explain the Features of bond? **07 Marks**
   c. The rate of return on stock A and market portfolio for 8 periods are given below. **10 Marks**

Period	1	2	3	4	5	6	7	8
Return on Stock A (%)	10	15	18	14	16	16	18	14
Return on Market Portfolio (%)	12	14	13	10	9	13	14	7

   Find the beta value of stock.

2. a. What is YTM? **03 Marks**
   b. Explain the different types of Bonds? **07 Marks**
   c. Consider two Stocks P & Q? **10 Marks**

	Stock P	Stock Q
Expected Return	16%	12%
Standard Deviation	15%	8%
Co-efficient of Correlation	0.60	

   a) What is the Covariance between Stock P and Q?
   b) What is the expected return & Risk of a portfolio in which P & Q have weights of 0.6 & 0.4?

3 a. Distinguish between systematic risk and unsystematic risk? **03 Marks**
   b. A portfolio consist of 3 Securities 1, 2and 3. The proportions of these securities are w1= 0.3, w2=0.5 and w3=0.2. The standard deviations of returns of these securities (in percentage terms) are 6, 9 and 10 respectively. The correlation coefficients among the security returns are P12=0,4, P23= 0.7. P13= 0.6. What is the standard deviation of Portfolio return? **07 Marks**

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Department of MBA
III Semester II Internal Assessment Test, February, 2023
Subject: Investment Management (20MBAFM303)
Scheme and Solution

1.a) A bond is a legal document containing an acknowledgement of indebtedness by a company. It contains a promise to pay a stated rate of interest for a defined period and then to repay the principle at a given date of maturity. **03 Marks**

1.b) Features of Bond **(02+05= 07 Marks)**

Credit Instrument

- A bond is a type of loan. A bond holder is a creditor of the company and is entitled to receive payments of interest and the principal.

Interest Rate

- In most of the cases, the bonds promise a rate of interest payable periodically to the bond holder. The rate of interest is also denoted as coupon rate.

Collateral / Security

- Bond issues are secured and therefore bonds may be called as secured investment.

Maturity Date

- Bonds have a fixed maturity date, when these will be repaid or redeemed in the manner specified

Face Value / Maturity Value

- Every bond has a face value as well as a maturity value. The maturity value is generally equal to the face value.

Priority in Liquidation

- In case of liquidation of the company, the claim of the debt holders is settled in priority over all share holders

1.c) **(5+4+1 = 10 Marks)**

X	12	14	13	10	9	13	14	7	**92**
Y	10	15	18	14	16	16	18	14	**121**
XY	120	210	234	140	144	208	252	98	**1406**
X2	144	196	169	100	81	169	196	49	**1104**

N=8

$\beta = N\sum XY - \sum X \sum Y / N\sum X2 - (\sum X)2$

$\beta = 0.3152$

2.a)

YTM is the rate of return, which an investor can expect to earn if the bond is held till maturity. The yield to maturity is calculated based on certain assumptions. They are:

1. There should not be any default. Coupon and principal amount should be paid as per schedule.
2. The investor has to hold the bond till maturity.
3. All the coupon payments should be reinvested immediately at the same interest rate as the same yield to maturity of the bond.

3 Marks

2.b) Types of Bonds **(2+5 Explanation = 7 Marks)**

1. Government Bonds
2. Corporate Bonds
3. Zero Coupon Bond/Deep discount bond
4. Plain Vanilla Bond/ Straight Bonds
5. Floating rate bonds
6. Bonds with Embedded Options

2.c) Covariance = 0.72
Expected Portfolio Return = 14.4%
Portfolio Risk = 11.22 % **(3+3+4 = 10 Marks)**

3.a) **3 Marks**

BASIS FOR COMPARISON	SYSTEMATIC RISK	UNSYSTEMATIC RISK
Meaning	Systematic risk refers to the hazard which is associated with the market or market segment as a whole.	Unsystematic risk refers to the risk associated with a particular security, company or industry.
Nature	Uncontrollable	Controllable
Factors	External factors	Int rnal factors
Affects	Large number of securities in the market.	Only particular company.
Types	Interest risk, market risk and purchasing power risk.	Business risk and financial risk
Protection	Asset allocation	Portfolio diversification

3.b) Standard deviation of portfolio return = **7.57** **(3+4 = 7 Marks)**

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Department of MBA

III Semester Internal Assessment Test -II

Direct Taxation

Time: 90 Minutes **Date: 08/02/2023**

Max marks: 50

Answer the following questions:

1. **a)** Define Business and Profession (3 marks)

   b) Mr. Manthri received during the previous year ending March 31, 2021, emoluments consisting of basic pay Rs. 1,62,000; special allowance Rs. 17,000 and reimbursement of medical expenditure Rs. 3,800. His employer has also provided a rent-free furnished flat in Bombay. Lease rent of the unfurnished flat is Rs. 50,000. Some of the household appliances provided to Mr. Manthri (with effect from June 1; 2020) are owned by the employer (cost price of which is Rs. 36,000, date of purchase is April 1, 1960 and written down value, as on April 1, 2020 is Rs. 620). Employer pays Rs. 10,000 annually as hire charges for three air-conditioners installed throughout the previous year in rent free flat. Compute the value of perquisite if

   i. Mr. Manthri is a Secretary in the Ministry of Law and Rs. 4,000 is the licence fee of unfurnished flat as per the Central Government Rules

   ii. Mr. Manthri is the Managing Director of ABC (P) Ltd. (7 marks)

   c) Explain the Taxability of pension under the hands of both Govt. and Non Govt. employee (10 marks)

2. **a)** Mr. Vishnu, a Government employee, gets Rs. 8,00,000 per annum as basic pay. In addition, he receives Rs. 8,500 as entertainment allowance. His actual expenditure on entertainment for official purposes, however, exceeds Rs. 9,000. Can he claim deduction of actual amount spent by him on entertainment? (3 marks)

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b) Explain the taxability of all types of Provident fund. (7 marks)

c) Mr. Sandeep, who is not covered by the Payment of Gratuity Act, 1972, retires on November 20, 2020 from ABC Ltd. And receives Rs. 1,86,000 as gratuity after service of 38 years and 10 months. His salary is Rs. 8,000 per month upto July 31, 2020 and Rs. 9,000 per month from August 1, 2020. Besides, he gets Rs. 500 per month as dearness allowance (69 percent of which is part of salary for computing all retirement benefits but 100 percent of dearness allowance is considered for computing provident fund). What amount of gratuity will be exempt from tax? (10 marks)

3. XYZ Ltd., a manufacturing Company owns the following assets on April 01, 2020.

Assets	Rate	WDV on 1-4-2020
Plant A	30%	200100
Plant B	15%	405700
Plant C	15%	1470000
Plant D	30%	20000

It has purchased the following assets on 10-03-2021

Assets	Rate	Cost
Plant E	30%	700000
Plant F	15%	400000

It has sold the following during previous year 2020-21

Assets	Rate	Sale Consideration	Express on transfer
Plant C	15%	850000	200
Plant A	30%	2405000	15700

Determine the Amount of Depreciation and Capital Gain for the assessment year 2021-22. The company is not eligible for additional depreciation. (10 marks)

b) Explain the taxability of all types of Provident fund. (7 marks)

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Plant A	30%	2405000	15700

Determine the Amount of Depreciation and Capital Gain for the assessment year 2021-22. The company is not eligible for additional depreciation. (10 marks)

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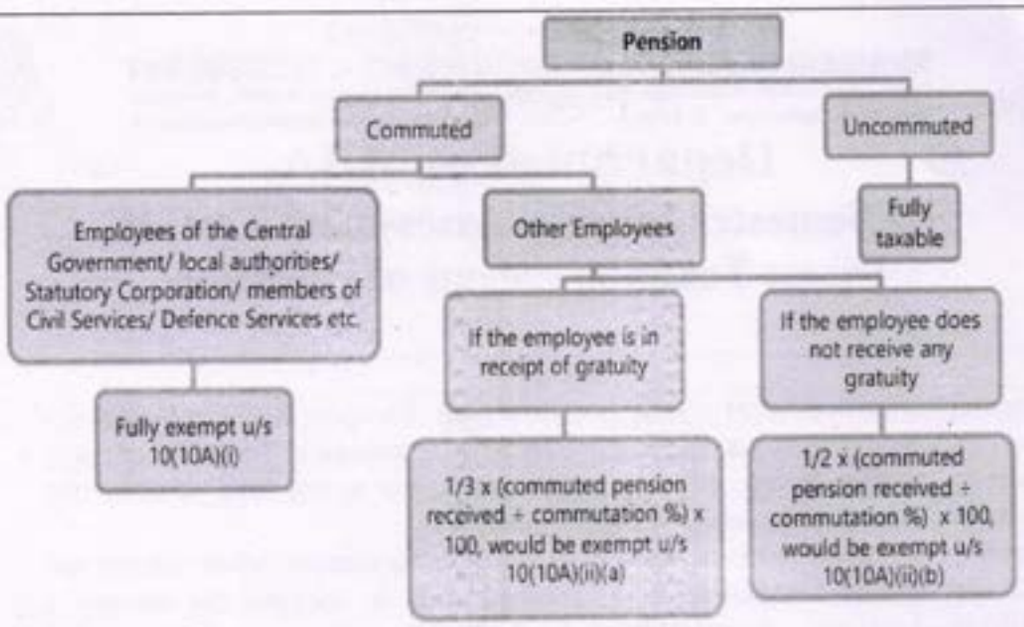
Department of MBA

III Semester Internal Assessment Test -II

Direct Taxation scheme of valuation

Sl. No.	Answers	Marks
1. a.	According to section 2(13) of the income tax act, the term business means any trade, commerce or manufacture or any adventure or concern in the nature of trade, commerce or manufacture. In simple, Business refers to any kind of economic activity done by an assessee for earning profits. According to section 2(36) profession refers to an occupation, where intellectual skills and technical expertise in a specified field is acquired for earning a livelihood. Lawyers', doctor, Engineer, Architect, auditor are some of the examples of the profession. Further, the profession includes vocation. Vocation means an activity upon which a person spends the major portion of his tone and out of which he makes his living. Music, dancing, writing books and contribution of articles to journals constitute the vocation of an assessee.	3
b.	Step 1: Accommodation is take on rent by the employer - Amount of rent Rs. 50,000 - 15% of Salary (1,79,000 x 15%) Rs. 26,850 whichever is less **The perquisite is Rs. 26,850** Step 2: Valuation of furniture 10% of furniture (36000 * 10% * 10/12) 3000 Rent of AC 10000 **Valuaton of furniture** **13000**	7
c	Pension means a periodical payment received by an employee after his retirement. On certain occasions, employer allows to withdraw a lump sum amount as the present value of periodical pension. When pension is received periodically by employee, it is known as Uncommuted Pension. On the other hand, pension received in lump sum is known as Commuted Pension. Such lump sum amount is determined considering factors like the age and health of the recipient, rate of interest, etc.	10

Particulars	Unfurnished	Furniture	Total
(a) Mr. Manthri is a Secretary to Central Government	4000	13000	17000
(b) If Mr. Manthri is the Managing Director of ABC (P.) Ltd	26850	13000	39850



2. a Mr. Vishnu received Rs. 8,500 as Entertainment Allowance. Least of the following is deductible from salary income: 3

5000	5000
20% of salary	160000
Entertainment allowance	8500

Therefore Rs. 5,000 is least; it is deductible from salary income.

b. 7

Particulars	Statutory provident fund	Recognized provident fund	Unrecognized provident fund	Public provident fund
Employers contribution to provident fund	Fully Exempt	Exempt only to the extent of 12% of salary	Fully Exempt	Employer does not contribute
Deduction under section 80C on employees contribution	Available	Available	Not Available	Available
Interest credited to provident fund	Fully Exempt	Exempt only to the extent rate of interest does not exceed 9.5%	Fully Exempt	Fully Exempt
Lump sum Payment received at the time of retirement or termination of service	Fully Exempt	Fully Exempt from tax	Fully Taxable (except employee's contribution)	Fully Exempt

c. 10

Computation of Average Monthly Salary.

Basic salary from January 1, 2020 to October 31, 2020 (Rs. 8000 x 7 + Rs. 9000 x 3)	83,000
69% of dearness allowance (69% x Rs. 500 x 10 months)	3,450
Total	86,450
Average monthly salary Rs. 86,450 ÷ 10 months	8,645

Least of the following is exempt from tax out of Rs. 1,86,000:

	Particulars	Amt
A	Statutory Limit	2000000
B	Half month's average salary** for each completed year of service (8,645 x ½ x 38)	164255
C	Gratuity actually received	186000

Rs. 1,64,255 being the least, is exempt from tax. Balance Rs. 21,745 (1,86,000 - 1,64,255) is taxable for the AY 2021-22. Mr. Sandeep can claim relief u/s 89.

3.

Block 1 (Plant A & Plant D @30%)		Amount
WDV on 01-04-2020		
Plant A	2,00,100	
Plant D	20,000	220100
Add: Actual cost of Plant E purchased on 10-03-2021		700000
		920100
Less: Sale Consideration (Plant A Sold: (24,05,000 + 15,700)		2420700
WDV of the Block on March 31, 2021		Nil
Less: Depreciation		Nil
Short term capital gain		1500600

In this block sale proceeds/consideration exceeds the value of the block. Hence the difference amount is treated as deemed to be short term capital gain.

Block 1 (Plant B & Plant C @15%)		Amount
WDV on 01-04-2020		
Plant B	4,05,700	
Plant C	14,70,000	18,75,700
Add: Actual cost of Plant F purchased on 10-03-2021		4,00,000
		22,75,700
Less: Sale Consideration (Plant C Sold: (8,50,000 + 200))		8,50,200
WDV of the Block on March 31, 2021		
Less: Depreciation [As building F is purchased in the year 2020-21 and it is put to use less than 180 days, Depreciation on Rs. 4,00,000 will be 50% of 15% of Rs. 4,00,000 and on the remaining amount depreciation will be 15% of (14,25,500 – 4,00,000)]	4,00,000 x 15% x ½ = Rs. 30,000 10,25,500 x 15% = Rs. 1,53,825	1,83,825
WDV / Depreciated value of the block on April 1, 2021		12,41,675

Amount of Depreciation for the A.Y. 2021-22 is Rs. 1,83,825

Short term capital gain is Rs. 15,00,600

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Department of MBA

Third Semester Internal Assessment Test -III

Time: 3 Hrs 20MBAHR303 RECRUITMENT & SELECTION DATE: 17.03.2023

Note: 1. Answer any FOUR full questions from Q.No.1 to 7. **Max marks: 100**
2. Q.No.8 is compulsory

1.	a. Define Recruitment?	**(3 marks)**
	b. Explain the factors affecting Recruitment.	**(7 marks)**
	c. Explain the strategies of Recruitment	**(10 marks)**
2.	a. What is Job Analysis, Job Description & Job Design?	**(3 marks)**
	b. Explain the process of Job Analysis.	**(7 marks)**
	c. Explain the methods of collecting Job Analysis data.	**(10 marks)**
3.	a. Define Selection & Interview?	**(3 marks)**
	b. Explain the process of Interview.	**(7 marks)**
	c. What is Test & Explain the types of Employment Tests?	**(10 marks)**
4.	a. What is Bio Data & Application Form?	**(3 marks)**
	b. Explain the Competency Ice Berg Model.	**(7 marks)**
	c. Define Job Evaluation and Explain its Methods.	**(10 marks)**
5.	a. What is Online Salary Survey?	**(3 marks)**
	b. Explain Hay Group-Pioneer in Job Evaluation.	**(7 marks)**
	c. Briefly Explain MBTI.	**(10 marks)**
6.	a. What is Background Check & Reference Check?	**(3 marks)**
	b. Explain the Birkman Method.	**(7 marks)**
	c. Briefly explain FIRO-B.	**(10 marks)**
7.	a. What is Induction & Placement?	**(3 marks)**
	b. Explain Honesty & Integrity Test.	**(7 marks)**
	c. Explain Assessment Center Process.	**(10 marks)**

8. CASE STUDY: (Compulsory)

XYZ Limited is a public sector undertaking with staff strength of around 1200 including 300 officers. As per the recruitment policy of the company, most employees join as trainees and after successful completion of training, are absorbed at the lowest intake level. Thus, in the case of workers, most start as Technician/Operator trainees and officers as Management Trainees. The company expects the higher posts to be filled by promotions and therefore, as far as possible, direct recruitment to higher positions is avoided. Only when there is an urgent

requirement of a person to fill a higher post and no candidates from within the organization are eligible, is an open advertisement released.

In 1982, the company urgently needed one junior engineer (instrumentation) to take charge of one of its plants. At that time, the company has four Junior Engineer (JES) in position who had joined as management trainees in 1980 and had been regularized in 1981. Immediately, above them was an Assistant Engineer, who in turn reported to the project manager. The company released an advertisement for the post of JE, seeking application form those with a least two years experience in the field. One Mr. Ramesh Chaudhari, who had 4 years experience in a private concem applied and was selected. He found the terms of appointment lucrative and joined the company in May 1982. As four JEs were already working in the company, Choudhari became Junior most JE as per the promotion policy of the company; the 4 JEs would become eligible for promotion to the post of Assistant Engineer' in 1985 (on completion of 4 years service) and Choudhari in 1986.

In July 1983, the Assistant Engineer left his job and hence, the company decided to fill the vacancy by direct recruitment. In the advertisement it was stipulated that the applicant should have a minimum of 5 years experience. Choudhari met the specification since he had 4 years previous experience plus one year in XYZ Ltd. Therefore, he applied for the post through proper channel. The company decided to call the eligible candidates for interview. Accordingly, Choudhari was also called along with the external candidates. He performed exceedingly well in the interview and was found suitable for the post. The General Manager (GM), who was Chairman of the Selection Committee, congratulated Choudhari and told him that he has been selected.

However, the GM changes his mind subsequently and asked the personnel officer not to issue the appointment letter to Choudhari. He gave the following reasons for reverting his decision:

i) Mr. Choudhari would get a higher post after completion of just over one year's service in the organization as against the normal recruitment of 4 years.

ii) ii) When Mr. Choudhari joined, he was junior to all the 4 JEs by about 1 year. If he was offered the higher post, he would suddenly become their boss. This would demoralize the JEs in fact they had already decided to seek jobs elsewhere if Choudhari become Assistant Engineer.

GM chose to disappoint Choudhari.

Questions:

a. Are there any drawbacks in the recruitment/promotion policies of the company? Elaborate. **(07 Marks)**

b. If Choudhari had been external candidate, would he have got job? As an internal candidate, did he deserve to be treated in different fashion? **(07 Marks)**

c. Did Management make mistake in calling Choudhari for interview? **(06 Marks)**

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Department of MBA

Scheme of Evaluation – Internal Assessment III

Subject : Recruitment and Selection	Code: 20MBAHR303
Max marks: 100	

Sl. No	Answer script	Marks
1.a	**Edwin B. Flippo** defines Recruitment "is a systematic process of searching for prospective candidates and stimulate them to apply for jobs". **Dale Yoder** described Recruitment as ""is a systematic process of searching for prospective candidates by using various sources".	**03 Marks**
b.	**Factors affecting Recruitment are-** 1. **Internal Factors-** • HRP • Recruitment Policy • Size of the Firm • Cost 2. **External Factors-** • Supply & Demand • Unemployment Rate • Image/Good will of the Company • Political-Social Legal Environment	**07 Marks** **02 marks for listing and 05 marks for explanation**
c.	**Strategies of Recruitment are-** 1. **Internal Sources-** • Transfer & Promotion • Present Employees • Retired Employees • Employee Reference • Dependants of Deceased Employees 2. **External Sources-** • Campus Recruitment • Third Party Consultants • Scouting • Walk-in • Head Hunting • E-Recruitment	**10 Marks** **03 marks for listing and 07 marks for explanation**

2.a	**Job Analysis** is a systematic process of collecting the data related to specific job. **Job Description** is detailed information of roles and responsibilities related to specific job. **Job design** decides the contents of a job. It fixes the duties and responsibilities of the job, the methods of doing the job, and the relationships between the job holder (manager) and his superiors, subordinates, and colleagues.	**03 Marks**
b.	**Process of Job Analysis-**It includes following steps • Organizational Analysis • Selection of Representative position to be analyzed • Collection of Job Analysis Data • Preparation of Job Description • Preparation of Job Specfication	**02 marks for listing and 05 marks for explanation**
c.	**Methods of collecting Job Analysis Data-** • Interview • Direct Method • Maintenance of Long Records • Questionnaire Method • Panel of Experts • Critical Incident Technique	**10 Marks** **03 marks for listing and 7 marks for explanation**
3.a	**According to Koontz** "Selection is a process of selecting the right candidate for the right job." **According to Dale** "Interview is a direct interaction takes place between interviewer and interviewee"'	**03 Marks** **07 Marks**
b.	**The process of Interview includes following steps-** • Preparation for the Interview • Conducting the Interview • Close the Interview • Evaluate Interview Results	**02 marks for listing and 05 marks for explanation**
c.	**Test** is a Systematic process of assessing the candidates Competency and to take decision whether the candidate is suitable for job or not. **Types of Employment Tests are-** • **Ability Test-** 1. Clerical Ability Test 2. Mechanical Ability Test 3. Physical Ability Test	**10 Marks** **02 marks for Meaning and 08 marks for explanation**

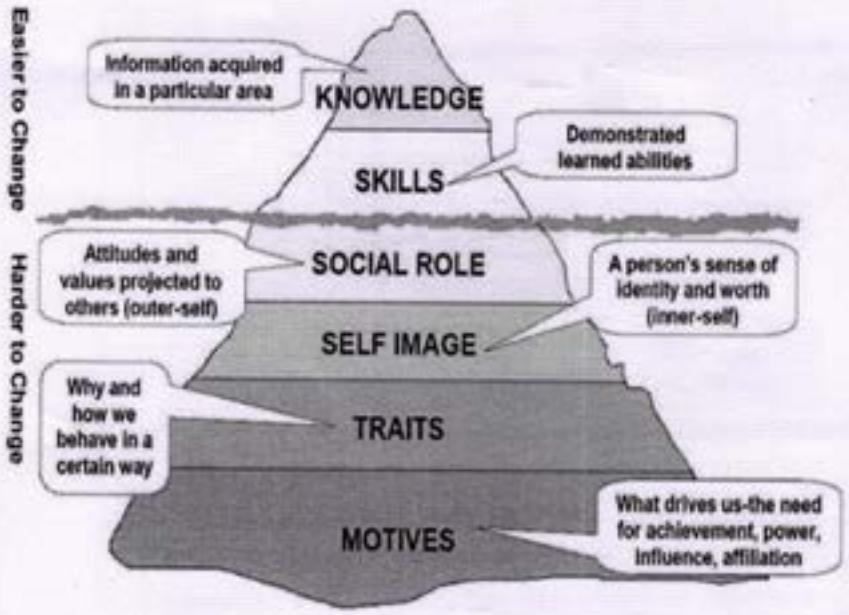
- **Knowledge Test-**
  1. Job Knowledge Test
- **Skill Test-**
  1. Performance Test
  2. Psychomotor Test

4.a **Bio Data-** Biographical information, often called bio data, is personal history information on an applicant's background and interests. Basically, results from a bio data survey provide a general description of a person's life history. **03 Marks**

Application Form-Job application forms are official forms which a company asks candidates to fill out when applying for a job. Unlike your CV, these forms allow employers to ask a specific set of questions – rather than letting jobseekers choose the format and content of their application themselves.

b. The iceberg model for competencies takes the help of an iceberg to explain the concept of competency. An iceberg which has just one-ninth of its volume above water and the rest remains beneath the surface in the sea. Similarly, a competency has some components which are visible like knowledge and skills but other behavioural components like attitude, traits, thinking styles, self-image, organizational fit etc are hidden or beneath the surface **07 Marks**

ICEBERG MODEL OF COMPETENCIES



c. **A Job Evaluation** is a systematic way of determining the value/worth of a job in relation to other jobs in an organization

10 Marks
2 Marks for meaning and 04 marks each explanation

Methods of Job Evaluation-

1. **Analytical Method-**

- Factor Comparison Method
- Point Ranking Method

2. **Non Analytical Method-**
   - Ranking Method
   - Job Grading Method

5.a **Online Salary Survey-** A salary survey is a tool specifically for remuneration specialists and managers to define a fair and competitive salary for the employees of a company. **03 Marks**

b. **HAY GROUP—PIONEER IN JOB EVALUATION**

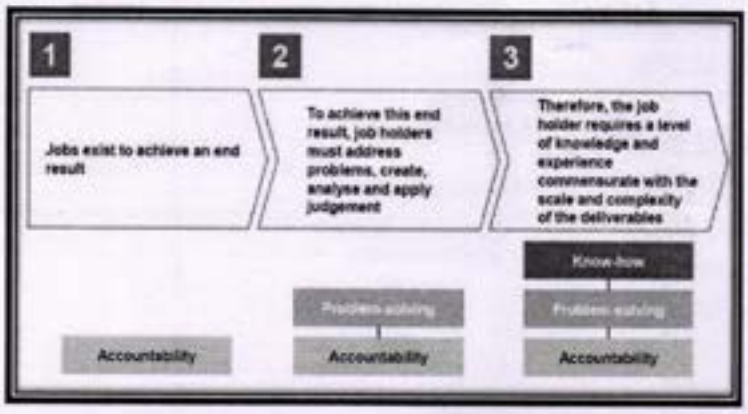
Hay Group was founded by Edward Hay, a senior personnel manager, in 1943. Even back in the 1940s, Edward Hay believed "the most successful companies of the future will be the ones that take full advantage of improved personnel techniques" (Capitalism 2.0 Inc., 2018).

07 Marks

His vision was to provide credible, accurate, and reliable data, tools, and advisory services for organizations to use to effectively leverage the talent and skills of their employees and to foster motivation and performance.

Hay's point-factor methodology was based on a foundation for effective job assessment that included the following components for ascertaining a job's value to the organization:

1. Job-required knowledge
2. Problem-solving and analytical ability
3. Level and scope of essential job responsibilities
4. A job's working conditions



c. In developing the Myers-Briggs Type Indicator [instrument], the aim of Isabel Briggs Myers, and her mother, Katharine Briggs, was to make the insights of type theory accessible to individuals and groups. They addressed the two related goals in the developments and application of the MBTI instrument:The identification of basic preferences of each of the four dichotomies specified or implicit in Jung's theory.

10 Marks

MYERS-BRIGGS

6.a

Background Check-Background verification is the process of vetting employment history, commercial records, financial records, criminal records, and other activities of a person or a company to confirm their authenticity.

Reference Check-Reference check refers to a recruiting process method used by hiring managers/recruiters to get more information about a candidate by contacting his/her previous employers, schools etc.

3 Marks

b.

Birkman Method-

The Birkman Method reveals 4 Key perspectives of every Person-

- Motivation
- Self Perception
- Social Perception
- Mindset

07 Marks

02 marks for listing and 05 marks for explanation

c.

1. The Fundamental Interpersonal Relations Orientation (FIRO) assessments help people understand their interpersonal needs and how those needs influence their communication style and behavior.

2. These accessible and universally applicable personality assessments have helped individuals, teams, and organizations around the world grow and succeed. In a recent survey, more than 90 percent of FIRO-B customers improved teamwork within their organization or for their clients.

10 Marks
2 Marks for listing and 08 marks each explanation

	3. The FIRO-B Assessment is a unique instrument that doesn't actually "measure" anything. Instead, it provides a score that is used to estimate how comfortable an individual is with a specific behavior. 4. The FIRO-B test includes three main areas: 1. Inclusion 2. Control 3. Affection	
7.a	**Induction**-An induction programme is the process used within many businesses to welcome new employees to the company and prepare them for their new role. ... **Placement**-A process of placing the selected candidates for selected Post.	**3 Marks**
b.	**Honesty & Integrity Test-** An integrity test is a specific type of personality test designed to assess an applicant's tendency to be honest, trustworthy, and dependable. 1. A lack of integrity is associated with such counterproductive behaviors as theft, violence, sabotage, disciplinary problems, and absenteeism. Integrity tests have been found to measure some of the same factors as standard personality tests, particularly conscientiousness, and perhaps some aspects of emotional stability and agreeableness. □ Overt integrity tests (also referred to as clear-purpose tests) are designed to directly measure attitudes relating to dishonest behavior. □ They are distinguished from personality-based tests in that they make no attempt to disguise the purpose of the assessment. □ Overt tests often contain questions that ask directly about the applicant's own involvement in illegal behavior or wrongdoing (e.g., theft, illicit drug use). Such transparency can make guessing the correct answer obvious. Applicant faking is always a concern with overt integrity tests. The score results from such tests should be interpreted with caution.	**7 Marks**
c.	**Assessment Center Process Model-** • Obtain Job Description • Identify performance Dimensions to Evaluate • Determine utility of Existing Selection Measure for Inclusion • Identify & Select Assessors • Co ordinate Date and Location • Conduct Assessment Center • Facilitate Assessor Group Evaluation and Candidate Ranking • Conduct Follow up Communication with all Candidates	**10 Marks** **2 Marks for listing and 08 marks each explanation**

8. a. b. c.	**CASE STUDY-** 1. Advertisement 2. Contents of Advertisement 3. Information Provided 4. Clarity 5. Policy of the company 1. As External Candidate he would have got job. 2. As Internal Candidates should have gone through policies of organization might have communicated the policy guidelines Mistakes of Management	**7 Marks** **7 Marks** **6 Marks**

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Department of MBA

III Semester Internal Assessment Test -III

Direct Taxation

Time: 3 hrs. **Date: 18/03/2023** **Max marks: 100**

Note: 1. Answer any FOUR full questions from Q.No.1 to 7.
2. Q.No.8 is compulsory

1 a. Define the term 'Assessee' as per the Income Tax Act 1961. (3 marks)

b. Ms. Bindu, residing in New York since 1991, came back to India on 19-02-2020 for permanent settlement in India. Explain the residential status of Ms. Bindu for AY 22-23 (7 marks)

c. Work out the amount of depreciation allowance for the assessment year 2022-23 from the following particulars of assets of a steel factory:

Assets	WDV as on 1.4.2021	Rate of depreciation
Building	1547380	10%
Plant	215740	10%
Machinery	3500000	15%
Motor car	150000	30%
Furniture	25170	10%

The factory purchased and installed old machinery on 31st Oct 2020 at a Cost of Rs. 5,00,000. One Plant (whose WDV as on 1.4.2021 was Rs. 1,15,000) was completely destroyed by fire on 1.9.2021 and Rs. 1,00,000 was received from the insurance company in respect thereof. (10 marks)

2 a. What is MAT? (3 marks)

b. Write short note on Tax planning and Tax evasion (7 marks)

c. X transfers the following assets on May 15, 2020

	Cost	Fair market value on 1.4.2001	Sale consideration
Land (acquired in 1968)	20000	45000	685000
Goodwill of business	Self generated	10000	175000
Tenancy rights	Self generated	30000	200000

Determine the amount of capital gains chargeable to tax for the assessment year 2021-22. (10 marks)

3 a. Mention the exception to general rule of previous year. (3 marks)

b. Explain the tax treatment of pension under section 10(10A) (7 marks)

c. Discuss the deduction u/s 80C, 80D, 80DDB and 80E. (10 marks)

4 a. What is gross total income? (3 marks)

b. Mr. Paramesh, an employee of PQ Co. Ltd., receives Rs. 78,000 as gratuity. He is covered by the Payment of Gratuity Act, 1972. He retires on December 12, 2020 after rendering service of 38 years and 8 months. At the time of retirement his monthly basic salary and dearness allowance was Rs. 2,400 and Rs. 800 respectively. Is the entire amount of gratuity exempt from tax? (7 marks)

c. Mr. Harish, employed as a Manager in a company furnished the following information for the year ended 31-03-2021.

i. Basic Salary Upto 31-10-2020 Rs. 50,000 PM, from 01-11-2021 Rs. 60,000 PM
ii. Dearness Allowance - 40% of Basic Pay (Not part of Retirement benefit)
iii. Bonus Rs. 50,000
iv. Contribution of employer to RPF @ 16% of Basic Pay.
v. Professional Tax paid by Harish Rs. 3000.
vi. 1.9 Ltr car is provided by employer from 01-11-2020. All expenses are met by employer. Harish is using the car for both official and private purpose.

Compute taxable salary of Mr. Harish. (10 marks)

5 a. What are perquisites? Name any two. (3 marks)

b. Explain the exemption/deductions under capital gain. (7 marks)

c. Following is the profit and loss account of Sri Lakshmi Narayana ltd., an Indian Company for the year ending 31-03-2022

Salaries and wages	750000	Gross profits	2500000
Advertisement expenses	150000		
Insurance	250000		
Audit fees	50000		
Depreciation	100000		
Income tax	30000		
Transfer to general reserve	40000		
Office expenses	15000		
Losses of subsidy company	25000		
Net profit	1090000		
	2500000		**2500000**

Additional information:

- Brought forward loss as per books of accounts is 125000 and as per income tax is 150000
- Unabsorbed depreciation as per books of accounts amount to 25000 and as per income tax is 75000

Calculate:

i. Total income of the company under normal provision

ii. Book profit and tax liability as per section 115JB

iii. Tax liability of the company. (10 marks)

6 a. What is direct and indirect tax? (3 marks)

b. Mr. B (40 years) is a businessman. His income for the previous year 2020-21 from business is 1400000. Besides, he has interest on savings bank account of 21000. He annually contributes 150000 towards public provident fund. B wants to know whether he should opt for alternative tax regime from assessment year 2021-22 or not. (7marks)

c. The following is the P & L A/c. of Raj Oil Mills for the financial year 2020-21. Compute its business income on the basis of additional information.

Profit and Loss A/c

Particulars	Amount	Particulars	Amount
Office salaries	15000	Gross profit	80000
General expenses	7000	Profit on sale of car	15000
Bad debts	1000	Recovery of bad debts	5000
Advertisement expenses	3700	Interest on Govt. securities	3500
Insurance premium (fire)	1500	Dividends	3500
Depreciation	5000	Gifts on the occasion of	5000
Reserved for bad debts	3000	Grihapravesham	
Donation to a school	2500		
Car expenses	2000		
Net profit	71300		
	112000		**112000**

Additional Information:

i. General expenses include:

  i. Rs. 2,500 as compensation paid to an accountant who had to be removed from service in the interest of business and

  ii. Rs. 3,300 as contribution paid to the Government for buying electric cables for the company's plant.

ii. Deprecation as regards the relevant blocks of assets under the Income Tax Act Rs. 3,500.

iii. In the A.Y. 2019-20, the Assessing officer had refused to allow deduction for the bad debts of Rs. 5,000 now recovered.

iv. Car expenses include Rs. 500 attributable to use of car for personal work. (10 marks)

7 a. What are the losses which can be carried forward as per IT Act? (3 marks)

b. List the income taxable under the head income from other sources. (7 marks)

c. X ltd. is engaged in the business of manufacture of computer hardware in Rajasthan since 1995. During the previous year 2020-21, the following assets are acquired and put to use

(Rs. In thousands)

	Block 1	Block 2	Block 3
Rate of Depreciation	15%	30%	40%
Number of assets in the block	11	12	17
Depreciated value of the block on April 1, 2020	1800	2500	500
Additions of plants (new) during the previous year 2020-21			
Plant A	5700	-	-
Plant B	-	400	-
Plant C	-	-	1700
Sale of old plants (one plant in each block)	8	2870	4200

Plants A, B and C are acquired during May 2020 and put to use during September 2020. However, Plant B is put to use in the last week of March 2021. Find out the amount of depreciation, additional depreciation and capital gains. (10 marks)

8 **Case Study (Compulsory):**

For the assessment year 2021-22, Ajay (age: 61 years), a resident individual furnishes the following information:

Basic pay Rs. 1,20,000
Project allowance Rs. 1,29,400
Education allowance (Rs. 200 pm for two sons & Rs. 150 pm for a daughter) Rs. 6,600
Hostel expenditure allowance (Rs. 650 per month for one child) Rs. 7,800
Transport allowance (for journey between office and resident) Rs. 19,200
Free car (1150cc) facility for Ajay for official and private purposes, cost to the employer – company Rs. 27,000
Free meals in office (300 working days) Rs. 12,700
Employer's contribution towards unrecognized provident fund Rs. 3,000
Share of profit from:

- A firm Rs. 36,000
- An association of persons Rs. 34,000
- A Hindu Undivided Family Rs. 18,000

Income from betting Rs. 2,400
Interest from Indian Overseas Bank (Fixed deposit interest: Rs. 14,000, savings bank interest: Rs. 48,000)
Income from business Rs. 4,91,600
PAYMENTS AND INVESTMENTS
Contribution towards unrecognized provident fund Rs. 6,700
Payment of premium on medical insurance policy on Ajay's father who is resident in India Rs. 30,500
Payment of premium on own medical policy Rs. 36,000
Investment in National Savings Certificates VIII issue Rs. 1,05,000
Donation to an approved public charitable institution Rs. 3,000
Determine the net income and tax liability of Ajay for the assessment year 2021-22. (20 marks)

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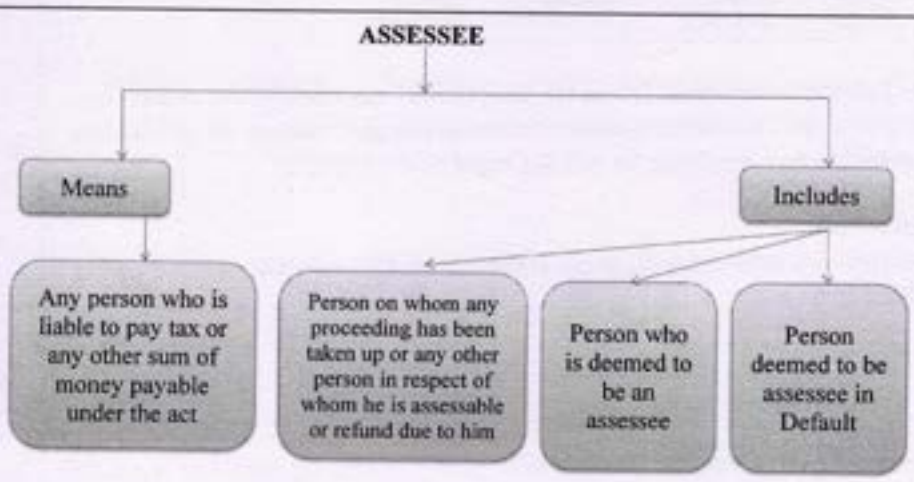
Department of MBA

III Semester Internal Assessment Test -III

Direct Taxation scheme of valuation (20MBAFM304)

Sl. No.	Answers	Marks
1.a.		3
b.	Calculation of residential status of Ms.Bindu Year / No. of days stayed in India: 21-22: 365; 20-21: 365; 19-20: 42; 18-19: -; 17-18: -; 16-17: -; 15-16: -; 14-15: -; 13-14: -; 12-13: - **Basic Condition – Sec 6(1)** a. He is in India in the previous year for a period of 182 days or more. b. He is in India for a period of 60 days or more during the previous year and 365 days or more during 4 years immediately preceding the previous year Ms. Bindu has satisfied the basic condition 'a' by staying in India more than days. Hence she is Resident. **Additional Conditions – Sec 6(6):** a. He has been resident in India at least 2 years out of 10 previous years immediately preceding the relevant previous year. b. He has been in India for a period of 730 days or more during 7 years immediately preceding the relevant previous year. But she has not satisfied additional conditions, hence Ms. Bindu is Resident but not ordinary resident.	7
c.	Calculation of depreciation Block -2 (Plant) / Amount: WDV 215740; Add: purchases -	10

	215740
Less: destroyed by fire	100000
	115740
Less: Depreciation	11574
	104166

	Block-1 Building	Block-3 Machinery	Block-4 Motor Car	Block-5 Furniture
WDV	1547380	3500000	150000	25170
Add: purchases	-	500000	-	-
	1547380	4000000	150000	25170
Less: sales	-	-	-	-
	1547380	4000000	150000	25170
Less: Depreciation	154738	562500	45000	2517
	1392642	3437500	105000	22653

2.a. MAT or Minimum Alternate Tax is a provision in Direct tax laws to limit tax exemptions availed by companies, so that they mandatorily pay a minimum amount of tax to the government. As per Section 115JB, all companies are required to pay corporate tax at least equal to the higher of 3

- Normal tax liability or
- MAT (minimum alternative tax)

All companies are required to pay minimum alternative tax at the rate of 15% of book profits plus surcharge and health and education cess.

b. **Tax Planning:**

Tax Planning is an arrangement of one's financial and economic affairs by taking complete legitimate benefits of all deductions, exemptions, allowances and rebates so that tax liability reduces to minimum. 7

Nature / Characteristics of Tax Planning:

1. Tax planning is legally recognized
2. Planning in connection with income, expenditure and investments
3. Tax planning is moral
4. Tax planning is in accordance with govt. policy
5. Tax planning reduces tax liability and increases after tax income
6. Tax planning is a continuous process
7. Tax planning is scientific

Tax Evasion:

When a person reduces his total income by making false claims or by withholding the information regarding his real income, so that his tax liability is reduced is known as Tax Evasion. It is not only illegal but it is also immoral, anti-social and anti-national practice. Hence under Direct Taxes law has been made to impose heavy penalty and institution of prosecution proceedings against tax evaders.

Methods of tax evasion:

1. Smuggling
2. Customs Duty Evasion
3. Illegal Income Tax Evasion
4. Under statement of receipts
5. Over estimation of business expenses

c. Calculation of capital gain 10

	Land	Goodwill	Tenancy Right
Sale consideration	685000	175000	200000
Less: expenses	-	-	-

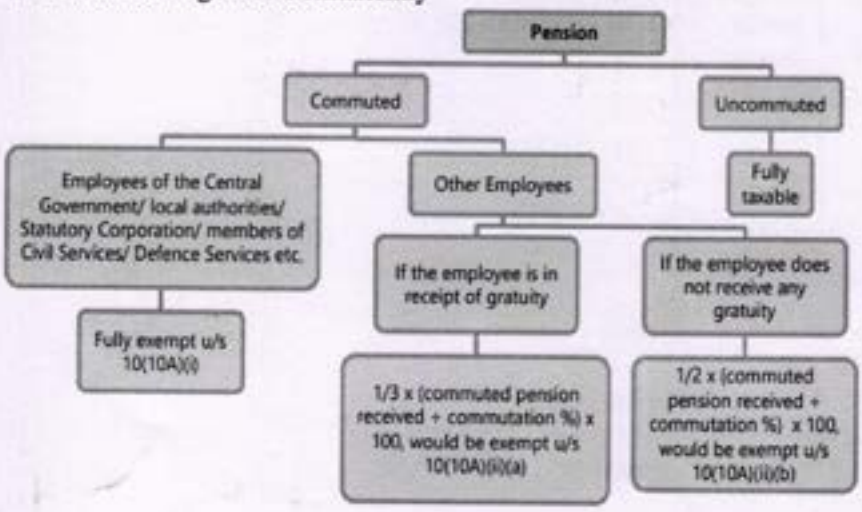
	685000	175000	200000	
Less: index cost of acquisition (45000*301/100)	135450	-	-	
Long term capital gain	549500	175000	200000	

3.a.

- AOP / BOI formed for Short duration
- NR shipping Business
- Transfer of property to Avoid Tax
- Closure of Business
- Person leaving India Permanently

3

b.



7

c.

Section 80C of the Income Tax Act provides provisions for tax deductions on a number of payments, with both individuals and Hindu Undivided Families eligible for these deductions. Eligible taxpayers can claim deductions to the tune of Rs 1.5 lakh per year under Section 80C, with this amount being a combination of deductions available under Sections 80 C, 80 CCC and 80 CCD

Section 80D of the Income Tax Act permits deductions on amounts spent by an individual towards the premium of a health insurance policy. This includes payment made on behalf of a spouse, children, parents, or self to a Central Government health plan. An amount of Rs 15,000 can be claimed as a deduction when paid towards the insurance for spouse, dependent children, or self, while this amount is *Rs 30,000* (Union Budget 2017) if the person is over the *age of 60* years. Both individuals and Hindu Undivided Families are eligible for this deduction, subject to the payment being made in *modes other than cash*.

10

Section 80DDB: Section 80DDB can be utilized by HUFs and resident individuals and provides provisions for deductions on the expense incurred by an individual/family towards medical treatment of certain diseases. The permitted deduction is limited to Rs 40,000, which can be increased to Rs 60,000 (Union Budget 2015) if the treatment is for a senior citizen. The deduction under Section 80DDB for senior citizens and very senior citizens has been increased to Rs.1 lakh in Union Budget 2018.

Section 80E of the Income Tax Act has been designed to ensure that educating oneself doesn't become an additional tax burden. Under this provision, taxpayers are eligible for tax deductions on the interest repayment of a loan taken to pursue higher education. This loan can be availed either by the taxpayer himself/herself or to sponsor the education of his/her ward/child. Only individuals are eligible for this deduction, with loans taken from approved charitable organizations and financial institutions permitted for tax benefits.

4.a.

Gross total income is the aggregate of all taxable receipts in the previous year. It is the income of assessee before deduction under section 80C to 80U. In simple gross total income refers to the total income computed under the five heads of incomes.

Gross total income = Income from salary + income from house property + Profits and gains from business and profession + income from capital gain + income from other sources

3

b.

Gratuity Received	78000
Less: exemption	72000
Taxable gratuity	6000

Note: calculation of exempted gratuity

Least of the following is exempted	2000000
15 days salary [15/26 * (2400 + 800) *39]	72000
Actual amount received	78000

7

Calculation of taxable salary of Mr. Harish for the AY 22021-22

c.

Particulars	Amount
Basic salary	650000
DA	260000
Bonus	50000
Employer Contribution to RPF	26000
Perquisites	12000
	998000
Less: deduction u/s 16	
- Standard deduction	50000
- Professional tax paid	3000
	945000

10

Note:

i. Basic salary = [(50000*7) + (60000*5)] = 350000 + 300000 = 650000
ii. DA = 650000*40% = 260000
iii. RPF contributed (650000*16%) 104000
Less: exemption (650000*12%) 78000
Taxable RPF 26000
iv. Perquisites
Car used from Nov to Mar = 5months
2400*5 = 12000

5.a. Perquisites are the benefits or amenities in cash or in kind, or in money or money's worth and also amenities which are not convertible into money, provided by the employer to the employee whether free of cost or at a concessional rate which are attached to an office or position in addition to salary and wages. Their value, to the extent these go to reduce the expenditure that the employee normally would have otherwise incurred in obtaining these benefits and amenities, is regarded as part of the taxable salary.

3

b. **Section 54** - Capital Gain arising from the transfer of residential house property.
Section 54B - Capital Gain arising from the transfer of land used for agricultural purpose.
Section 54D - Capital Gain on compulsory acquisition of land and building, forming part of industrial undertaking.
Section 54EC - Capital Gain arising from the transfer of any long-term capital asset on the basis of investment in certain bonds.
Section 54EE - Capital Gain not to be charged on investment in units of a specified fund.
Section 54F - Capital Gain arising on transfer of a long term capital asset other than a house property
Section 54G - Capital Gain arising on transfer of assets in cases of shifting of industrial undertaking from urban area to rural area.
Section 54GA - Capital Gain on transfer of assets in cases of shifting of industrial undertaking from urban area to special economic zone.
Section 54GB - Capital Gain on transfer of residential property

7

Computation of total income

c.

Net profits		1090000
Add: inadmissible expenses		
- Income tax	30000	
- Transfer to general reserve	40000	70000
		1160000
Less: brought forward loss as per IT	150000	
Unabsorbed depreciation under IT	75000	225000
Income from business		935000

10

Income from capital gain		-
Income from other sources		-
Gross total income		935000
Less: deduction		-
Total income		935000

Computation of tax liability

Tax (935000@30%)	280500
Add: HEC @ 4%	11220
Total tax	291720

Computation of book profit and MAT

Net profit		1090000
Add: inadmissible expenses		
- Income tax		30000
- Transfer to general reserve		40000
- Losses of subsidiary company		25000
		1185000
Less: Brought forward loss or unabsorbed depreciation (WEL – 125000 or 25000)		25000
		1160000
MAT u/s 115JB	174000	
Add: HEC @ 4%	6960	
MAT	180960	

Tax liability = 291720

6.a. Tax, of which incidence and impact fall on the same person, is known as direct tax. The person who pays the tax to the Government cannot recover it from somebody else i.e. the burden of a direct tax cannot be shifted. If tax is levied directly on the income or wealth of a person, then it is known as direct tax.
If tax is levied on the price of a good or service, then, it is an indirect tax e.g. Goods and Services Tax (GST) or Custom Duty. In the case of indirect taxes, the person paying the tax passes on the incidence to another person. Incidence and impact on two different persons. 3

Total income and tax liability as per IT Act

PGBP	1400000
Income from other source	21000
	1421000
Less: Deductions	
- 80C PPF	150000
- 80TTA Interest	10000
Total Income	1261000

b. **Tax:**

0-250000	nil
250000-500000	12500
500000-1000000	100000
Above 1000000	78300
	190800
Add: HEC @ 4%	7632
Net tax	198432

7

Total income and tax liability as per sec 115BAC

PGBP	1400000
Income from other source	21000
	1421000

Tax:

	0-250000	nil	
	250000-500000	12500	
	500000-750000	25000	
	750000-1000000	37500	
	1000000-1250000	50000	
	1250000-1421000	42750	
		167750	
	Add: HEC @ 4%	6710	
	Net tax	174460	

Taxable income from business

	Net profit		71300
c.	Add: disallowed expenses		
	- Depreciation	1500	
	- Reserve for bad debts	3000	10
	- Donation to school	2500	
	- Car expenses	500	7500
			78800
	Less: income from other heads		
	- Sale of car	15000	
	- Interest	3500	
	- Dividends	3500	
	- Gifts	5000	27000
	Taxable income from business		51800

	House property	
	Speculative business	
7.a.	Unabsorbed depreciation	
	Non-speculative business	3
	Long term capital loss	
	Short term capital los	

b.

1. Income from subletting of a house property by a tenant
2. Casual income
3. Insurance commissions received by the assessee
4. Family pension payments received by the legal heirs of dead employees
5. Interest on bank deposits and deposits with companies
6. Interest on loans given
7. Remuneration received by Members of Parliament
8. Rent earned from a vacant plot of land
9. Agricultural income from agricultural land situated outside India
10. Interest paid by the Government on excess payment of advance tax
11. Insurance commission.
12. Income from undisclosed sources
13. Income from private tuition.
14. Interest on income tax refund.

7

Computation of Amount of Depreciation, Additional Depreciation and Capital Gains

c.

	Block -1	Block – 2	Block -3
Depreciated value of the block on April 1, 2020	1800000	2500000	500000
ADD: Actual cost of Plants A, B and C acquired during the previous year	5700000	400000	1700000
	7500000	2900000	2200000
Less: sales	8000	2870000	4200000
	7492000	30000	Nil
Less: normal depreciation	1123800	4500	-
Less: additional depreciation	1140000	40000	340000

10

	WDV	5228200	Nil	Nil
	Capital Gain	Nil	Nil	2000000

8

Computation of Net Income and Tax Liability of Ajay

Income from salary:			
Basic Pay			120000
Project Allowance			129400
Education Allowance		6600	
Less: Exempt (Rs. 100 per child x 2 Child x 12 month)		2400	4200
Hostel expenditure Allowance		7800	
Less: Exempt (Rs. 300 x 12 month)		3600	4200
Transport Allowance		19200	
Less: Exempt		19200	-
Perquisite in respect of car (less than 1600 cc Rs. 1800 x 12)			21600
Perquisite in respect of free meals (not chargeable to tax)			-
Employer's contribution towards unrecognized provident fund (Exempt from tax)			-
Gross salary			279400
Less: standard deduction			50000
Net Salary			248600
PGBP			491600
Other sources			
- Betting		2400	
- Interest		14000	
- SB interest		48000	64400
Gross Total Income			804600
Less: deduction u/s 80C to 80U			
- 80C		105000	
- 80D		66500	
- 80G		1500	
- 80TTB		50000	223000
Net Income			581600

Computation of tax

Up to 300000	nil
300000-500000	10000
500000-1000000	16320
	26320
Add: HEC @4%	1053
Tax	27373

20

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Department of MBA AY 2022-23

Third Semester Preparatory Examination, March 2023

20MBA301: Emerging Exponential Technologies

Time:3 Hrs **Marks:100**

Answer any Four Question No. 1 to 7, Question No. 8 is compulsory

1.	a. What is Data Science?	**3 Marks**
	b. Explain the Future Trends in Emerging Technologies.	**7 Marks**
	c. Explain the Importance/Significance of ethics.	**10 Marks**
2.	a. What is Artificial Intelligence?	**3 Marks**
	b. Explain the types of Augmented Reality.	**7 Marks**
	b. Explain the challenges of IoT.	**10 Marks**
3.	a. Define is Machine Learning.	**3 Marks**
	b. Bring out the different benefits of adopting Industry 4.0.	**7 Marks**
	c. State the different applications of AI in business.	**10 Marks**
4.	a. Define Autonomic Computing.	**3 Marks**
	b. Explain any application of AI in health sector.	**7 Marks**
	c. Explain the process of Data Science.	**10 Marks**
5.	a. Define Deep Learning.	**3 Marks**
	b. Bring out the difference between AR,VR and MR.	**7 Marks**
	c. Explain the application of computer vision.	**10 Marks**
6.	a. What do you mean by cloud computing?	**3 Marks**
	b. What is digital privacy? Explain the ways to ensure the security of digital data.	**7 Marks**
	c. Explain the types of cyber security threats.	**10 Marks**
7.	a.What is cyber Security?	**3 Marks**
	b. Briefly explain the architecture of IoT.	**7 Marks**
	c. Explain the challenges of Data Science.	**10 Marks**

Case Study **20 Marks**

Digital Transformation Initiatives

The American multinational coffee giant Starbucks Corporation (Starbucks) offered a loyalty program known as the Starbucks Rewards program wherein customers registering for the program received a card to pay for their purchases at the stores. For every purchase, users earned stars, which they could later redeem for a free drink. This was followed by Starbucks launching its mobile app, which allowed the consumers to pay for their purchases using their smartphones at Starbucks stores. To enable consumers to pre-order and pay though their

phones and pick up their items at Starbucks stores, Starbucks launched the Mobile Order & Pay feature, thus saving its consumers time. In 2017, the coffee giant integrated its rewards program, mobile order, payment, and personalization as part of its Digital Flywheel strategy that collected the order history of the consumers to make personalized recommendations to consumers through its smartphone app. Taking its digital initiatives forward, in 2017, Starbucks in association with American multinational technology giant Microsoft Corporation, launched Deep Brew, an Artificial Intelligence (AI) engine that offered customizable menu boards to drive-thru consumers wherein the engine suggested items based on the purchase history of consumers, time of day, weather, community preferences, popularity, store inventory, etc. In addition to this, Deep Brew automated time-consuming tasks such as management of inventory and did preventive maintenance of the company's espresso machines connected through Internet of Things

Analysts appreciated Starbucks for implementing several digital initiatives as part of its company philosophy and said these initiatives had helped it improve its sales and operational efficiency,enhancecustomer service, etc.Some critics pointed out that though the company's digital initiatives helped it survive the pandemic in its US stores and other global markets, Starbucks was facing declining sales in China – the company's second largest market after the US, due to Covid-19 related restrictions, Starbucks was facing increasing competition from Canadian coffee and doughnut chain Tims China, which was aggressively expanding in the country by opening its 300th store in October 2021, and local Chinese coffee chain Luckin Coffee Inc. Industry analysts believed that Starbucks could cash in on the trend of work-from-home in China attributable to the Covid-19 pandemic ,and increase its sales.

Starbucks President and CEO Kevin Johnson remained optimistic about the growth of Starbucks in the US, China, and other global markets due to the company's digital-ecosystem and robust innovation pipeline, which would be rolled out in the coming months, thereby further enhancing the experience of consumers with Starbucks while increasing its sales and efficiency.

Questions:

1. How digitalization enables a company to improve its operational efficiency, sales, and customer experience. **5 Marks**
2. Discuss how Starbucks could tackle challenges in China – its second largest market after the US, using its digital initiatives. **5 Marks**
3. Discuss how the prior investments in digital technologies helped Starbucks overcome the challenges posed by the Covid-19 pandemic. **5 Marks**
4. Explore how Starbucks could further improve its customer service and sales using AI and IoT. **5 Marks**

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Department of MBA
III Semester Preparatory Examination, March, 2023
Subject: Technology and Operational Strategy(20MBA302)

Time: 3 Hrs. **Max. Marks: 100**

Note: 1. ***Answer any FOUR full questions from Q. No 1 to Q. No 7.***
2. Q. NO. 8 is Compulsory.

1. a) Define Operations Management.	3 Marks
b) Highlight the Contribution of Juran.	7 Marks
c) Explain Scope the Functions of Operations Management.	10Marks
2. a) Define Process Mapping.	3 Marks
b) Briefly Explain Different Types of Waste?	7 Marks
c) Explain Root Cause Analysis using Fishbone Diagram.	10 Marks
3.a) Define: Just in Time?	3 Marks
b) Explain 5S Principles of Lean Manufacturing.	7 Marks
c) Explain Toyota Production System Model?	10 Marks
4.a) Define PDCA?	3 Marks
b) Explain Eight Building Blocks of TQM.	7 Marks
c) What is Benchmarking? Explain Benchmarking Process.	10 Marks
5.a) What are Quality Circles?	3 Marks
b) Explain DMAIC Concepts in Six Sigma.	7 Marks
c) Explain the Relationship between Operations and Supply Chain.	10 Marks
6.a) Define Quality.	3 Marks
b) Explain the Roles and Functions of Operations Manager.	7 Marks
c) Differentiate between Lean and Traditional Manufacturing.	10 Marks
7.a) What do you mean by Lean Manufacturing?	3 Marks
b) Highlight the Benefits of ISO 21000?	7 Marks
c) Briefly Explain KEIRETSU with advantages and limitations?	10 Marks

8.CASE STUDY:

Tata Motors Limited is a leading global automobile manufacturer of cars utility vehicles buses trucks and defense vehicles. As India's largest automobile company and part of the USD 100 billion Tata group Tata Motors has operations in the UK, South Korea, Thailand, South Africaand Indonesia through a strong global network of 76 subsidiary and associate companies including Jaguar Land Rover in the UK and Tata Daewoo in South Korea. In India Tata Motorsis a market leader in commercial vehicles and among the top passenger vehicles manufacturerswith 9 million vehicles on Indian roads.

The Tata Nano manufactured by Tata Motors made and sold primarily in India. The Nano was initially launched with a price of 100,000 rupees which has increased with time. Designed to lure India's middle classes away from motorcycles, it received much publicity, but the sales expectations were not met. Multiple issues like factory relocation from Singur, cases of Nano catching fire, and the perception of Nano being unsafe and lacking quality due to cost cutting led to the decline of sales volume. As compared to Tata Motor's aspiration of 250000 unit salesannually at the time of launch, sales in FY 2016-17 were 7591 units only. The car is a loss- making product for Tata Motors as disclosed by former Tata Sons chairman Cyrus Mistry. TataMotors has confirmed that despite no demand the production of the car will continue for some more time due to the emotional connect of the product with the Tata Group.

Questions:

8.a) Identify the Case Facts. 10 Marks

b) Identify the Problem and Potential Causes using Fishbone Diagram. 10 Marks

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SERVICES MARKETING SC: 20MBAMM303

Time: 3 Hours **Maximum Marks: 100**

Instructions to Students: **Part-A: Answer any FIVE FULL Questions & Part-B Compulsory**

1. a) Define Service Quality? (3Marks)
   b) Explain the service marketing Mix? (7 Marks)
   c) Explain the GAP Models of Service Quality? (10 Marks)

2. a) What do you mean by Intangibility of services? (3 Marks)
   b) Explain the Factors Influencing Customer expectation of services? (7 Marks)
   c) Briefly explain the Search, Experience & Credence property in Services? (10 Marks)

3. a) What do you mean by service blueprint? (3 Marks)
   b) Explain the guidance for physical evidence strategies? (7 Marks)
   c) Build a service blueprint for overnight stay in hotel? (10 Marks)

4. a) What do you mean by Hard Standards? (3 Marks)
   b) Explain the process for developing customer defined standards? (7 Marks)
   c) Explain the Stages in New Service Development? (10 Marks)

5. a) Define Emotional Labor? (3 Marks)
   b) Explain the importance of employees in services? (7 Marks)
   c) Explain the Strategies for Closing GAP 3? (10 marks)

6. a) What are the roles of a customer in service delivery? (3 marks)
   b) Explain the strategy for effective service delivery through intermediary? (7 Marks)
   c) Explain the strategies for enhancing Customer participation? (10 Marks)

7. a) What are the key reasons for Gap 1? (3 Marks)
   b) Explain the levels of retention Strategies? (7Marks)
   c) Explain the different types of Service research? (10 Marks)

Part-B

8. Case Study

The elevator market in India is around Rs.450 crores. OTIS India is the market leader with a market share of about 70% Bharat Bijlee, ECE, Mitsubishi and Hyundai are Competitive brands. OTIS has a network of nearly 65 centers. The company launched a chip – driven elevator model, OTIS 300F priced between Rs.15 lakhs and Rs.25 lakhs. Hotel industry forms an important segment in this category as elevators are considered essential to consumers. The microprocessor model takes an optimal combination of destinations ensuring a quick landing at respective destinations (Specific floor). The product is also likely to save energy costs significantly, which is an additional USP.OTIS 300F has a target new buildings as old buildings will not have the infrastructure to take the new model. OTIS also has other models for a huge replacement market which may be integrated in new elevators. It may be noted that grill type of elevators have been banned and this market may be integrated into a "no grill elevator" a lower end of the product line.

Questions:

1. What are the market segments that you identify for OTIS 300F elevators? **(5 Marks)**
2. What should be your target marketing strategies in the above identified segments? **(5 Marks)**
3. What would be your marketing strategies for the models in the replacement markets? **(5 Marks)**
4. What channels would you recommend for OTIS 300F and replacement market? **(5 Marks)**

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MARKETING RESEARCH & ANALYTICS SC: 20MBAMM304

Time: 3 Hours **Maximum Marks: 100**

Instructions to Students: **Part-A: Answer any Four FULL Questions & Part-B Compulsory**

1. a) Define Marketing Research? (3Marks)
   b) Explain the importance of Marketing Research? (7 Marks)
   c) Explain the Marketing research Process? (10 Marks)

2. a) What do you mean research ethics? (3 Marks)
   b) Explain the advantages and disadvantages of Marketing Inteligence? (7 Marks)
   c) Briefly ethical issues in Marketing research? (10 Marks)

3. a) What do you mean by Decision Support System? (3 Marks)
   b) Explain the types of database? (7 Marks)
   c) Briefly explain the concept of Big Data ? (10 Marks)

4. a) What do you mean Advertisement research? (3 Marks)
   b) What do you mean by Motivational Research and Explain its Tools? (7 Marks)
   c) Explain the different methods of sales forecasting? (10 Marks)

5. a) What do you mean by Predictive analysis? (3 Marks)
   b) Explain the importance of Predictive analysis? (7 Marks)
   c) Explain the process of Predictive analysis? (10 marks)

6. a) What do you mean by Data Mining? (3 marks)
   b) Explain Myths and misconception about Predictive analysis? (7 Marks)
   c) Explain the reason behind conducting Consumer research? (10 Marks)

7. a) Briefly explain the concept of Product? (3 Marks)
   b) Explain the levels of retention Strategies? (7Marks)
   c) Explain the different steps involved in New product Development? (10 Marks)

Part-B

Levi's : Fading Jeans and market Share

The Situation

As of 2006, Levi's is a leading global apparel company, with sales in more than 110 countries. It has been a long standing company with over 150 years of being in the clothing business. While one may think this long history can only result in good things, Levi's heritage has been its worst enemy. Philip Marineau, the president and chief executive officer for Levi Strauss & Co., had to work to revamp Levi's antique image and make the brand appealing to younger generations in efforts to boost its declining sales. In the last five years, Marineau saw worldwide sales drop 40 percent, losing market share to competitors like the Gap, and trendier ones such as Calvin Klein, Tommy Hilfiger, and Diesel. Another problem for Marineau came from store brand jeans, such as JCPenney's Arizona brand jeans or the Gap's in-house brand, which have changed their image and launched an assult on big brand names like Levi's. These store brand jeans, along with other store label jeans, now target the teenage market with "cutting edge" advertising. American trade publication Brand Strategy estimated that the brand has lost about 50 percent of the younger consumer market share world wide between 1999 and 2005.

To compete with these brands and maintain leadership, Levi's the market leader, is considering introducing their own line of private label jeans to capture a larger portion of the teenage market. Philip Marineau wonders. "How powerful is a national brand like Levi's compared to an in-house brand like Gap or store brand like JCpenney's Arizona jeans ?

The Marketing Research Decision

1) If you were Philip Marineau, what type of research would you want to conduct to help arrive at an answer ?

2) Please explain how you would implement the type of research you have recommended.

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Department of MBA

Third Semester Internal Assessment Test -III

Time: 3 Hrs **20MBAHR303 RECRUITMENT & SELECTION** **DATE: 17.03.2023**

Note: 1. Answer any FOUR full questions from Q.No.1 to 7. **Max marks: 100**

2. Q.No.8 is compulsory

1. a. Define Recruitment?	**(3 marks)**
b. Explain the factors affecting Recruitment.	**(7 marks)**
c. Explain the strategies of Recruitment	**(10 marks)**
2. a. What is Job Analysis, Job Description & Job Design?	**(3 marks)**
b. Explain the process of Job Analysis.	**(7 marks)**
c. Explain the methods of collecting Job Analysis data.	**(10 marks)**
3. a. Define Selection & Interview?	**(3 marks)**
b. Explain the process of Interview.	**(7 marks)**
c. What is Test & Explain the types of Employment Tests?	**(10 marks)**
4.. a. What is Bio Data & Application Form?	**(3 marks)**
b. Explain the Competency Ice Berg Model.	**(7 marks)**
c. Define Job Evaluation and Explain its Methods.	**(10 marks)**
5.. a. What is Online Salary Survey?	**(3 marks)**
b. Explain Hay Group-Pioneer in Job Evaluation.	**(7 marks)**
c. Briefly Explain MBTI.	**(10 marks)**
6.. a. What is Background Check & Reference Check?	**(3 marks)**
b. Explain the Birkman Method.	**(7 marks)**
c. Briefly explain FIRO-B.	**(10 marks)**
7. a. What is Induction & Placement?	**(3 marks)**
b. Explain Honesty & Integrity Test.	**(7 marks)**
c. Explain Assessment Center Process.	**(10 marks)**

8. CASE STUDY: (Compulsory)

XYZ Limited is a public sector undertaking with staff strength of around 1200 including 300 officers. As per the recruitment policy of the company, most employees join as trainees and after successful completion of training, are absorbed at the lowest intake level. Thus, in the case of workers, most start as Technician/Operator trainees and officers as Management Trainees. The company expects the higher posts to be filled by promotions and therefore, as far as possible, direct recruitment to higher positions is avoided. Only when there is an urgent

requirement of a person to fill a higher post and no candidates from within the organization are eligible, is an open advertisement released.

In 1982, the company urgently needed one junior engineer (instrumentation) to take charge of one of its plants. At that time, the company has four Junior Engineer (JES) in position who had joined as management trainees in 1980 and had been regularized in 1981. Immediately, above them was an Assistant Engineer, who in turn reported to the project manager. The company released an advertisement for the post of JE, seeking application form those with a least two years experience in the field. One Mr. Ramesh Chaudhari, who had 4 years experience in a private concem applied and was selected. He found the terms of appointment lucrative and joined the company in May 1982. As four JEs were already working in the company, Choudhari became Junior most JE as per the promotion policy of the company; the 4 JEs would become eligible for promotion to the post of Assistant Engineer' in 1985 (on completion of 4 years service) and Choudhari in 1986.

In July 1983, the Assistant Engineer left his job and hence, the company decided to fill the vacancy by direct recruitment. In the advertisement it was stipulated that the applicant should have a minimum of 5 years experience. Choudhari met the specification since he had 4 years previous experience plus one year in XYZ Ltd. Therefore, he applied for the post through proper channel. The company decided to call the eligible candidates for interview. Accordingly, Choudhari was also called along with the external candidates. He performed exceedingly well in the interview and was found suitable for the post. The General Manager (GM), who was Chairman of the Selection Committee, congratulated Choudhari and told him that he has been selected.

However, the GM changes his mind subsequently and asked the personnel officer not to issue the appointment letter to Choudhari. He gave the following reasons for reverting his decision:

i) Mr. Choudhari would get a higher post after completion of just over one year's service in the organization as against the normal recruitment of 4 years.

ii) ii) When Mr. Choudhari joined, he was junior to all the 4 JEs by about 1 year. If he was offered the higher post, he would suddenly become their boss. This would demoralize the JEs in fact they had already decided to seek jobs elsewhere if Choudhari become Assistant Engineer.

GM chose to disappoint Choudhari.

Questions:

a. Are there any drawbacks in the recruitment/promotion policies of the company? Elaborate. **(07 Marks)**

b. If Choudhari had been external candidate, would he have got job? As an internal candidate, did he deserve to be treated in different fashion? **(07 Marks)**

c. Did Management make mistake in calling Choudhari for interview? **(06 Marks)**

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Department of MBA
III Semester Preparatory Examination, March, 2023
Subject: Investment Management (20MBAFM303)

Time: 3 Hrs. **Max. Marks: 100**

Note: 1. ***Answer any FOUR full questions from Q. No 1 to Q. No 7.***
2. Q. NO. 8 is Compulsory.

1.a) Distinguish between Economic and Financial Investment. **3 Marks**
b) Explain the attributes that an investor should consider while evaluating an investment. **7 Marks**
c) The returns of securities A and B are given below: **10 Marks**

Probability	Security A	Security B
0.5	4	0
0.4	2	3
0.1	0	3

Give the security; of your preference. The security has to be selected on the basis of return and risk.

2.a) What are 'Derivatives'?Give examples. **3 Marks**
b) A portfolio consists of 3 securities 1,2 and 3. The proportions of these securities are W1= 0.3, W2=0.5 and W3=0.2. the standard deviation of returns on these securities (in percentage terms) are 6,9 and 10 Respectively. The correlation coefficients among security are P12=0.4, P13=0.6, P23=0.7. what is the standard deviation of portfolio return? **7 Marks**
c) Prem is considering the purchase of bond currently selling at Rs.878.50. The bond has four years to maturity, with a face value of Rs.1000 and 8 percent coupon rate. The next annual interest payment is due after one year. The required rate of return is 10 percent.
i) Calculate the intrinsic value of the bond. Should Prem buy the bond? (PVIFA (10%, 4 yrs) =3.170)
ii) what is the value of bond expected rate of return is 12%? **10 Marks**

3.a) Distinguish between Systematic Risk and Unsystematic Risk? **3 Marks**
b) How is technical analysis different from Fundamental analysis? **7 Marks**
c) Arun buys a bond with four years to maturity. The bond has a coupon rate of 9 percent and is priced at Rs.100 in the market.
i) What is the duration of the bond? **10 Marks**
ii) What will be the percentage change in the price of the bond, if the interest rate rises by 1 percent?

4.a) What is Coupon Rate and Zero-Coupon bond? **3 Marks**
b) Explain the key macro-economic variables and their impact on stock market? **7 Marks**
c) Vardhman Limited's earnings and dividends have been growing at a rate of 18 percent per annum. This growth rate is expected to continue for 4 years. After that the growth rate will fall to 12 percent for the next 4 years. Thereafter, the growth rate is expected to be 6 percent forever. If the last dividend per share was Rs.2.00 and the investor's required rate of return on Vardhman's equity is 15 percent, what is the Intrinsic Value per Share? **10 Marks**

5.a) What is breadth of market? How is it used? **3 Marks**
b) Distinguish between CAPM and Arbitrage Pricing Theory? **7 Marks**
c) What is RSI? From the information given below, compute tire RSI of company X's share. **10 Marks**

Day	1	2	3	4	5	6	7	8	9	10

Price	300	304	319	317	319	333	331	332	348	346

6.a) What is an efficient frontier? **3 Marks**

b) Explain the Single Index Model proposed by William Sharpe. **7 Marks**

c) The returns on the equity stock of Auto Electricals Limited and the market portfolio over a 15 year period aregiven: **10 Marks**

Return on Auto Electrical Ltd (%)	10	15	18	14	16	16	18	4	-9	14	15	14	6	7	-8
Return on market portfolio (%)	12	14	13	10	9	13	14	7	1	12	-11	16	8	7	10

What is the beta for Stock A?

7.a) What is meant by passive portfolio management strategy? **3Marks**

b) What is Random Walk Theory? What does it project in its weak from, semi-strong form and strong form? **7 Marks**

c) Pearl and Diamond are the two mutual funds. Pearl has a mean success of 0.15 and diamond has 0.22. The diamond has double the beta of pearl fund's 1.5. The standard deviations of Pearl and Diamond funds are 15% and 21.43%. The mean return of market index is 1 2%o and its Standard Deviation is 7. The risk-free rate is 8%. **10 Marks**

i) Compute the Jensen Index for each fund.

ii) Compute the Treynor and Sharpe indices for the funds. Interpret the results.

8. Compulsory

A Financial Analyst is analyzing two investment alternatives, stock Z and stock Y. The estimated rates of return and their chances of occurrence for' the next year are given below: **20 Marks**

Probability of Occurrence	Rates of Return (%)	
	Y	Z
0.20	22	5
0.60	14	15
0.20	-4	25

i) Determine expected rates of return, variance and standard deviation of Y and Z.

ii) Is 'Y' comparatively riskless?

iii) If the Financial Analyst wishes to invest half in Z g1nd another half in Y, would it reduce the risk? Explain.

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Department of MBA

Third Semester Preparatory Examination, March 2023

20MBAHR304: Human Resource Analytics

Time:3 Hrs **Marks:100**

Answer any Four Question No. 1 to 7, Question No. 8 is compulsory

1. a. What is correlation? 3 Marks
   b. Explain one way ANOVA and state its importance. 7 Marks
   c. Explain on story boarding "connecting the Dots and integrating the findings. 10 Marks

2. a. What do you mean by Factor analysis? 3 Marks
   b. Discuss the process of business analytics. 7 Marks
   b. Explain the multiple regression with an example. 10 Marks

3. a. Define logistics regression . 3 Marks
   b.What is scatter plots? Explain the types of scatter plots. 7 Marks
   c. Explain the pitfalls of HR analytics. 10 Marks

4. a. What is the case of an outlier? 3 Marks
   b. Explain the types of correlation. 7 Marks
   c. Explain the types of Logistic regression. 10 Marks

5. a. Define is cluster analysis. 3 Marks
   b. What do you mean by T-test Discuss assumption of T- test 7Marks
   c. What is HR dashboards? Discuss the benefits of it to the HR team. 10 Marks

6. a. What is developer tab? 3 Marks
   b. State the advantages of open source software. 7Marks
   c. Explain the steps in conducting one sample T- test. 10 Marks

7. a.Differentiate between dashboard and reports? 3 Marks
   b. Briefly explain the application of text analytics. 7 Marks
   c. Explain the steps in conducting logistics regression in Excel. 10 Marks

Case Study **20 Marks**

Regional Hospital is a 500 bed hospital and several associated clinics in a major East Coast metropolitan area. It has been an aggregate adopter of computing technologies in efforts to decrease cost and improve operational efficiencies. A critical challenges facing the hospital meeting its ongoing challenges to staff the hospital and allied clinic effectively, given the

ongoing shortage of nurses, uncertainly in health care legislation; emphasis on shortening hospital stays to reduce cost, which causes the daily census(number of patients in various departments) to vary dramatically from day to day and shift to shift, the continued aging of the population in its primary care area; and the unending competition for employees with key skill sets. Employee expenses represent more than 80% of the overall costs of operation for the hospital, so identifying ways to match optimal skills and numbers of employees to the appropriate shifts is critical to achieving consistent success. However, individual shift managers struggle to make effective staffing decisions, resulting in consistent overstaffing or understaffing of shifts and departments. These staffing problems potentially increase the high costs of varied levels of patient care and satisfaction and potentially increase the risk that staff turnover may escalate because of dissatisfaction with the continuing inability of managers to match staffing needs to demand. Company managers recognise the potential that HR metrics and analytics might have for their organisation , and they have come to you for help. They are hearing from their peers in other hospitals that metrics can help in this area but are not quite sure where to start. They are looking for you to offer guidance on how to do HR metrics and workforce analytics.

Questions:

1. Do you believe that a program of HR metrics and workforce analytics might be useful in regional hospital? If so, why? 7Marks

2. What opportunities do you see regarding where and how metrics and analytics might be applied in this organisation? 7Marks

3. Identify three analyses and associated metrics you think might be useful for regional hospital. 6Marks

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Department of MBA

III Semester Internal Assessment Test -III

Direct Taxation

Time: 3 hrs. **Date: 18/03/2023**
Max marks: 100

Note: 1. Answer any FOUR full questions from Q.No.1 to 7.
2. Q.No.8 is compulsory

1 a. Define the term 'Assessee' as per the Income Tax Act 1961. (3 marks)

b. Ms. Bindu, residing in New York since 1991, came back to India on 19-02-2020 for permanent settlement in India. Explain the residential status of Ms. Bindu for AY 22-23 (7 marks)

c. Work out the amount of depreciation allowance for the assessment year 2022-23 from the following particulars of assets of a steel factory:

Assets	WDV as on 1.4.2021	Rate of depreciation
Building	1547380	10%
Plant	215740	10%
Machinery	3500000	15%
Motor car	150000	30%
Furniture	25170	10%

The factory purchased and installed old machinery on 31st Oct 2020 at a Cost of Rs. 5,00,000. One Plant (whose WDV as on 1.4.2021 was Rs. 1,15,000) was completely destroyed by fire on 1.9.2021 and Rs. 1,00,000 was received from the insurance company in respect thereof. (10 marks)

2 a. What is MAT? (3 marks)

b. Write short note on Tax planning and Tax evasion (7 marks)

c. X transfers the following assets on May 15, 2020

	Cost	Fair market value on 1.4.2001	Sale consideration
Land (acquired in 1968)	20000	45000	685000
Goodwill of business	Self generated	10000	175000
Tenancy rights	Self generated	30000	200000

Determine the amount of capital gains chargeable to tax for the assessment year 2021-22. (10 marks)

3 a. Mention the exception to general rule of previous year. (3 marks)

b. Explain the tax treatment of pension under section 10(10A) (7 marks)

c. Discuss the deduction u/s 80C, 80D, 80DDB and 80E. (10 marks)

4 a. What is gross total income? (3 marks)

b. Mr. Paramesh, an employee of PQ Co. Ltd., receives Rs. 78,000 as gratuity. He is covered by the Payment of Gratuity Act, 1972. He retires on December 12, 2020 after rendering service of 38 years and 8 months. At the time of retirement his monthly basic salary and dearness allowance was Rs. 2,400 and Rs. 800 respectively. Is the entire amount of gratuity exempt from tax? (7 marks)

c. Mr. Harish, employed as a Manager in a company furnished the following information for the year ended 31-03-2021.

i. Basic Salary Upto 31-10-2020 Rs. 50,000 PM, from 01-11-2021 Rs. 60,000 PM
ii. Dearness Allowance - 40% of Basic Pay (Not part of Retirement benefit)
iii. Bonus Rs. 50,000
iv. Contribution of employer to RPF @ 16% of Basic Pay.
v. Professional Tax paid by Harish Rs. 3000.
vi. 1.9 Ltr car is provided by employer from 01-11-2020. All expenses are met by employer. Harish is using the car for both official and private purpose.

Compute taxable salary of Mr. Harish. (10 marks)

5 a. What are perquisites? Name any two. (3 marks)

b. Explain the exemption/deductions under capital gain. (7 marks)

c. Following is the profit and loss account of Sri Lakshmi Narayana ltd., an Indian Company for the year ending 31-03-2022

Salaries and wages	750000	Gross profits	2500000
Advertisement expenses	150000		
Insurance	250000		
Audit fees	50000		
Depreciation	100000		
Income tax	30000		
Transfer to general reserve	40000		
Office expenses	15000		
Losses of subsidy company	25000		
Net profit	1090000		
	2500000		**2500000**

Additional information:

- Brought forward loss as per books of accounts is 125000 and as per income tax is 150000
- Unabsorbed depreciation as per books of accounts amount to 25000 and as per income tax is 75000

Calculate:

i. Total income of the company under normal provision

ii. Book profit and tax liability as per section 115JB

iii. Tax liability of the company. (10 marks)

6 a. What is direct and indirect tax? (3 marks)

b. Mr. B (40 years) is a businessman. His income for the previous year 2020-21 from business is 1400000. Besides, he has interest on savings bank account of 21000. He annually contributes 150000 towards public provident fund. B wants to know whether he should opt for alternative tax regime from assessment year 2021-22 or not. (7marks)

c. The following is the P & L A/c. of Raj Oil Mills for the financial year 2020-21. Compute its business income on the basis of additional information.

Profit and Loss A/c

Particulars	Amount	Particulars	Amount
Office salaries	15000	Gross profit	80000
General expenses	7000	Profit on sale of car	15000
Bad debts	1000	Recovery of bad debts	5000
Advertisement expenses	3700	Interest on Govt. securities	3500
Insurance premium (fire)	1500	Dividends	3500
Depreciation	5000	Gifts on the occasion of	5000
Reserved for bad debts	3000	Grihapravesham	
Donation to a school	2500		
Car expenses	2000		
Net profit	71300		
	112000		**112000**

Additional Information:

i. General expenses include:

  i. Rs. 2,500 as compensation paid to an accountant who had to be removed from service in the interest of business and

  ii. Rs. 3,300 as contribution paid to the Government for buying electric cables for the company's plant.

ii. Deprecation as regards the relevant blocks of assets under the Income Tax Act Rs. 3,500.

iii. In the A.Y. 2019-20, the Assessing officer had refused to allow deduction for the bad debts of Rs. 5,000 now recovered.

iv. Car expenses include Rs. 500 attributable to use of car for personal work. (10 marks)

7 a. What are the losses which can be carried forward as per IT Act? (3 marks)

b. List the income taxable under the head income from other sources. (7 marks)

c. X ltd. is engaged in the business of manufacture of computer hardware in Rajasthan since 1995. During the previous year 2020-21, the following assets are acquired and put to use

(Rs. In thousands)

	Block 1	Block 2	Block 3
Rate of Depreciation	15%	30%	40%
Number of assets in the block	11	12	17
Depreciated value of the block on April 1, 2020	1800	2500	500
Additions of plants (new) during the previous year 2020-21			
Plant A	5700	-	-
Plant B	-	400	-
Plant C	-	-	1700
Sale of old plants (one plant in each block)	8	2870	4200

Plants A, B and C are acquired during May 2020 and put to use during September 2020. However, Plant B is put to use in the last week of March 2021. Find out the amount of depreciation, additional depreciation and capital gains. (10 marks)

8 **Case Study (Compulsory):**

For the assessment year 2021-22, Ajay (age: 61 years), a resident individual furnishes the following information:

Basic pay Rs. 1,20,000
Project allowance Rs. 1,29,400
Education allowance (Rs. 200 pm for two sons & Rs. 150 pm for a daughter) Rs. 6,600
Hostel expenditure allowance (Rs. 650 per month for one child) Rs. 7,800
Transport allowance (for journey between office and resident) Rs. 19,200
Free car (1150cc) facility for Ajay for official and private purposes, cost to the employer – company Rs. 27,000
Free meals in office (300 working days) Rs. 12,700
Employer's contribution towards unrecognized provident fund Rs. 3,000
Share of profit from:

- A firm Rs. 36,000
- An association of persons Rs. 34,000
- A Hindu Undivided Family Rs. 18,000

Income from betting Rs. 2,400
Interest from Indian Overseas Bank (Fixed deposit interest: Rs. 14,000, savings bank interest: Rs. 48,000)
Income from business Rs. 4,91,600
PAYMENTS AND INVESTMENTS
Contribution towards unrecognized provident fund Rs. 6,700
Payment of premium on medical insurance policy on Ajay's father who is resident in India Rs. 30,500
Payment of premium on own medical policy Rs. 36,000
Investment in National Savings Certificates VIII issue Rs. 1,05,000
Donation to an approved public charitable institution Rs. 3,000
Determine the net income and tax liability of Ajay for the assessment year 2021-22. (20 marks)

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Department of MBA

Third Semester Preparatory Examination, March 2023

20MBAHR304: Human Resource Analytics

Time:3 Hrs **Marks:100**

Answer any Four Question No. 1 to 7, Question No. 8 is compulsory

1. a. What is correlation? 3 Marks
   b. Explain one way ANOVA and state its importance. 7 Marks
   c. Explain on story boarding "connecting the Dots and integrating the findings. 10 Marks

2. a. What do you mean by Factor analysis? 3 Marks
   b. Discuss the process of business analytics. 7 Marks
   b. Explain the multiple regression with an example. 10 Marks

3. a. Define logistics regression . 3 Marks
   b.What is scatter plots? Explain the types of scatter plots. 7 Marks
   c. Explain the pitfalls of HR analytics. 10 Marks

4. a. What is the case of an outlier? 3 Marks
   b. Explain the types of correlation. 7 Marks
   c. Explain the types of Logistic regression. 10 Marks

5. a. Define is cluster analysis. 3 Marks
   b. What do you mean by T-test Discuss assumption of T- test 7Marks
   c. What is HR dashboards? Discuss the benefits of it to the HR team. 10 Marks

6. a. What is developer tab? 3 Marks
   b. State the advantages of open source software. 7Marks
   c. Explain the steps in conducting one sample T- test. 10 Marks

7. a.Differentiate between dashboard and reports? 3 Marks
   b. Briefly explain the application of text analytics. 7 Marks
   c. Explain the steps in conducting logistics regression in Excel. 10 Marks

Case Study **20 Marks**

Regional Hospital is a 500 bed hospital and several associated clinics in a major East Coast metropolitan area. It has been an aggregate adopter of computing technologies in efforts to decrease cost and improve operational efficiencies. A critical challenges facing the hospital meeting its ongoing challenges to staff the hospital and allied clinic effectively, given the

ongoing shortage of nurses, uncertainly in health care legislation; emphasis on shortening hospital stays to reduce cost, which causes the daily census(number of patients in various departments) to vary dramatically from day to day and shift to shift, the continued aging of the population in its primary care area; and the unending competition for employees with key skill sets. Employee expenses represent more than 80% of the overall costs of operation for the hospital, so identifying ways to match optimal skills and numbers of employees to the appropriate shifts is critical to achieving consistent success. However, individual shift managers struggle to make effective staffing decisions, resulting in consistent overstaffing or understaffing of shifts and departments. These staffing problems potentially increase the high costs of varied levels of patient care and satisfaction and potentially increase the risk that staff turnover may escalate because of dissatisfaction with the continuing inability of managers to match staffing needs to demand. Company managers recognise the potential that HR metrics and analytics might have for their organisation , and they have come to you for help. They are hearing from their peers in other hospitals that metrics can help in this area but are not quite sure where to start. They are looking for you to offer guidance on how to do HR metrics and workforce analytics.

Questions:

1. Do you believe that a program of HR metrics and workforce analytics might be useful in regional hospital? If so, why? 7Marks

2. What opportunities do you see regarding where and how metrics and analytics might be applied in this organisation? 7Marks

3. Identify three analyses and associated metrics you think might be useful for regional hospital. 6Marks

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Department of MBA- AY 2022-23

Scheme of Evaluation – Preparatory Examination

III Sem **20MBAHR304 : HR ANALYTICS** **Max.Marks:50**

Q.No	Answers	Marks
1a	Correlation refers to the statistical relationship between two entities. In other words, it's how two variables move in relation to one another. Correlation can be used for various data sets, as well. In some cases, you might have predicted how things will correlate, while in others, the relationship will be a surprise to you. It's important to understand that correlation does not mean the relationship is causal.	3 marks
b	There are two main types of ANOVA: one-way (or unidirectional) and two-way. There also variations of ANOVA. For example, MANOVA (multivariate ANOVA) differs from ANOVA as the former tests for multiple dependent variables simultaneously while the latter assesses only one dependent variable at a time. One-way or two-way refers to the number of independent variables in your analysis of variance test. A one-way ANOVA evaluates the impact of a sole factor on a sole response variable. It determines whether all the samples are the same. The one-way ANOVA is used to determine whether there are any statistically significant differences between the means of three or more independent (unrelated) groups. ANOVA gives us mathematical sets of rules, that hold certain given assumptions, to decide when we can have confidence that the real average of one group is different from the real average of one or more other groups. ANOVA sets up these rules by asking how sure we are that the means are the same, a concept that we refer to as the null hypothesis.	7marks Listing 2m Explanation 5m
c	**Storyboarding: Connecting the Dots and Integrating the Findings.** **Goal Statement** **Data Collection Plan** **Baseline Performance** **Root Cause Identification** **Root Cause Confirmation** **Solutions to Address Root Cause** **Verification of Improvement** **Monitoring & Response Plan**	10marks Listing 3m Explanation 7m
2a	**Factor analysis** is a statistical technique that reduces a set of variables by extracting all their commonalities into a smaller number of factors. It can also be called **data reduction**. When observing vast numbers of variables, some common patterns emerge, which are known as factors. These serve as an index of all the variables involved and can be utilized for later analysis.	3 marks
b	1.Establish (and Manage) Your Project Scope 2. Be Relentless with Your Communication 3. Determine a Line of Escalation 4. Monitor Work Streams with Tracker Apps 5. Track Finances 6. Bonus Tip: Be Confident	7marks Listing 2m Explanation 5m
c	**Sourcing our data** We will obtain public data from Eurostat, the statistics database for the European Commission for this exercise. All the relevant source data is within the model file for your convenience, which you can download below. The EU dataset gives us information for all member states of the union. As a massive fan of Agatha Christie's HerculePoirot, let's direct our attention to Belgium.	10marks Listing 3m Explanation 7m

	As you can see in the table below, we have nineteen observations of our target variable (GDP), as well as our three predictor variables: X1 — Education Spend in mil.; X2 — Unemployment Rate as % of the Labor Force; X3 — Employee compensation in mil. Even before we run our regression model, we notice some dependencies in our data. Looking at the development over the periods, we can assume that GDP increases together with Education Spend and Employee Compensation. Running a Multiple Linear Regression There are ways to calculate all the relevant statistics in Excel using formulas. But it's much easier with the Data Analysis Tool Pack, which you can enable from the Developer Tab -> Excel Add-ins. Look to the Data tab, and on the right, you will see the Data Analysis tool within the Analyze section. Run it and pick Regression from all the options. Note, we use the same menu for both simple (single) and multiple linear regression models. Now it's time to set some ranges and settings. The Y Range will include our dependent variable, GDP. And in the X Range, we will select all X variable columns. Please, note that this is the same as running a single linear regression, the only difference being that we choose multiple columns for X Range. Remember that Excel requires that all X variables are in adjacent columns. As I have selected the column Titles, it is crucial to mark the checkbox for Labels. A 95% confidence interval is appropriate in most financial analysis scenarios, so we will not change this.	
3a	Logistic regression is a statistical analysis method to predict a binary outcome, such as yes or no, based on prior observations of a data set.A logistic regression model predicts a dependent data variable by analysing the relationship between one or more existing independent variables.	3 marks
b	**Scatterplots** A descriptive graphing approach to examining relationships between variables is the scatterplot. This graph is made from data where each person has two measured variables. Our example for this kind of data will be the commonly used textbook example for screening college applicants. Each student has a standardized test score (SAT, ACT, etc.) and grade point average from their first year of college. The relationships from these past institutional data can be used to help screen new applicants who are applying to college. The example data file has fifteen students, with a SAT score and a first year college GPA for each student. Start by going to the Graphs menu and then select the Scatterplot command. Three types of correlation are mentioned above using scatterplots. A **positive correlation** is a type of correlation between two variables when both the variables are changes in the same direction. When one keeps increasing and the other keeps increasing too. A **negative correlation** is a contradiction to positive correlation. It means as one variable increases and the other decreases. When there is no relationship between the variables and all the data points are scattered everywhere. In such a case, there is no correlation.	7marks Listing 2m Explanation 5m
c	**Hr will fail miserably in giving empirical evidence for the use of hr analytics to a company.** **The quality of the results depends on both the quality and quantity of data** **Analysts try to devise a conceptual model that is theoretically sound and seems to explain outcome quite convincingly but hardly helps the organisation prepare a workable plan** **Hra may well be misused in order to convince the stakeholders on the story**	10marks Listing 3m Explanation 7m

	'the' powerful or influential person would like to convey	
4a	**The Case of Outlier** A value that "lies outside" (is much smaller or larger than) most of the other values in a set of data. An *outlier* is an observation that lies an abnormal distance from other values in a random sample from a population. In statistics, an outlier is **a data point that differs significantly from other observations**. An outlier may be due to variability in the measurement or it may indicate experimental error; the latter are sometimes excluded from the data set. For example in the scores **25,29,3,32,85,33,27,28** both 3 and 85 are "outliers".	3 marks
b	**Positive correlation:** **A positive correlation would be 1. This means the two variables moved either up or down in the same direction together.** Here are some examples of positive correlations: 1. The more time you spend on a project, the more effort you'll have put in. 2. The more money you make, the more taxes you will owe. **Negative correlation:** A negative correlation is -1. This means the two variables moved in opposite directions. Here are some examples of negative correlations: 1. The more payments you make on a loan, the less money you'll owe. 2. As the number of your employees decreases, the more job positions you'll have open. **Zero or no correlation:** A correlation of zero means there is no relationship between the two variables. In other words, as one variable moves one way, the other moved in another unrelated direction. Here are some examples of entities with zero correlation: 1. The nicer you treat your employees, the higher their pay will be. 2. The smarter you are, the later you'll arrive at work.	7marks Listing 2m Explanation 5m
c	**Types of Logistics Regression** **Binary logistic regression** Logistic regression models for binary response variables allow us to estimate the probability of the outcome (e.g., yes vs. no), based on the values of the explanatory variables. We could simply model this probability directly as a function of the explanatory variables but, instead, we use the logit function, $\text{logit}(p) = \ln(p/(1-p))$, where p is the probability of the outcome occurring, in order to determine the corresponding log odds of the outcome which we then model as a linear combination of the explanatory variables. As with standard linear regression analyses, the model coefficients can then be interpreted in order to understand the direction and strength of the relationships between the explanatory variables and the response variable. **Categorical logistic regression** All of the above (binary logistic regression modelling) can be extended to categorical outcomes (e.g., blood type: A, B, AB or O) – using multinomial logistic regression. The principles are very similar, but with the key difference being that one category of the response variable must be chosen as the reference category. Separate odds ratios are determined for all explanatory variables for each category of the response variable, except for the reference category. The odds ratios then represent the change in odds of the outcome being a particular category versus the reference category, for differing factor levels of the corresponding explanatory variable. There are also extensions to the logistic regression model when the categorical outcome has a natural ordering (we call this 'ordinal' data as opposed to 'nominal' data).	10marks Listing 3m Explanation 7m

5a	Cluster analysis is a statistical method in research that allows researchers to bucket or group a set of objects into small but distinct clusters that differ in characteristics from other such different clusters. The underlying theme in exploratory data analysis helps brands, organizations, and researchers derive insights from visual data to spot trends and validate hypotheses and explicit assumptions.	3 marks
b	The T-Tests are the hypothesis tests that are applicable in the scenarios where we need to compare the means of one or more groups. It is usually used to calculate the probability of significant difference between two groups. Assumptions of the one-sample *t*-test **Independence.** In rough terms, independence means each observation in the sample does not 'depend on' the others. We'll discuss this more carefully when we consider the principles of experimental design. The key thing to know now is why this assumption matters: if the data are not independent the *p*-values generated by the one-sample *t*-test will be unreliable. (In fact, the *p*-values will be too small when the non-independence assumption is broken. That means we risk the false conclusion that a difference is statistically significant, when in reality, it is not) **Measurement scale.** The variable being analysed should be measured on an interval or ratio scale, i.e. it should be a numeric variable of some kind. It doesn't make much sense to apply a one-sample *t*-test to a variable that isn't measured on one of these scales. **Normality.** The one-sample *t*-test will only produce completely reliable *p*-values when the variable is normally distributed in the population. However, this assumption is less important than many people think. The *t*-test is robust to mild departures from normality when the sample size is small, and when the sample size is large the normality assumption hardly matters at all.	7marks Listing 2m Explanation 5m
c	DASHBOARD An Excel Dashboard can be an amazing tool when it comes to tracking KPIs, comparing data points, and getting data-backed views that can help management make decisions. An Excel dashboard is one-pager (mostly, but not always necessary) that helps managers and business leaders in tracking key KPIs or metrics and take a decision based on it. It contains charts/tables/views that are backed by data. A dashboard is often called a report, however, not all reports are dashboards. A dashboard, on the other hand, would instantly answer important questions such which regions are performing better and which products should the management focus on. These dashboards could be static or interactive (where the user can make selections and change views and the data would dynamically update). A manager would probably only be interested in the insights your dashboard provides, however, some data analysts in his team may need a more detailed view. Based on who uses your dashboard, you need to structure the data and the final output.	10marks Listing 3m Explanation 7m
6a	The Developer tab is the area of the toolbar at the top of the screen (*known as the Ribbon*) that has the buttons to open the VBA editor, write macros, and create Form/ActiveX Controls like buttons, checkboxes, etc. By default, when you install Excel, the Developer tab will be hidden. However, with a few easy steps, you can display this tab and access the advanced programming features of Excel.	3 marks
b	**Advantages of Open Source Software** **1. Cost Effective** **2. Reliability** **3. Flexibility.**	7marks Listing 2m

	4. Scalability **5. Licensing** **6. Error Free**	Explanation 5m
c	**Conducting a one-sample T-test in Excel** Firstly, calculate the mean, standard deviation (SD) and standard error of the mean (SEM) in Excel. Then, use this information to determine the t-statistic and ultimately the p-value. Step 1: Calculate the average The first thing you should do is to calculate the average value of the sample data. This can be easily calculated by using the AVERAGE function in Excel. In Excel, click on an empty cell and enter the following… =AVERAGE(cell1:cell2) Replace cell1 in the equation with the cell containing the first data point and replace cell2 with the cell containing the last data point. Step 2: Calculate the standard deviation The next step is the calculate the SD of the sample data. To do this, use the STDEV function. In an empty cell, enter the following… =STDEV(cell1:cell2) Again, replace cell1 and cell 2 in the equation with the cell containing the first and last data points, respectively. Note, you can also use the STDEV.S function to achieve the same result. Step 3: Calculate the number of observations For the next step, simply count the number of observations in the sample.	10marks Listing 3m Explanation 7m
7a	A report would only collect and show data in a single place. For example, if a manager wants to know how the sales have grown over the last period and which region were the most profitable, a report would not be able to answer it. It would simply report all the relevant sales data. These reports are then used to create dashboards (in Excel or PowerPoint) that will aid in decision making. A dashboard, on the other hand, would instantly answer important questions such which regions are performing better and which products should the management focus on. These dashboards could be static or interactive (where the user can make selections and change views and the data would dynamically update).	3 marks
b	Application of Text Analytics Recruitment Survey & feedback analysis Appraisal Social Media analysis Succession & career development	7marks Listing 2m Explanation 5m
c	**Logistic Regression in Excel** Step 1: Input the data. Step 2: Enter cells for regression coefficients. Step 3: Create values for the logit. Step 4: Create values for e^{logit}. Step 5: Create values for probability. Step 6: Create values for log likelihood Step 7: Find the sum of the log likelihoods. Step 8: Use the Solver to solve for the regression coefficients.	10marks Listing 3m Explanation 7m
8 a b c d	**Marks will be given on the analysis of the case**	5x4=20 Marks

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Department of MBA

Third Semester Preparatory Examination, March 2023

20MBA301: Emerging Exponential Technologies

Time:3 Hrs **Marks:100**

Answer any Four Question No. 1 to 7, Question No. 8 is compulsory

1.	a. What is Data Science?	**3 Marks**
	b. Explain the Future Trends in Emerging Technologies.	**7 Marks**
	c. Explain the Importance/Significance of ethics.	**10 Marks**
2.	a. What is Artificial Intelligence?	**3 Marks**
	b. Explain the types of Augmented Reality.	**7 Marks**
	b. Explain the challenges of IoT.	**10 Marks**
3.	a. Define is Machine Learning.	**3 Marks**
	b. Bring out the different benefits of adopting Industry 4.0.	**7 Marks**
	c. State the different applications of AI in business.	**10 Marks**
4.	a. Define Autonomic Computing.	**3 Marks**
	b. Explain any application of AI in health sector.	**7 Marks**
	c. Explain the process of Data Science.	**10 Marks**
5.	a. Define Deep Learning.	**3 Marks**
	b. Bring out the difference between AR,VR and MR.	**7 Marks**
	c. Explain the application of computer vision.	**10 Marks**
6.	a. What do you mean by cloud computing?	**3 Marks**
	b. What is digital privacy? Explain the ways to ensure the security of digital data.	**7 Marks**
	c. Explain the types of cyber security threats.	**10 Marks**
7.	a.What is cyber Security?	**3 Marks**
	b. Briefly explain the architecture of IoT.	**7 Marks**
	c. Explain the challenges of Data Science.	**10 Marks**

Case Study **20 Marks**

Digital Transformation Initiatives

The American multinational coffee giant Starbucks Corporation (Starbucks) offered a loyalty program known as the Starbucks Rewards program wherein customers registering for the program received a card to pay for their purchases at the stores. For every purchase, users earned stars, which they could later redeem for a free drink. This was followed by Starbucks launching its mobile app, which allowed the consumers to pay for their purchases using their smartphones at Starbucks stores. To enable consumers to pre-order and pay though their

phones and pick up their items at Starbucks stores, Starbucks launched the Mobile Order & Pay feature, thus saving its consumers time. In 2017, the coffee giant integrated its rewards program, mobile order, payment, and personalization as part of its Digital Flywheel strategy that collected the order history of the consumers to make personalized recommendations to consumers through its smartphone app. Taking its digital initiatives forward, in 2017, Starbucks in association with American multinational technology giant Microsoft Corporation, launched Deep Brew, an Artificial Intelligence (AI) engine that offered customizable menu boards to drive-thru consumers wherein the engine suggested items based on the purchase history of consumers, time of day, weather, community preferences, popularity, store inventory, etc. In addition to this, Deep Brew automated time-consuming tasks such as management of inventory and did preventive maintenance of the company's espresso machines connected through Internet of Things

Analysts appreciated Starbucks for implementing several digital initiatives as part of its company philosophy and said these initiatives had helped it improve its sales and operational efficiency,enhancecustomer service, etc.Some critics pointed out that though the company's digital initiatives helped it survive the pandemic in its US stores and other global markets, Starbucks was facing declining sales in China – the company's second largest market after the US, due to Covid-19 related restrictions, Starbucks was facing increasing competition from Canadian coffee and doughnut chain Tims China, which was aggressively expanding in the country by opening its 300th store in October 2021, and local Chinese coffee chain Luckin Coffee Inc. Industry analysts believed that Starbucks could cash in on the trend of work-from-home in China attributable to the Covid-19 pandemic ,and increase its sales.

Starbucks President and CEO Kevin Johnson remained optimistic about the growth of Starbucks in the US, China, and other global markets due to the company's digital-ecosystem and robust innovation pipeline, which would be rolled out in the coming months, thereby further enhancing the experience of consumers with Starbucks while increasing its sales and efficiency.

Questions:

1. How digitalization enables a company to improve its operational efficiency, sales, and customer experience. **5 Marks**
2. Discuss how Starbucks could tackle challenges in China – its second largest market after the US, using its digital initiatives. **5 Marks**
3. Discuss how the prior investments in digital technologies helped Starbucks overcome the challenges posed by the Covid-19 pandemic. **5 Marks**
4. Explore how Starbucks could further improve its customer service and sales using AI and IoT. **5 Marks**

Department of MBA

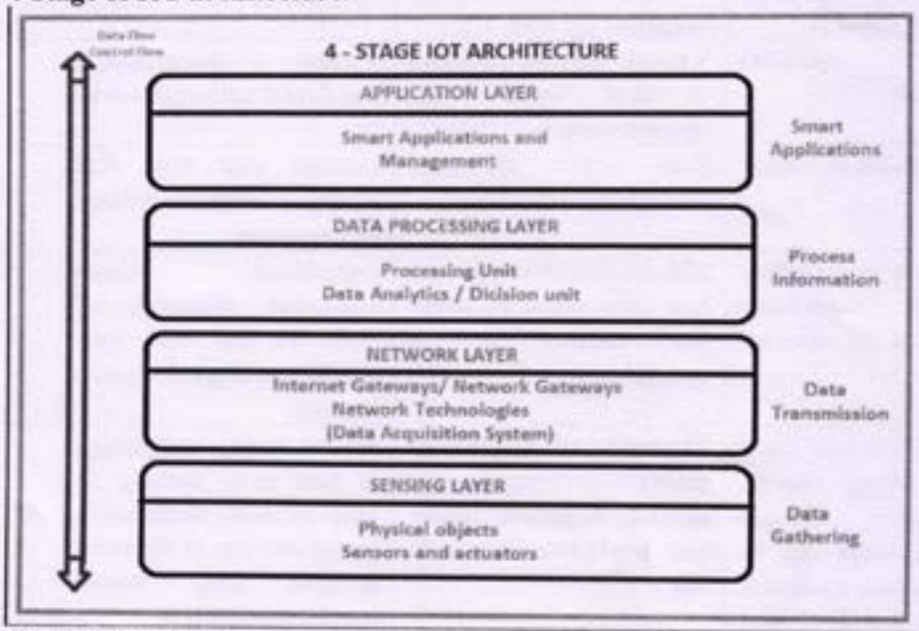
Scheme of Evaluation- III Internals Preparatory Examination

III Sem **20MBA301 : Emerging Exponential Technologies** **Max.Marks:100**

Q.No	Question and Answers	Marks
1a	• **Data science** is the area of study that combines domain expertise in programming skills and knowledge of statistics and mathematics to obtain meaningful insights from the data. And in turn this gives insights that the analysts and business users can to generate value for the business.	3Marks
b	**Future Trends in Emerging Technologies** • Artificial Intelligence (AI) and Machine Learning • Robotic Process Automation (RPA) • Edge Computing • Quantum Computing • Virtual Reality and Augmented Reality • Block chain • Internet of Things (IoT) • Cyber Security	7Marks Listing 2m Explanation 5m
c	**Importance/ Significance of Ethics** Most of us would agree that it is ethics in practice that makes sense; just having it carefully drafted and redrafted in books may not serve the purpose. Of course all of us want businesses to be fair, clean and beneficial to the society. For that to happen, organizations need to abide by ethics or rule of law, engage themselves in fair practices and competition; all of which will benefit the consumer, the society and organization. Primarily it is the individual, the consumer, the employee or the human social unit of the society who benefits from ethics. In addition ethics is important because of the following: 1. **Satisfying Basic Human Needs:** practices. 2. **Creating Credibility:** 3. **Uniting People and Leadership** 4. **Improving Decision Making**	10Marks
2a	The intelligence demonstrated by machines is known as Artificial Intelligence. Artificial Intelligence has grown to be very popular in today's world. It is the simulation of natural intelligence in machines that are programmed to learn and mimic the actions of humans.	3Marks
b	**Types of Augmented Reality** • AR technology is categorized into two types, each having its own benefits and limitations - marker-based AR and markerless AR. **1. Marker-based AR** **2. Markerless AR** **i)Project-based augmented** **ii)Location-based augmented reality**	7MarksListing 2m Explanation 5m
c	1. Lack of regulation **about IoT** **2.** Challenges with compatibility **3. Limited** bandwidth **4.** Customer expectations **5. Weak password protection**	10Marks Listing 3m Explanation 7m
3a	• Machine learning is one of the most common types of artificial intelligence in development for business purposes today. Machine learning is primarily used to process large amounts of data quickly. These types of artificial intelligence are algorithms that appear to "learn" over time, getting better at what they do the more often they do it. Feed a machine learning algorithm more data and its modelling should	3Marks

	improve. Machine learning is useful for putting vast troves of data – increasingly captured by connected devices and the internet of things – into a digestible context for humans.	
b	It makes you more competitive, especially against disruptors like Amazon It makes you more attractive to the younger workforce. It makes your team stronger and more collaborative. It allows you to address potential issues before they become big problems. It allows you to trim costs, boost profits, and fuel growth.	7Marks
c	• **A)Personalized Shopping** • **B) AI-powered Assistants** • **C)Provide a personal touch with chatbots.** **D) Empower store workers.** • E) Fraud Prevention **F) Integrate with everyday household items.** • **G) Create a more efficient sales process.** • **H) Identify exceptional target prospects.** • **I) AI in communication** • **J) Workplace communication** • **K) AI in Supply chain mgmt..**	10Marks Listing 3m Explanation 7m
4a	Autonomic computing is a computer's ability to manage itself automatically through adaptive technologies that further computing capabilities and cut down on the time required by computer professionals to resolve system difficulties and other maintenance such as software updates.	3Marks
b	• **a) AI Healthcare Solutions for Doctors** • Doctors are being benefited by the AI solutions as it is helping in improving performance and experience. • For example, it analyzes the data and applies AI machine learning to give decision support while improving diagnostics. • With deep learning programs and technology categorization, AI-based imaging systems are equipped with algorithms having quick image reading. **(b) AI Solution for Patients** • The Healthcare industry is focusing on the patient's experience and engagement with artificial general intelligence. • With AI-enabled interfaces, patients have taken control over their care solutions. • ***Virtual Health Assistant*** • Artificial Intelligence companies have introduced virtual health assistants using augmented reality, cognitive computing, speech, and body gestures. • **The application** has the ability to deliver a personalized experience where patients are free to clear their doubts and learn how to manage their health efficiently.	7Marks Listing 2m Explanation 5m
c	Step 1: Frame the problem Step 2: Collect the raw data needed for your problem Step 3: Process the data for analysis Step 4: Explore the data Step 5: Perform in-depth analysis Step 6: Communicate results of the analysis	10Marks Listing 3m Explanation 7m
5a	Deep learning is an even more specific version of machine learning that relies on neural networks to engage in nonlinear reasoning. Deep learning is critical to performing more advanced functions, such as fraud detection. It can do this by analyzing a wide range of factors at once.	3Marks

b	**Virtual Reality**	**Augmented Reality**	**Mixed or Merged**	7Marks
	uses VR headsets or closed head-mounted displays (HMDS) to completely insulate and transpose the user to an alternative world	adds or supplements to our existing reality with digital objects and digital object overlays enhances our presence by 'augmenting' reality	uses holographic lens to converge VR and AR where virtual objects interact with real-world objects	Listing 2m Explanation 5m
	Fully artificial Environment	Virtual objects overlaid on real world on environment	Virtual environment combined with real world	
	Full immersion in virtual world	Real world enhanced with digital objects	Interact with both real world and virtual environment	
	implies a complete immersion experience that shuts out the physical world.	adds digital elements to a live view often by using the camera on a smartphone.	experience, which combines elements of both AR and VR, real-world and digital objects interact.	
	Using VR devices such as HTC Vive, Oculus Rift or Google Cardboard, users can be transported into a number of real-world and imagined environments	Examples of augmented reality experiences include Snapchat lenses and the game Pokemon Go.	Mixed reality technology is just now starting to take off with Microsoft's HoloLens one of the most notable early mixed reality apparatuses.	
c	**Applications Of Computer Vision** Computer vision is one of the areas in Machine Learning where core concepts are already being integrated into major products that we use every day. CV In Self-Driving Cars Computer vision enables self-driving cars to make sense of their CV In Facial Recognition CV In Augmented Reality & Mixed Reality **CV In Healthcare**			10Marks Listing 3m Explanation 7m
6a	Cloud computing refers to the practice of using interconnected remote servers hosted on the Internet to store, manage, and process information.			3Marks
b	Data privacy generally means the ability of a person to determine for themselves when, how, and to what extent personal information about them is shared with or communicated to others. This personal information can be one's name, location, contact information, or online or real-world behavior. • **1.** Check social privacy settings • 2. Don't use public storages for private information • 3. Evade tracking • 4. Keep your main e-mail address and phone number private • 5. Use messaging apps with end-to-end encryption • 6. Use secure passwords • 7. Review permissions for mobile apps and browser extensions • 8. Secure your phone and computer with passwords or passcodes • 9. Disable lock screen notifications • 10. Stay private on Wi-Fi networks			7Marks Listing 2m Explanation 5m
c	**Types of cybersecurity threats** • Phishing • Ransomware • Malware • Man in the Middle • Emotet • SQL Injection			10Marks Listing 3m Explanation 7m

	• Password Attacks	
7a	A successful cybersecurity approach has multiple layers of protection spread across the computers, networks, programs, or data that one intends to keep safe. In an organization, the people, processes, and technology must all complement one another to create an effective defense from cyber attacks.	3Marks
b	**4 Stage of IoT architecture.**  **1 Sensing Layer –** **2 Network Layer –** **3.. Data processing Layer –** **4. Application Layer –**	7Marks Listing 2m Explanation 5m
c	**Challenges of Data science Technology** • High variety of information & data is required for accurate analysis • Not adequate data science talent pool available • Management does not provide financial support for a data science team • Unavailability of/difficult access to data • Data Science results not effectively used by business decision makers • Explaining data science to others is difficult • Privacy issues • Lack of significant domain expert • If an organization is very small, they can't have a Data Science team	10Marks Listing 3m Explanation 7m
8a b c d	**Marks will be given on the analysis of the case by the students**	5x4=20 Marks

Sri Shridevi Charitable Trust (R.)

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

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Department of MBA

III Semester Preparatory Examination, March, 2023

Subject: Investment Management (20MBAFM303)

Time: 3 Hrs. **Max. Marks: 100**

Note: 1. *Answer any FOUR full questions from Q. No 1 to Q. No 7.*
2. Q. NO. 8 is Compulsory.

1.a) Distinguish between Economic and Financial Investment. **3 Marks**
b) Explain the attributes that an investor should consider while evaluating an investment. **7 Marks**
c) The returns of securities A and B are given below: **10 Marks**

Probability	Security A	Security B
0.5	4	0
0.4	2	3
0.1	0	3

Give the security; of your preference. The security has to be selected on the basis of return and risk.

2.a) What are 'Derivatives'?Give examples. **3 Marks**
b) A portfolio consists of 3 securities 1,2 and 3. The proportions of these securities are W1= 0.3, W2=0.5 and W3=0.2. the standard deviation of returns on these securities (in percentage terms) are 6,9 and 10 Respectively. The correlation coefficients among security are P12=0.4, P13=0.6, P23=0.7. what is the standard deviation of portfolio return? **7 Marks**
c) Prem is considering the purchase of bond currently selling at Rs.878.50. The bond has four years to maturity, with a face value of Rs.1000 and 8 percent coupon rate. The next annual interest payment is due after one year. The required rate of return is 10 percent.
i) Calculate the intrinsic value of the bond. Should Prem buy the bond? (PVIFA (10%, 4 yrs) =3.170)
ii) what is the value of bond expected rate of return is 12%? **10 Marks**

3.a) Distinguish between Systematic Risk and Unsystematic Risk? **3 Marks**
b) How is technical analysis different from Fundamental analysis? **7 Marks**
c) Arun buys a bond with four years to maturity. The bond has a coupon rate of 9 percent and is priced at Rs.100 in the market.
i) What is the duration of the bond? **10 Marks**
ii) What will be the percentage change in the price of the bond, if the interest rate rises by 1 percent?

4.a) What is Coupon Rate and Zero-Coupon bond? **3 Marks**
b) Explain the key macro-economic variables and their impact on stock market? **7 Marks**
c) Vardhman Limited's earnings and dividends have been growing at a rate of 18 percent per annum. This growth rate is expected to continue for 4 years. After that the growth rate will fall to 12 percent for the next 4 years. Thereafter, the growth rate is expected to be 6 percent forever. If the last dividend per share was Rs.2.00 and the investor's required rate of return on Vardhman's equity is 15 percent, what is the Intrinsic Value per Share? **10 Marks**

5.a) What is breadth of market? How is it used? **3 Marks**
b) Distinguish between CAPM and Arbitrage Pricing Theory? **7 Marks**
c) What is RSI? From the information given below, compute tire RSI of company X's share. **10 Marks**

Day	1	2	3	4	5	6	7	8	9	10

Price	300	304	319	317	319	333	311	332	348	346

6.a) What is an efficient frontier? **3 Marks**

b) Explain the Single Index Model proposed by William Sharpe. **7 Marks**

c) The returns on the equity stock of Auto Electricals Limited and the market portfolio over a 15 year period aregiven: **16 Marks**

Return on Auto Electrical Ltd (%)	10	15	18	14	16	16	18	14	-9	14	15	14	6	7	-8
Return on market portfolio (%)	12	14	13	10	9	13	14	7	1	12	-11	16	8	7	10

What is the beta for Stock A?

7.a) What is meant by passive portfolio management strategy? **3Marks**

b) What is Random Walk Theory? What does it project in its weak from, semi-strong form and strong form? **7 Marks**

c) Pearl and Diamond are the two mutual funds. Pearl has a mean success of 0.15 and diamond has 0.22. The diamond has double the beta of pearl fund's 1.5. The standard deviations of Pearl and Diamond funds are 15% and 21.43%. The mean return of market index is 12% and its Standard Deviation is 7. The risk-free rate is 8%. **10 Marks**

i) Compute the Jensen Index for each fund.

ii) Compute the Treynor and Sharpe indices for the funds. Interpret the results.

8. Compulsory

A Financial Analyst is analyzing two investment alternatives, stock Z and stock Y. The estimated rates of return and their chances of occurrence for' the next year are given below: **20 Marks**

Probability of Occurrence	Rates of Return (%)	
	Y	Z
0.20	22	5
0.60	14	15
0.20	-4	25

i) Determine expected rates of return, variance and standard deviation of Y and Z.

ii) Is 'Y' comparatively riskless?

iii) If the Financial Analyst wishes to invest half in Z g1nd another half in Y, would it reduce the risk? Explain.

1) A) Financial Investment.

- Investing in new and with the aim of earning in future
- Involves investment in both Real & financial Assets
- To Make financial gains
- Shares bonds new and Asset etc.,

Economic Investment.

- Addition Replacement of capital goods Necessary for Producing Goods
- Involves investment in Real Assets only
- To increase Productivity
- New land, machinary, factory etc.,

1) B.

Attributes of Investment.

- Rate of Return
- Risk
- Marketability
- Tax Shelters
- Convenience
- Liquidity
- Tax benefits
- Cash flow Estimation
- Safety
- Hedge against Inflation.

12 c

Security A.

P	Security	ER - ERP	R - ER	R - ER)²	P · R - ER)²
0.5	4	2	1.2	1.44	0.72
0.4	2	0.8	0.8	0.64	0.256
0.1	0	0	2.8	7.84	0.784
		2.8			∑ 1.76
					1.3

P	Security	ER - ERP	R - ER	R - ER²	P · R - ER²
0.5	0	0	(1.5)	2.25	1.125
0.4	3	1.2	1.5	2.25	0.9
0.1	3	0.3	1.5	2.25	0.225
		1.5			∑ 2.25
					1.5

2.4 Q Derivatives are instruments whose value is derived from one or more underlying Asset. the underlying instrument could be a financial security index or commodities or some combination of securities

2.4 R.

$w_1 = 0.3$ $w_2 = 0.5$ $w_3 = 0.2$.

$\sigma_1 = 6$ $\sigma_2 = 9$ $\sigma_3 = 10$

$\rho_{12} = 0.4$ $\rho_{23} = 0.6$ $\rho_{13} = 0.7$.

$$\sqrt{2x_2x_3(\rho_{23}\sigma_2\sigma_3) + 2x_1x_3\rho_{13}\sigma_1\sigma_3}$$

$$(0.3)^2(6)^2 + (0.5)^2(9)^2 + (0.2)^2(10)^2 + 2(0.3)(0.5)(0.4)(6)(9) + 2(0.5)(0.2)(0.7)(9)(10) + 2(0.3)(0.2)(0.6)(6)(10)$$

$$(0.09)(36) + (0.25)(81) + (0.04)(100) + 2(0.15)$$

$$(21.6) + 2(0.1)(63) + 2(0.15)(36)$$

$$3.24 + 20.25 + 4 + 6.48 + 12.6 + 10.8$$

$$= \sqrt{57.37}$$

$$= 7.57$$

Q. C

D: 4 years.

FV: 1000

C: 8% on 1000: 80

D_0: $C \times PVIFA_{R,n} + M \times PVIF_{R,n}$

$80 \times PVIFA_{10.4} + 1000 \times PVIF_{10.4}$

$80 \times 3.170 + 1000 \times 0.683$

$253.6 + 683$

936.6

YTM: $\frac{C + (M-P)/4}{0.4M + 0.6P}$

$\frac{80 + [1000 - 878.50]/4}{0.4(1000) + 0.6(878.50)}$

$\frac{80 + 30.375}{400 + 527}$

$= \frac{110.375}{927.1} \times 100$

$= 11.91\%$

3) A. Systematic Risk.

- Systematic Risk is also Referred to As non diversifiable Risk or Market Risk.
- Systematic Risk is the Variation in the Returns on securities that occur due to macro economics.
  - Interest Risk.
  - Inflation Risk.
  - Market Risk.

Unsystematic Risk.

The Variation in Returns of a company arising due to micro economic factors are termed as Unsystematic Risk.
- Business Risk.
- Financial Risk.

3) B.

- Economic Analysis
- Industry Analysis
- Company Analysis.

Economic Analysis

GDP
Saving & investment
Inflation
Interest Rates
Budget
for structure
balance of payment

Industry Analysis

Growth industry
Cyclical Industry
Defensive industry
Cyclical Growth
Industry

Company Analysis

Competitive edge of the company
Earnings of the Company
Capital structure
Management
Financial Performance
Operation Efficiency

3) c

face value 100
Coupon Rate 100 x 9% = 9
Fixed Rate = 9%

Year	cashflow	PV @ 9%	PVCF	PVCF/100
1	9	0.917	8.253	0.083
2	9	0.842	7.578	0.076
3	9	0.772	6.948	0.069
4	109	0.708	77.172	0.772

PVCF/100

0.083
0.1515
0.208
3.088

3.53 years

Modified duration.

$$\frac{D}{1 + \frac{0.9}{0.10}}$$

$$\frac{3.53}{1 + \frac{0.09}{0.10}} = \frac{3.53}{1 + 0.9}$$

= 1.85

4 A. **coupon Rate**

The coupon Rate is the Annual income An Investor can expect to Receive while Holding a particular bond.

It is fixed when the bond is issued & is calculated by Dividing the sum of the Annual coupon payments by the par value

Zero coupon bond

Zero coupon bond are bonds that do not pay interest during the life of the bonds. Instead Investor buy zero coupon bonds at deep discount from their Redeemable

4 B.

- Gross domestic product
- Unemployment
- Consumer price & Produce price index.
- Retail sales
- Industrial output
- Inflation Rate
- Interest Rate
- Exchange Rate
- Money supply

4.1 C

DDM

Stage · g₁ · g₂ · g₃ · gn

1-4 18% P.a

5-8 12% P.a

9 Above 6% P.a

D. 2.

R. 15%.

Year	Dividend (1+g)	PV @ 15%	D × PV. PVCR
1	2 (1+0.18) = 2.36	0.870	2.0532
2	2.36 (1+0.18) = 2.78	0.756	2.1053
3	2.78 (1+0.18) = 3.28	0.658	2.1585
4	3.28 (1+0.18) 3.87	0.572	2.2139
5	3.87 (1+0.18) 4.33	0.497	2.1542
6	4.33 (1+0.18) 4.84	0.432	2.0950
7	4.84 (1+0.18) 5.42	0.376	2.0382
8	5.42 (1+0.18) 6.07	0.327	1.9850
			16.8033

Stage $\frac{D.R. (1+g)}{R - G.}$

$= \frac{6.0704 \ (1+0.06)}{0.15 - 0.06}$

$= \frac{6.4346}{0.09}$

$= 71.50$

Stage 3

Present value the stock = Future value x PV@15%/for 8 years.

71.50 x 0.327.

23.38.

Stage :4

Intrinsic value.

Present value of the stock + PVCF on stage + stage 3

= 16.8033 + 23.38

= 40.1833.

5) A.

the breadth of market theory is a technical analysis methodology that measures the strength of the market according to the number of stocks that advance for decline in a particular trading day for how much upside volume there is relative to downside volume.

breadth line value. (No of advance stocks - No of decline stocks + breadth line value of the previous day.

5) B. The capital Asset Pricing model (CAPM) is An idealized portrayal of how financial markets price securities & there by determine expected Returns on capital investments.
the model provides a methodology for Quantifying risk & translating that risk into estimates of expected Return on equity.

Arbitrage Pricing theory.
APT is a multi factor Asset Pricing model based on the idea that An Asset Returns can be predicted using the linear Relationship between the Asset expected Return & a number of macroeconomic variables that capture systematic risk.

5) C Relative Strength Index developed by J. Welles Wilder. is a momentum oscillator that measures the speed & change of price of movements.
the RSI oscillate between zero to 100.
Traditionally the RSI is considered Over brought when above 70 & Overpsold when below 30.

6 A

In modern portfolio theory the efficient frontier is An investment portfolio which occupies the "efficient" parts of the risk return spectrum.

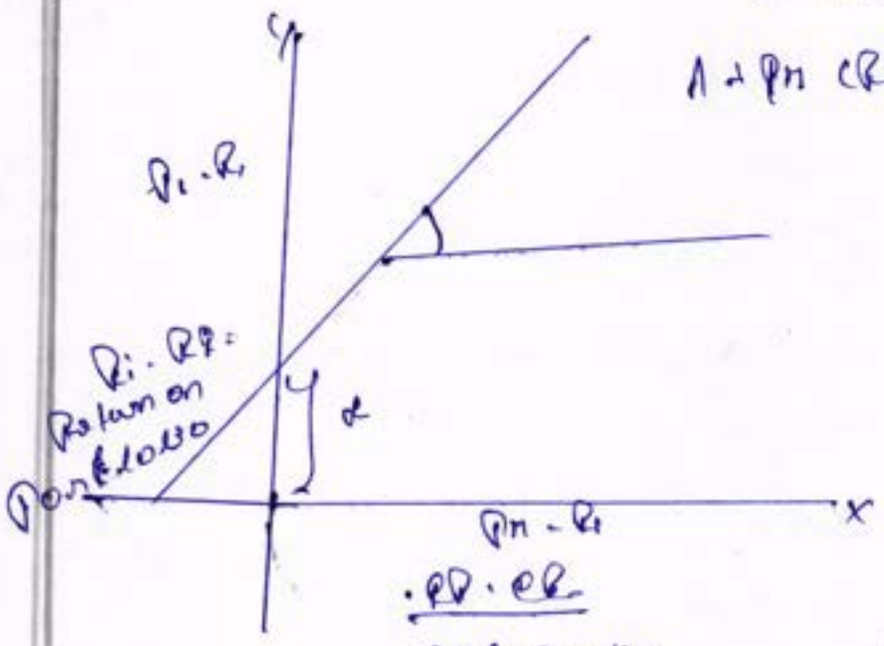
Formally it is the set of portfolios which satisfy the condition that no other portfolio exists with a higher expected return but with the same standard deviation of return.

6 B.

Single index model

The single index model is a simple Asset pricing model to measure both the risk & the return of a stock.

The model has been developed by William Sharpe in 1963 & is commonly used in the finance industry.



$\alpha + \beta_m (R_m - R_f) + \varepsilon$

α - idiosyncratic component of the excess return

$\beta_m (R_m - R_f)$ market systematic component of the excess return.

6) c

x	y	xy	x^2
12	10	120	144
14	15	210	196
13	18	234	169
10	14	140	100
9	16	144	81
13	16	192	169
14	18	252	196
7	14	98	49
1	-9	-9	1
12	14	168	144
-11	15	-165	121
16	14	224	256
8	6	48	64
7	7	49	49
10	-8	-80	100
157	194	2133	1839

$$\beta = \frac{n\Sigma xy - (\Sigma x)(\Sigma y)}{n\Sigma x^2 - (\Sigma x)^2}$$

$$= \frac{15(2133) - (157)(194)}{15(1839) - (157)^2}$$

$$\frac{31995 - 30458}{27585 - 24649}$$

$$= \frac{1537}{2936}$$

$$= 0.5235$$

Calculation of Alpha

$$\alpha = \bar{y} - \bar{\beta}\bar{x}$$

$$\bar{y} = \frac{194}{15} = 12.93$$

$$\bar{x} = \frac{157}{15} = 10.46$$

$$12.93 - (0.5235)\,10.46$$

$$12.93 - 5.47581$$

$$= 7.4541$$

74 A The purpose of Passive portfolio management is to generate a Return a Passive strategy don't have a management team making investment decisions. It can be structured As An Exchange traded fund (ETF). A mutual fund. Or a unit investment trust UIT.

74 B. Random walk theory suggests that changes in Asset Prices are Random. This means that Stock Prices move unpredictably. So that past Prices cannot be used to Accurately Predict future Prices.

Random walk theory also implies that the Stock Market is efficient & Reveals all available information.

74 C

Case Study:

8)

P	R	ER-RP	R-ER	$(R-ER)^2$	$P(R-ER)^2$
0.20	22	4.4	22 - 12 = 10	100	20
0.60	14	8.4	14 - 12 = 2	4	2.4
0.20	-4	-0.8	-4 - 12 = 16	256	51.2
		12			$\sqrt{73.6}$ = 8.6

P	R	ER-RP	R-ER	$(R-ER)^2$	$P(R-ER)^2$
0.20	5	1	-10	100	20
0.60	15	9	0	0	0
0.20	25	5	10	100	20
		15			$\sqrt{40}$ = 6.32

	Return	Risk
Y	12	8.6
Z	15	6.32

So Y Risk is not less when compare to Z

Z Return & Risk is Return 15 & Risk 6.32

Y Return & Risk is Return 12 & Risk 8.6

(iii)

P	R	RY	RY-RY
0.20	22	4.4	0.4
0.60	14	8.4	4.4
0.20	-4	-0.8	4.8

$\bar{R}Y = \frac{ERY}{N} = \frac{12}{3}$ = 4

0.20	5	1	-4
0.60	15	9	4
0.20	25	5	0
		15	

$Z = \frac{ERZ}{N} = \frac{15}{3} = 5$

$R_4 - R_4 - (R_2 - R_2)$

$0.4 \times -4 = -1.6$

$4.4 \times 4 = 17.6$

$4.8 \times 0 = 0$

16

Co. variance

$$\text{Cov}_{AB} \cdot n_{t-1} \cdot \frac{\sum R_4 - \sum E_4 \; R_2 \cdot R_2}{n}$$

$$= \frac{16}{3}$$

$$= 5.33$$