Sri Shridevi Charitable Trust (R.)
ESTD:2002
SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
Sira Road, Tumkur - 572 106, Karnataka, India.
Phone: 0816 - 2212629 | Principal: 0816 - 2212627, 9686114899 | Telefax: 0816 - 2212628
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)

2021-22

Internal assessment Question paper with scheme of evaluation

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY, TUMKUR-572 106

Second Semester B.E. Degree II-Internal Assessment Test August 2021

18MAT21: Advanced Calculus and Numerical Methods

Max Time: 90 Min **(CBCS Scheme Common to All)** Max Marks: 40 Marks

Note: Answer Any **TWO** full questions choosing **ONE** full question from each part

PART-A

1. a) Verify Green's theorem for $\int_c (xy+y^2)dx + x^2dy$ where C is the closed curve of the region bounded by $y=x$ and $y=x^2$. **(07 Marks CO 1)**

b) Verify Stoke's theorem for $\vec{F}=(x^2+y^2)\hat{i}-2xy\,\hat{j}$ taken round the rectangle bounded by the lines $x=\pm a$, $y=0$ and $y=b$. **(07 Marks CO 1)**

c) Use the divergence theorem to evaluate $\iint_s \vec{F}.\hat{n}\,ds$ over the entire surface of the region above xy plane bounded by the cone $z^2=x^2+y^2$ the plane $z=4$ where $\vec{F}=4xz\,\hat{i}+xyz^2\,\hat{j}+3z\,\hat{k}$. **(06 Marks CO 1)**

OR

2. a) Solve $(4D^4-4D^3-23D^2+12D+36)y=0$ **(07 Marks CO 2)**

b) Solve $(4D^4-8D^3-7D^2+11D+6)y=0$ **(07 Marks CO 2)**

c) Solve $\frac{d^3y}{dx^3}-2\frac{d^2y}{dx^2}+4\frac{dy}{dx}-8y=0$ **(06 Marks CO 2)**

PRINCIPAL
SIET., TUMAKURU

PTO

3. a) Derive one dimensional Wave equation. **(07 Marks CO 3)**

b) Find the PDE of the Family of all sphere whose center lies in the plane Z=0 and have a constant radius 'r'. **(07 Marks CO 3)**

c) Solve $\frac{\partial^2 z}{\partial x^2}+z=0$, given that when $x=0$, $z=e^y$ and $\frac{\partial z}{\partial x}=1$ **(06 Marks CO 3)**

OR

4. a) Derive one dimensional Heat equation. **(07 Marks CO 3)**

b) Find the PDE by eliminating arbitrary function $\phi(xy+z^2, x+y+z)=0$. **(07 Marks CO 3)**

c) Solve $x(y^2-z^2)p+y(z^2-x^2)q=z(x^2-y^2)$ by using Lagrange's multipliers. **(06 Marks CO 3)**

SUB: Advanced calculus and Numerical methods (18MAT21)
II - INTERNAL TEST AUG. 2021

Time: 90 min SCHEME OF EVALUATION Max. marks: 40

---

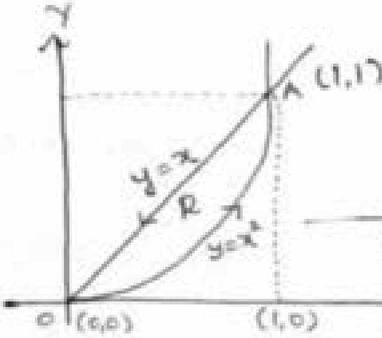
1 a) Let $I = \int_C (xy+y^2)\,dx + x^2 dy$ C: $y=x$ and $y=x^2$

The points of intersection are (0,0), (1,1).

Green's theorem

$$\int_C M\,dx + N\,dy = \iint_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right) dx\,dy.$$

$$\int_C (xy+y^2)dx + y^2 dy = \int_{OA} + \int_{AO} = I_1 + I_2$$



— 2M

Along OA: $y=x^2$ $I_1 = \int_0^1 (3x^3+x^4)\,dx = \frac{19}{20}$

Along AO: $y=x$ $I_2 = \int_1^0 3x^2 dx = -1$

} — 2M

LHS = $I_1 + I_2 = \frac{19}{20} - 1 = \frac{-1}{20}$ — 2M

RHS $\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} = 2x - (x+2y) = x - 2y$

$$\iint_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right) dx\,dy = \int_{x=0}^{1}\int_{y=x^2}^{x} (x-2y)\,dy\,dx = \frac{1}{5} - \frac{1}{4} = \frac{-1}{20}$$

— 1M

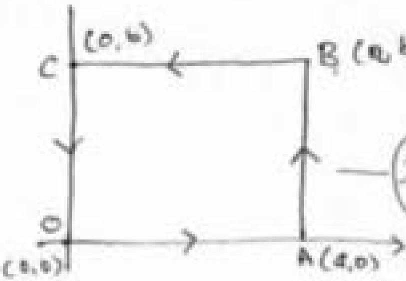
LHS = RHS.

b) $\vec{F} = (x^2+y^2)\,i - 2xy\,j$ C: $x=0$, $x=a$, $y=0$, $y=b$

By Stoke's theorem $\oint_C \vec{F}\cdot d\vec{r} = \iint_S (\nabla\times F)\cdot\hat{n}\,ds$

LHS $\oint_C \vec{F}\cdot d\vec{r} = \int_{OA} + \int_{AB} + \int_{BC} + \int_{CO}$

$= I_1 + I_2 + I_3 + I_4$



— 2M

Along OA: $y=0$. $I_1 = \int_0^a x^2 dx = \frac{a^3}{3}$

AB: $x=a$ $I_2 = \int_0^b -2ay\,dy = -ab^2$

BC: $y=b$ $I_3 = \int_a^0 (x^2+b^2)\,dx = -\frac{a^3}{3} - ab^2$

CO: $x=0$ $I_4 = \int_b^0 0.dy = 0$

LHS $= -2ab^2$ —— ①

PRINCIPAL
SIET., TUMAKURU.

— 2M

$$\nabla\times\vec{F} = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ x^2+y^2 & -2xy & 0 \end{vmatrix} = k(-2y-2y) = -4yk.$$

(2m) (2M)

$(\nabla\times\vec{F}).\hat{n}\,ds = -4y\,dx\,dy$

RHS $= \iint_S (\nabla\times\vec{F}).\hat{n}\,ds = \iint_R -4y\,dx\,dy = -2ab^2$ — ②

(1M)

LHS = RHS

c) $\iint_S \vec{F}.\hat{n}\,ds = \iiint_V \text{div}\,\vec{F}\,dv$

(3M)

$\text{div}\,\vec{F} = \nabla.\vec{F} = 4z+xz^2+3.$

$$\iiint_V \text{div}\,\vec{F}\,dv = \int_{z=0}^{4}\int_{x=-4}^{4}\int_{y=-\sqrt{16-x^2}}^{\sqrt{16-x^2}} (4z+xz^2+3)\,dy\,dx\,dz$$

(3M)

$$= \underline{704}\,\pi$$

2 a) $(4D^4-4D^3-23D^2+12D+36)\,y = 0.$

AE is, $4m^4-4m^3-23m^2+12m+36=0.$

$m=2$

$$m=2 \left|\begin{array}{ccccc} 4 & -4 & -23 & 12 & 36 \\ 0 & 8 & 8 & -30 & -36 \\ \hline 4 & 4 & -15 & -18 & 0 \end{array}\right.$$

(2M)

$4m^3+4m^2-15m-18=0.$

$$m=2 \left|\begin{array}{cccc} 4 & 4 & -15 & -18 \\ 0 & 8 & 24 & 18 \\ \hline 4 & 12 & 9 & 0 \end{array}\right.$$

(2M)

$4m^2+12m+9=0.$

$(2m+3)\,(2m+3)=0.$

(2M)

$m=-3/2 \quad m=-3/2$

The roots are $2, 2, -3/2, -3/2.$

(1M)

G.S. is $y = (c_1+c_2x)\,e^{2x} + (c_3+c_4x)\,e^{-3/2x}$

2 b) $(4D^4-8D^3-7D^2+11D+6)y=0.$

AE is $4m^4-8m^3-7m^2+11m+6=0.$

$$m=-1\;\begin{array}{|ccccc}4&-8&-7&11&6\\0&-4&12&-5&-6\\\hline 4&-12&5&6&0\end{array}$$

$4m^3-12m^2+5m+6=0.$ — 2M

$$m=2\;\begin{array}{|cccc}4&-12&5&6\\0&8&-8&-6\\\hline 4&-4&-3&0\end{array}$$

$4m^2-4m-3=0.$

$(2m+1)(2m-3)=0.$ — 2M

$m=-1/2 \quad m=3/2.$

Roots are $-1, 2, -1/2, 3/2$ — 2M

G.S. is $y=c_1e^{-x}+c_2e^{2x}+c_3e^{-1/2x}+c_4e^{-3/2x}$ — 1M

2c) $(D^3-2D^2+4D-8)y=0.$

$m^3-2m^2+4m-8=0.$

$m^2(m-2)+4(m-2)=0.$

$(m-2)(m^2+4)=0.$

$m=2, \quad m^2=-2$

$m=\pm 2i$ — 6M

3a) One dimensional wave equation

Book work $\dfrac{\partial^2 u}{\partial t^2}=c^2\dfrac{\partial^2 u}{\partial x^2}$ — 4M

b) Sphere whose centre lie on the plane $z=0$ is,

$(x-a)^2+(y-b)^2+z^2=r^2$ —— ① — 2m

D.P. w.r.t. x & y

$2(x-a)+0+2z\dfrac{\partial z}{\partial x}=0 \Rightarrow (x-a)=-2p$ — 2m

$2(y-b)+0+2z\dfrac{\partial z}{\partial y}=0 \Rightarrow (y-b)=-2q.$ — 2m

$(-2p)^2+(-2q)^2+z^2=r^2$

$z^2(p^2+q^2+1)=r^2$ — 1m

3 b) $\frac{\partial^2 z}{\partial x^2} + z = 0 \Rightarrow (D^2+1)z = 0$

AE is, $m^2+1=0 \Rightarrow m^2=-1$

$m = \pm i$ — (2M)

$CF = e^{0.x}(C_1\cos x + C_2 \sin x)$

$z = C_1 \cos x + C_2 \sin x$ — ①

Case(i): put $x=0,\ z=e^y$

① ⇒ $C_1 = e^y$ — (2m)

Case(ii): put $\frac{\partial z}{\partial x} = 1,\ x=0$

$C_2 = 1$ — (2M)

$\therefore z = e^y \cos x + \sin x$

A a) one dimensional Heat equation

Book look: $\frac{\partial u}{\partial t} = c^2 \frac{\partial u}{\partial x^2}$ — (1M)

b) $\phi(xy+z^2,\ x+y+z) = 0$. — (3M)

$u = xy+z^2$ $\quad$ $v = x+y+z$

$$\frac{\frac{\partial u}{\partial x}}{\frac{\partial u}{\partial y}} = \frac{\frac{\partial v}{\partial x}}{\frac{\partial v}{\partial y}} \Rightarrow \frac{y+2zp}{x+2zq} = \frac{1+p}{1+q}$$ — (4M)

$\Rightarrow p(2z-x) + q(y-2z) + (y-x) = 0$.

c) $x(y^2-z^2)p + y(z^2-x^2)q - z(x^2-y^2)$

$\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R} \Rightarrow \frac{dx}{x(y^2-z^2)} = \frac{dy}{y(z^2-x^2)} = \frac{dz}{z(x^2-y^2)}$ — (3M)

⇒ multipliers $1/x, 1/y, 1/z$

$$\frac{1/x\,dx + 1/y\,dy + 1/z\,dz}{y^2-z^2+z^2-x^2+x^2-y^2} = 0$$

$1/x\,dx + 1/y\,dy + 1/z\,dz = 0$

Int, $\log xyz = \log c_1$

$xyz = c_1$

choose multipliers x, y, z

$$\frac{x\,dx + y\,dy + z\,dz}{x^2y^2 - x^2z^2 + y^2z^2 - y^2x^2 + z^2x^2 - z^2y^2} = 0$$

$x\,dx + y\,dy + z\,dz = 0$.

Int, $\frac{x^2}{2} + \frac{y^2}{2} + \frac{z^2}{2} = \frac{C_2}{2}$

$x^2 + y^2 + z^2 = C_2$ — (3M)

G.S. is $\phi(xyz,\ x^2+y^2+z^2) = 0$.

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY, TUMKUR-572 106

Second Semester B.E. Degree III Internal Examination
21MAT21: Advanced Calculus and Numerical Methods

USN										

Time: 3 Hrs (Common to all Branches) Max.Marks: 100

Note: Answer any *FIVE* full questions, choosing at least *ONE* full question from each module.

Module-1

1. a) Evaluate $\int_0^1 \int_0^{\sqrt{1-y^2}} x^3 y \, dxdy$ **(06 Marks)**

b) Solve $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial z}{\partial x} - 4z = 0$ subjected to the conditions that $z = 1$ & $\frac{\partial z}{\partial x} = y$ when $x = 0$ **(07 Marks)**

c) Elimination of arbitrary function Solve $z = f(x + at) + g(x - at)$ **(07 Marks)**

OR

2. a) Find the PDE of the family of all spheres whose centers lie on the plane z = 0 and have constant radius 'r'. **(06 Marks)**

b) Evaluate $\int_{-1}^{1} \int_{0}^{z} \int_{x-z}^{x+z} (x + y + z) dydxdz$ **(07 Marks)**

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 Marks)**

Module-2

3. a) Find the directional derivative of the function xyz along the direction of the normal to the surface $xy^2 + yz^2 + zx^2 = 3$ at the points (1, 1, 1). **(06 Marks)**

b) Find the constants a and b such that $\vec{F} = (axy + z^3)\hat{i} + (3x^2 - z)\hat{j} + (bxz^2 - y)\hat{k}$ is irrotational. Also find a scalar function ϕ such that $\vec{F} = \nabla\phi$. **(07 Marks)**

c) Verify Green's theorem for $\int_c (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the closed curve of the region bounded by $y = \sqrt{x}$ and $y = x^2$ **(07 Marks)**

OR

4. a) Find the $div\vec{F}$ and $curl\vec{F}$ where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$ **(06 Marks)**

b) Find $curl(curl\vec{A})$ given that $\vec{A} = xy\hat{i} + y^2z\hat{j} + z^2y\hat{k}$ **(07 Marks)**

c) Verify Stoke's theorem for $\vec{F} = (x^2 + y^2)\hat{i} - 2xy\hat{j}$ taken round the rectangle bounded by the lines $x = 0,\ x = a,\ y = 0$ and $y = b$ **(07 Marks)**

Module-3

5. a) Form the partial differential equation of $z = yf(x) + x\phi(y)$ **(06 Marks)**

b) Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ for which $\frac{\partial z}{\partial y} = -2\sin y$ when x = 0 and z = 0 if y is an odd multiple of $\frac{\pi}{2}$. **(07 Marks)**

c) Derive one-dimensional wave equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ **(07 Marks)**

PRINCIPAL
SIET., TUMAKURU.

OR

6\. a) Solve $(y^2+z^2)p+x(yq-z)=0$ **(06 Marks)**

b) Solve $\frac{\partial^2 z}{\partial x^2}=xy$ to the conditions that $\frac{\partial z}{\partial x}=\log(1+y)$ when x = 1 , z = 0 when x = 0. **(07 Marks)**

c) With usual notations derive one-dimensional heat equation. **(07 Marks)**

Module-4

7\. a) Using the Newton-Raphson method, find the root of $3x=\cos x+1$ correct four decimal places. **(06 Marks)**

b) Construct the interpolation polynomial for the data given below using Newton's general interpolation formula

x	2	4	5	6	8	10
y	10	96	196	350	868	1746

(07 Marks)

c) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's(1/3)rd rule taking four equal strips and hence deduce an approximate value of π. **(07 Marks)**

OR

8\. a) Find the interpolating polynomial f(x) satisfying f(0)=0, f(2)=4, f(4)=56, f(6)=204, f(8)=496, f(10)=980 and hence find f(3). **(06 Marks)**

b) Using Lagrange's interpolation formula, fit a polynomial which passes through the points (−1,0),(1,2),(2,9) and (3,8) and hence estimate the value of y when x= 2.2 **(07 Marks)**

c) Evaluate $\int_0^1 \frac{dx}{1+x}$ taking seven ordinates by applying Simpson's (3/8)th rule. Hence deduce the value of $\log_e 2$. **(07 Marks)**

Module-5

9\. a) Employ the Taylor's method to obtain approximate value of y at x=0.2 for the DE $\frac{dy}{dx}=2y+3e^{x}$, y(0)=0. **(06 Marks)**

b) Use modified Euler's method to solve $\frac{dy}{dx}=x+\left|\sqrt{y}\right|$ in the range $0\le x\le 0.4$ by taking h=0.2 given that y=1 at x=0 initially. **(07 Marks)**

c) Using R-K method of order four find y(0.2) for the equation $\frac{dy}{dx}=\frac{y-x}{y+x}$, y(0)=1, taking h=0.2 **(07 Marks)**

OR

10\. a) Use modified Euler's method to solve the initial value problem $\frac{dy}{dx}=\log(x+y)$ with y(1)=2 at the points x=1.2 and x=1.4 taking h=0.2 **(06 Marks)**

b) Apply Runge-Kutta method to find an approximate value of y for x=0.2 if $\frac{dy}{dx}=x+y^2$ Given that y=1 when x=0. **(07 Marks)**

c) Using Milne's predictor-corrector method solve $\frac{dy}{dx}=x-y^2$, y(0)=0, y(0.2)=0.02, y(0.4)=0.0795, y(0.6)=0.1762. Compute y at x=0.8 correct to four decimal places. **(07 Marks)**

* * * * *

PRINCIPAL
SIET., TUMAKURU

21MAT21 : ADVANCED CALCULUS AND NUMERICAL METHODS

SCHEME OF EVALUATION

MODULE-1

1. ⓐ $I=\int_{y=0}^{1}\int_{x=0}^{\sqrt{1-y^2}} x^3 y\,dx\,dy = \frac{1}{4}\int_{y=0}^{1}(y-2y^3+y^5)dy = \frac{1}{24}$ ⟶ 6 Marks

6 Marks

ⓑ finding p, q, r, s, t ⟶ 4 Marks

$\frac{r}{t} = \frac{1}{a^2}$ ⓐ $t = a^2 r$

$\boxed{\frac{\partial^2 z}{\partial t^2} - a^2\frac{\partial^2 z}{\partial x^2} = 0}$ ⟶ 3 Marks

7 Marks

ⓑ $z = c_1 e^{x} + c_2 e^{-4x}$ ⟶ 2 Marks

$g(y) = \frac{1-y}{5}$, $f(y) = \frac{4+y}{5}$ ⟶ 3 Marks

$\boxed{z = \left(\frac{4+y}{5}\right)e^{x} + \left(\frac{1-y}{5}\right)e^{-4x}}$ ⟶ 2 Marks

7 Marks

OR

2. ⓐ $(x-a)^2+(y-b)^2+z^2=r^2$ ⟶ 2 Marks

$(x-a) = -zp$ & $(y-b) = -zq$ ⟶ 2 Marks

$\boxed{z^2(p^2+q^2+1)=r^2}$ ⟶ 2 Marks

6 Marks

ⓑ $I=\int_{z=-1}^{1}\int_{x=0}^{z}\int_{y=x-z}^{x+z}(x+y+z)\,dy\,dx\,dz$ ⟶ 1 Mark

$I=\int_{z=-1}^{1}\int_{x=0}^{z}(4xz+2z^2)\,dx\,dz$ ⟶ 3 Marks

$\boxed{I=\int_{z=-1}^{1} 4z^3\,dz = 0}$ ⟶ 3 Marks

7 Marks

ⓒ $\phi_1 = x^2+y^2+z^2$ & $\phi_2 = x^2+y^2-z$ ⟶ 2 Marks

$[\nabla\phi_1]_{(2,-1,2)} = 2(2\hat{i}-\hat{j}+2\hat{k})$

$[\nabla\phi_2]_{(2,-1,2)} = 4\hat{i}-2\hat{j}-\hat{k}$ ⟶ 3 Marks

$\cos\theta = \frac{\nabla\phi_1\cdot\nabla\phi_2}{|\nabla\phi_1||\nabla\phi_2|} = \frac{8}{3\sqrt{21}}$

$\boxed{\theta=\cos^{-1}\left(\frac{8}{3\sqrt{21}}\right)}$ ⟶ 2 Marks

7 Marks

PRINCIPAL
SIET., TUMAKURU.

MODULE-2:

3. ⓐ

$[\nabla\phi]_{(1,1,1)} = \hat{i}+\hat{j}+\hat{k}$

$[\nabla\psi]_{(1,1,1)} = 3(\hat{i}+\hat{j}+\hat{k})$ $\Big\}$ $\longrightarrow$ 2 Marks

$\hat{n} = \dfrac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}$ $\longrightarrow$ 2 Marks

$\nabla\phi\cdot\hat{n} = (\hat{i}+\hat{j}+\hat{k})\cdot\dfrac{(\hat{i}+\hat{j}+\hat{k})}{\sqrt{3}} = \underline{\underline{\sqrt{3}}}$ $\longrightarrow$ 2 Marks

6 Marks

ⓑ

$\nabla\times\vec{F}=0 \Rightarrow -z^2(b-3)\hat{j} + x(6-a)\hat{k} = \vec{0}$ $\longrightarrow$ 3 Marks

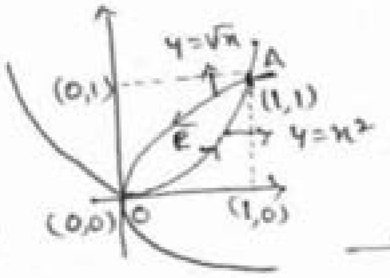
$a=6$ and $b=3$ $\longrightarrow$ 1 Mark

$\boxed{\phi = 3x^2y + xz^3 - 4z}$ $\longrightarrow$ 3 Marks

7 Marks

ⓒ

$\int_C M\,dx + N\,dy = \iint_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)dx\,dy$



LHS $= \int_C M\,dx + N\,dy = \int_{OA} M\,dx + N\,dy + \int_{AO} M\,dx + N\,dy$

$\int_C M\,dx + N\,dy = -1 + 5/2 = \underline{\underline{3/2}} \longrightarrow ①$ $\longrightarrow$ 4 Marks

RHS $= \iint_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right)dx\,dy = \int_{x=0}^{1}\int_{y=x^2}^{\sqrt{x}} (-6y+16y)\,dy\,dx = \underline{\underline{3/2}} \longrightarrow ②$ $\longrightarrow$ 3 Marks

7 Marks

OR

4. ⓐ

$\mathrm{div}\,\vec{F} = 6(x+y+z)$, $\vec{F} = (3x^2-3yz)\hat{i} + (3y^2-3xz)\hat{j} + (3z^2-3xy)\hat{k}$ $\longrightarrow$ 3 Marks

$\underline{\underline{\mathrm{curl}\,\vec{F} = 0}}$ $\longrightarrow$ 3 Marks

6 Marks

ⓑ

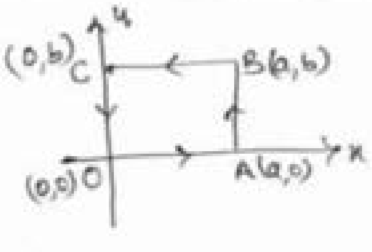
$\nabla\times\vec{A} = \hat{i}(z^2-y^2) - \hat{j}(0-0) + \hat{k}(0-x)$ $\longrightarrow$ 3 Marks

$\nabla\times(\nabla\times\vec{A}) = (1+2z)\hat{j} + 2y\hat{k}$ $\longrightarrow$ 4 Marks

7 Marks

ⓒ

$\int_C \vec{F}\cdot d\vec{r} = \iint_S \mathrm{curl}\,\vec{F}\cdot\hat{n}\,ds$



$\int_C \vec{F}\cdot d\vec{r} = \cancel{\frac{a^3}{3}} - ab^2 - ab^2 - \cancel{\frac{a^3}{3}}$ $\longrightarrow$ 4 Marks

$\int_C \vec{F}\cdot d\vec{r} = \underline{\underline{-2ab^2}} \longrightarrow ①$

$\mathrm{curl}\,\vec{F}\cdot\hat{n}\,ds = -4y\,dx\,dy$

$\iint_S \mathrm{curl}\,\vec{F}\cdot\hat{n}\,ds = \int_{x=0}^{a}\int_{y=0}^{b} -4y\,dy\,dx = \underline{\underline{-2ab^2}} \longrightarrow ②$ $\longrightarrow$ 3 Marks

7 Marks

MODULE-3 :-

5.ⓐ $p = y f'(x) + \phi(y)$, $r = y f''(x)$

$q = f(x) + x\phi'(y)$, $s = f'(x) + \phi'(y)$, $t = x\phi''(y)$ → 3 Marks

$$s = \frac{p-\phi(y)}{y} + \frac{q-f(x)}{x}$$ → 2 Marks

$$\boxed{xys = px + qy - z}$$ → 1 Mark

6 Marks

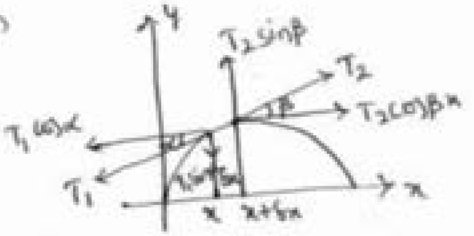
ⓑ $\frac{\partial z}{\partial y} = -\sin y \cos x + f(y)$ → 2 Marks

$z = \cos x \cos y + F(y) + g(x)$ → 3 Marks

$$\boxed{z = \cos y(\cos x + 1)}$$ → 2 Marks

7 Marks

ⓒ $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ → Derivation



→ 7 Marks

7 Marks

OR

6ⓐ $\frac{dx}{y^2+z^2} = \frac{dy}{xy} = \frac{dz}{xz}$ → 3 Marks

$\frac{dy}{y} = \frac{dz}{z} \Rightarrow \boxed{y/z = c_1}$

xply $x, -y, -z$ Each ratio $xdx - ydy - zdz = 0$ → 3 Marks

$$\boxed{x^2 - y^2 - z^2 = 2c_2}$$

$$\boxed{\phi(y/z,\ x^2-y^2-z^2) = 0}$$

6 Marks

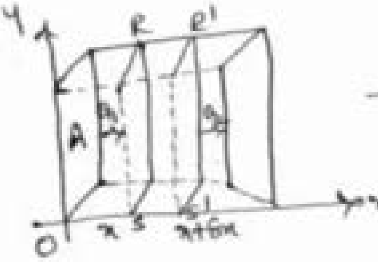
ⓑ $z = \frac{y}{2}\int x^2 dx + f(y)\int dx + g(y)$ → 2 Marks

$z = \frac{x^3 y}{6} + x f(y) + g(y)$ → 2 Marks

$$\boxed{z = \frac{x^3 y}{6} + x\left[\log(1+y) - \frac{y}{2}\right]}$$ → 3 Marks

7 Marks

ⓒ $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ → Derivation



→ 7 Marks

7 Marks

MODULE-4:

7 (a) $f(x) = 3x - \cos x - 1$, $x_0 = 1$

$\boxed{x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 0.62001}$ → 3 Marks

$\boxed{x_2 = 0.60712}$, $\boxed{x_3 = 0.60710}$ → 3 Marks

6 Marks

(b) $y = f(x_0) + (x-x_0) f(x_0,x_1) + (x-x_0)(x-x_1) f(x_0,x_1,x_2)$
$+ (x-x_0)(x-x_1)(x-x_2) f(x_0,x_1,x_2,x_3) + \cdots$ → 1 Mark

Divided Difference table.

$f(x_0,x_1) = 43$, $f(x_0,x_1,x_2) = 19$, $f(x_0,x_1,x_2,x_3) = 2$ } → 3 Marks

$f(x_0,x_1,x_2,x_3,x_4) = 0$ → 3 Marks

$\boxed{y = 2x^3 - 3x^2 + 5x - 4}$

7 Marks

(c) $I = \int_0^1 \frac{1}{1+x^2}dx = \frac{h}{3}\left[(y_0+y_n) + 4(y_1+y_3+y_5+\cdots) + 2(y_2+y_4+\cdots)\right]$ → 2 Mark

→ 2 Marks

$I = \int_0^1 \frac{1}{1+x^2}dx = \underline{0.78539} \rightarrow ①$ → 2 Marks

Also $I = \int_0^1 \frac{1}{1+x^2}dx = \left[\tan^{-1}x\right]_0^1 = \pi/4 \rightarrow ②$ → 1 Mark

$\boxed{\pi = 3.14156}$

7 Marks

OR

8 (a) N.F.D. Table. → 3 Marks

$\Delta y_0 = 4$, $\Delta^2 y_0 = 48$, $\Delta^3 y_0 = 48$, $\Delta^4 y_0 = 0$

$y = y_0 + r\Delta y_0 + \frac{r(r-1)}{2!}\Delta^2 y_0 + \frac{r(r-1)(r-2)}{3!}\Delta^3 y_0 + \cdots$ $r = \frac{x-x_0}{h} = \frac{x}{2}$ → 1 Mark

→ 2 Marks

$\boxed{y = f(x) = x^3 - 2x}$ $\boxed{y = f(3) = 21}$

6 Marks

(b) $y = f(x) = \frac{(x-x_1)(x-x_2)(x-x_3)}{(x_0-x_1)(x_0-x_2)(x_0-x_3)} y_0 + \frac{(x-x_0)(x-x_2)(x-x_3)}{(x_1-x_0)(x_1-x_2)(x_1-x_3)} \cdot y_1$
$+ \frac{(x-x_0)(x-x_1)(x-x_3)}{(x_2-x_0)(x_2-x_1)(x_2-x_3)} y_2 + \frac{(x-x_0)(x-x_1)(x-x_2)}{(x_3-x_0)(x_3-x_1)(x_3-x_2)} y_3$ → 2 Marks

→ 4 Marks

$y = f(2.2) = -\frac{3x^3}{2} + 5x^2 + \frac{5}{2}x - 4$ → 1 Mark

$\boxed{y = f(2.2) = 9.728}$

7 Marks

ⓒ $I=\int_0^1 \frac{1}{1+x}dx = \frac{3h}{8}\left[(y_0+y_6)+3(y_1+y_2+y_4+y_5)+2y_3\right]$ $\longrightarrow$ 2 Marks

$I=\int_0^1 \frac{1}{1+x}dx = 0.6932 \longrightarrow ①$ $\longrightarrow$ 2 Marks

Also $I=\int_0^1 \frac{1}{1+x}dx = \left[\log(1+x)\right]_0^1 = \log_e 2 \longrightarrow ②$ $\longrightarrow$ 2 Marks

$\therefore \boxed{\log_e 2 = 0.6932}$ $\longrightarrow$ 1 Mark

7 Marks

MODULE-5:-

9 ⓐ $y(x) = y(x_0)+(x-x_0)y'(x_0)+\frac{(x-x_0)^2}{2!}y''(x_0)+\frac{(x-x_0)^3}{3!}y'''(x_0)+\cdots$ $\longrightarrow$ 2 Marks

$y(x) = 3x+\frac{9x^2}{2}+\frac{7x^3}{2}$ $\longrightarrow$ 3 Marks

$\boxed{y(0.2) = 0.808}$ $\longrightarrow$ 1 Mark

6 Marks

ⓑ ⓘ $y_1^{(0)} = y_0+h\,f(x_0,y_0) = 1.2$

$y_1^{(1)} = y_0+\frac{h}{2}\left[f(x_0,y_0)+f(x_1,y_1^{(0)})\right] = 1.2295$

$y_1^{(2)} = 1.2309$, $y_1^{(3)} = 1.2309$ $\longrightarrow$ 4 Marks

$\boxed{y(0.2) = 1.2309}$

ⓘⓘ $y_1^{(0)} = 1.4928$

$y_1^{(1)} = 1.5253$, $y_1^{(2)} = 1.5253$, $y_1^{(3)} = 1.5254$ $\longrightarrow$ 3 Marks

$\boxed{y(0.4) = 1.5254}$

7 Marks

ⓒ $K_1 = 0.2$

$K_2 = 0.1667$

$K_3 = 0.1662$ $\longrightarrow$ 5 Marks

$K_4 = 0.1414$

$y(x_0+h) = y_0+\frac{1}{6}\left[K_1+2K_2+2K_3+K_4\right]$ $\longrightarrow$ 1 Mark

$\boxed{y(0.2) = 1.1679}$ $\longrightarrow$ 1 Mark

7 Marks

PRINCIPAL
SIET., TUMAKURU

OR

10·ⓐ ① $y_1^{(0)} = 2.2197$

$y_1^{(1)} = 2.2328$ → 3 Marks

$y_1^{(2)} = 2.2331$

$y_1^{(3)} = 2.2332$

$\boxed{y(1.2) = 2.2332}$

Ⓘ $y_1^{(0)} = 2.4798$

$y_1^{(1)} = 2.4921$ → 3 Marks

$y_1^{(2)} = 2.4924$

$y_1^{(3)} = 2.49248$

Then $\boxed{y(1.4) = 2.4924}$

6 Marks

ⓑ $K_1 = 0.2$, $K_2 = 0.262$, $K_3 = 0.2758$, $K_4 = 0.3255$ → 4 Marks

$y(x_0+h) = y_0 + \frac{1}{6}[K_1 + 2K_2 + 2K_3 + K_4]$ → 2 Marks

$\boxed{y(0.2) = 1.26685}$ → 1 Mark

7 Marks

ⓒ Table values

$y_0' = 0$, $y_1' = 0.1996$, $y_2' = 0.3937$, $y_3' = 0.5689$

$y_4^{(P)} = y_0 + \frac{4h}{3}(2y_1' - y_2' + 2y_3')$ → 3 Marks

$\boxed{y_4^{(P)} = 0.3049}$ $y_4' = 0.707$

$y_4^{(c)} = y_2 + \frac{h}{3}(y_2' + 4y_3' + y_4')$

$\boxed{y_4^{(c)} = 0.3046}$ → 4 Marks

$y_4' = 0.7072$

$\boxed{y_4^{(c)} = 0.3046}$

7 Marks.

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY, TUMKUR-572 106

Fourth Semester B.E. Degree Preparatory Examination: August-2021

18MAT41: Complex Analysis, Probability and Statistical Methods

USN										

Time: 3 Hrs (Common to all Branches) Max.Marks: 100

Note: Answer any **FIVE** full questions

1. **a)** State and Prove Cauchy-Riemann equation in the Cartesian form. **(07 Marks-CO 1)**

   b) Find the analytic function whose real part is $(x\sin x\cosh y - y\cos x\sinh y)$. **(07 Marks-CO 1)**

   c) Find the analytic function $f(z) = u + iv$ where $u - v = (x-y)(x^2+4xy+y^2)$. **(06 Marks-CO 1)**

2. **a)** State and Prove Cauchy-Riemann equation in the Polar form. **(07 Marks-CO 1)**

   b) Find the analytic function whose real part is $(x^2-y^2)+\dfrac{x}{(x^2+y^2)}$ **(07 Marks-CO 1)**

   c) If $f(z)$ is analytic Show that $\left[\dfrac{\partial^2}{\partial x^2}+\dfrac{\partial^2}{\partial y^2}\right]|f(z)|^2 = 4|f'(z)|^2$ **(06 Marks-CO 1)**

3. **a)** Discussion of the Transformation $w = z^2$ **(07 Marks-CO 2)**

   b) State and prove Cauchy's integral formula. **(07 Marks-CO 2)**

   c) Evaluate $\int_0^{2+i} (\bar{z})^2 dz$ along (a) the line $x = 2y$ (b) the real axis up to 2 and then vertically to $2+i$ **(06 Marks-CO 2)**

4. **a)** State and prove Cauchy's theorem. **(07 Marks-CO 2)**

   b) Evaluate $\int_C \dfrac{\sin\pi z^2+\cos\pi z^2}{(z-1)(z-2)}dz$ where C is the circle

   (i) $|z|=3$ (ii) $|z|=\frac{1}{2}$ (iii) $|z|=\frac{3}{2}$ **(07 Marks-CO 2)**

   c) Find the bilinear transformation that maps the points $1,\ i,\ -1$ onto $0,\ 1,\ \infty$ **(06 Marks-CO 2)**

PRINCIPAL
SIET., TUMAKURU

5. a) A random variable X has the following probability function for various values of x

x	0	1	2	3	4	5	6	7
$P(x)$	0	K	$2K$	$2K$	$3K$	K^2	$2K^2$	$7K^2+K$

(i) Find (ii) Evaluate $P(x<6)$, $P(x\geq 6)$ *and* $P(3<x\leq 6)$.

Also find the probability distribution and the distribution function of X.

(07 Marks-CO 3)

b) In a test on electric bulbs, it was found that the life time of a particular brand was distributed normally with an average life of 2000 hours and S.D of 60 hours. In a firm purchases 2500 bulbs find the number of bulbs that are likely to last for (i) more than 2100 hours (ii) less than 1950 hours (iii) between 1900 to 2100 hours. [Given $\phi(1.67)=0.4525$, $\phi(0.83)=0.2967$]. **(07 Marks-CO 3)**

c) In a quiz contest of answering 'Yes' or 'No' what is the probability of guessing at least 6 answers correctly out of 10 questions asked? Also find the probability of the same if there are 4 options for a correct answer. **(06 Marks-CO 3)**

6. a) The Probability of a random variable x is given

X	0	1	2	3	4	5
P(X)	K	5K	10K	10K	5K	K

Find i) K ii) $P(x \leq 1)$ iii) $P(0 \leq x \leq 3)$

(07 Marks-CO 3)

b) In a certain factory manufacturing the razor blades, there is a small chance of 0.002 for a blade to be defective. The blades are supplied in packets of 10. Use poisson distribution to calculate the approximate number of packets containing i) no defective ii) one defective iii) two defective blades in a Consignment of 1000 pockets. **(07 Marks-CO 3)**

c) Suppose 300 misprints are randomly distributed throughout a book of 500 pages. Find the probability that a given pages contains i) exactly 3 misprints ii) less than 3 misprints iii) Four or more misprints **(06 Marks-CO 3)**

7. a) Fit a parabola $y=ax^2+bx+c$ by the method of least squares for the following data.

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

(07 Marks-CO 4)

b) Compute the Coefficient of correlation and the equation of lines of regression for the data.

X	1	2	3	4	5	6	7
Y	9	8	10	12	11	13	14

(07 Marks-CO 4)

c) Show that if θ the angle between the lines of regression, then

$$\tan\theta = \frac{\sigma x \sigma y}{\sigma x^2 + \sigma y^2}\left(\frac{1-r^2}{r}\right)$$

(06 Marks-CO 4)

PRINCIPAL
SIET., TUMAKURU

8. a) Compute the Coefficient of correlation and the equation of lines of regression for the data.

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

(07 Marks-CO 4)

b) Given the equation of the regression line $x = 19.13 - 0.87y$, $y = 11.64 - 0.5x$.
Compute the mean of x's mean of y's and the coefficient of correlation. **(07 Marks-CO4)**

c) In a bivariate distribution, it is found that $\sigma x = \sigma y$ and the acute angle between the lines of regression is $\tan^{-1}(3)$. Find the correlation coefficient. **(06 Marks-CO 4)**

9. a) The Joint distribution of two random variables X and Y is as follows.

Y X	-4	2	7
1	1/8	¼	1/8
5	1/4	1/8	1/8

Compute the following (a) E(X) and E(Y) (b) E(XY) (c) σ_x and σ_y
(d) COV (X,Y) (e) $\rho(X,Y)$ **(07 Marks-CO 5)**

b) A coin was tossed 400 times and the head turned up 216 times. Test the hypothesis that the coin is unbiased at 5% level of significance. **(07 Marks-CO 5)**

c) A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure. 5, 2, 8, -1, 3, 0, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure? ($t_{0.05}$ for degree of freedom = 2.201). **(06 Marks-CO 5)**

10. a) The joint probability of two discrete random variables X and Y is given by f(x,y) = k(2x+y) where x and y are integers such that $0 \le x \le 2$ *and* $0 \le y \le 3$
i) Find the value of constant kii) Marginal PD of X and Y iii) Show that the random variables X and Y are dependent. **(07 Marks-CO 5)**

b) A die is thrown 264 times and the number appearing on the face (x) follows the following frequency distribution

X	1	2	3	4	5	6
F	40	32	28	58	54	60

Calculate the value of χ^2. **(07 Marks-CO 5)**

c) Find the students 't' for the following variable values in a simple of eight: -4, -2, -2, 0, 2, 2, 3, 3 taking the mean of the universe to be zero.

(06 Marks-CO 5)

PRINCIPAL
SIET., TUMAKURU

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shridevienginееring.org | Web: http://www.shridevienginееring.org
An ISO 9001:2015 Certified Institution

DEPARTMENT OF MATHEMATICS

I-semester: I Internal assessment Test: FEB-2021

18MAT11-Calculus and Linear algebra(Common to A, B & C sections)

Time: 90 min] **Note: Answer any 2 full questions from each part** **[Max marks:30**

PART-A

1. a) Obtain the Taylor's expansion of $log_e x$ about x =1 up to the term containing 4th degree and hence obtain $log_e(1.1)$ (CO2)(5marks)

b) Evaluate $\lim_{x\to 0}\frac{xe^x-log(1+x)}{x^2}$ (CO2)(5marks)

c) Find the value of constants a and b such that $\lim_{x\to 0}\frac{a\,coshx-b\,cosx}{x^2}$ may be equal to unity. (CO2)(5marks)

OR

2 a) Find the Maclaurin's series expansion of secx upto x^4 term. (CO2)(5marks)

b) Evaluate $\lim_{x\to 0}\frac{tanx-x}{x^2tanx}$ (CO2)(5marks)

c) Evaluate $\lim_{x\to 0}(\frac{tanx}{x})^{\frac{1}{x^2}}$ (CO2)(5marks)

P.T.O

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shridevienginееring.org | Web: http://www.shridevienginееring.org
An ISO 9001:2015 Certified Institution

DEPARTMENT OF MATHEMATICS

I-semester: I Internal assessment Test: FEB-2021

18MAT11-Calculus and Linear algebra(Common to A, B & C sections)

Time: 90 min] Note: Answer any 2 full questions from each part [Max marks:30

PART-A

1 a) Obtain the Taylor's expansion of $log_e x$ about x =1 up to the term containing 4th degree and hence obtain $log_e(1.1)$ (CO2)(5marks)

b) Evaluate $\lim_{x\to 0}\frac{xe^x-log(1+x)}{x^2}$ (CO2)(5marks)

c) Find the value of constants a and b such that $\lim_{x\to 0}\frac{a\,coshx-b\,cosx}{x^2}$ may be equal to unity. (CO2)(5marks)

OR

2 . a) Find the Maclaurin's series expansion of secx upto x^4 term. (CO2)(5marks)

b) Evaluate $\lim_{x\to 0}\frac{tanx-x}{x^2tanx}$ (CO2)(5marks)

c) Evaluate $\lim_{x\to 0}(\frac{tanx}{x})^{\frac{1}{x^2}}$ (CO2)(5marks)

P.T.O

PRINCIPAL
SIET., TUMAKURU.

PART-B

3. a) Find the rank of the matrix A= $\begin{bmatrix}1 & 2 & 4 & 3\\ 2 & 4 & 6 & 8\\ 4 & 8 & 12 & 16\\ 1 & 2 & 3 & 4\end{bmatrix}$ **(CO5)(5marks)**

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. **(CO5)(5marks)**

c) Solve by Gauss-Seidel iteration method: $20x+y-2z=17, 3x+20y-z=-18, 2x-3y+20z=25$ **(CO5)(5marks)**

OR

4. a) Solve by Gauss-Elimination method $x+2y+z=3, 2x+3y+2z=5, 3x-5y+5z=2$ **(CO5)(5marks)**

b) Find the largest Eigen value and the corresponding Eigen vector of the matrix A by the Rayleigh's power method given that A = $\begin{bmatrix}2 & 0 & 1\\ 0 & 2 & 0\\ 1 & 0 & 2\end{bmatrix}$ **(CO5)(5marks)**

c) Diagonalise the matrix $\begin{bmatrix}-19 & 7\\ -42 & 16\end{bmatrix}$ **(CO5)(5marks)**

PART-B

3 a) Find the rank of the matrix A= $\begin{bmatrix}1 & 2 & 4 & 3\\ 2 & 4 & 6 & 8\\ 4 & 8 & 12 & 16\\ 1 & 2 & 3 & 4\end{bmatrix}$ (CO5)(5marks)

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. (CO5)(5marks)

c) Solve by Gauss-Seidel iteration method: $20x+y-2z=17, 3x+20y-z=-18, 2x-3y+20z=25$ (CO5)(5marks)

OR

4. a) Solve by Gauss-Elimination method $x+2y+z=3, 2x+3y+2z=5, 3x-5y+5z=2$ (CO5)(5marks)

b) Find the largest Eigen value and the corresponding Eigen vector of the matrix A by the Rayleigh's power method given that A = $\begin{bmatrix}2 & 0 & 1\\ 0 & 2 & 0\\ 1 & 0 & 2\end{bmatrix}$ (CO5)(5marks)

c) Diagonalise the matrix $\begin{bmatrix}-19 & 7\\ -42 & 16\end{bmatrix}$ (CO5)(5marks)

18MAT11: CALCULUS AND LINEAR ALGEBRA

I INTERNAL TEST : FEB. 2021

SCHEME OF EVALUATION 18.02.2021

1

a) $y = \log_e x \quad , a = 1$

Taylor's Series exp,

$y = y(a) + (x-a)y_1(a) + \frac{(x-a)^2}{2!}y_2(a) + \ldots\ldots$ 1M

$y(1) = \log_e 1 = 0$

$y_1(1) = \frac{1}{x} = 1$

$y_2(1) = \frac{-1}{x^2} = -1$

$y_3(1) = \frac{2}{x^3} = 2$

$y_4(1) = \frac{-6}{x^4} = -6$ 3M

$\log_e x = (x-1) + -\frac{(x-1)^2}{2} + \frac{(x-1)^3}{3} - \frac{(x-1)^4}{4}$ 1M

$\log_e(1.1) = 0.0953$

b. Let $k = \lim_{x\to 0} \frac{xe^x - \log(1+x)}{x^2}$ $(\frac{0}{0}$ form)

Apply L Hospital rule

$K = \lim_{x\to 0} \frac{xe^x + e^x - 1/1+x}{2x}$ $(\frac{0}{0}$ form) 2M

$= \lim_{x\to 0} \frac{xe^x + e^x + e^x + 1/(1+x)^2}{2}$

$= \frac{0+1+1+1}{2} = \frac{3}{2}$

$K = \frac{3}{2}$ 3M

PRINCIPAL
SIET., TUMAKURU.

c) Let $k = \lim_{x\to 0} \frac{a\cosh x - b\cos x}{x^2}$ $\left(\frac{0}{0} \text{ form}\right)$ $a-b=0$ —①

Apply L Hospital rule 2M

$K = \lim_{x\to 0} \frac{a\sinh x + b\sin x}{2x}$ $\left(\frac{0}{0} \text{ form}\right)$

$= \lim_{x\to 0} \frac{a\cosh x + b\cos x}{2}$

$K = \frac{a+b}{2} \Rightarrow a+b = 2$ $(\because K=1)$

$a-b=0$ & $a+b=2$ 3M

then $a=1,\ b=1$

2

a) $y = \sec x$ $y(0) = \sec 0 = 1$

$y_1 = \sec x \tan x$ $y_1(0) = 0$

$y_1 = y\tan x$

$y_2 = y\sec^2 x + \tan x\, y_1$ $y_2(0) = 1+0 = 1$

$y_2 = y^3 + \tan x\, y_1$

$y_3 = 3y^2 y_1 + \tan x\, y_2 + y_1 \sec^2 x$ $y_3(0) = 0+0+0 = 0$

$y_3 = 4y^2 y_1 + \tan x\, y_2$

$y_4 = 4y^2 y_2 + 8y y_1^2 + \tan x\, y_3 + y_2 \sec^2 x$

$y_4(0) = 4+0+0+1 = 5$

$y = y(0) + x\,y_1(0) + \frac{x^2}{2!} y_2(0) + \frac{x^3}{3!} y_3(0) + \frac{x^4}{4!} y_4(0) + \cdots$ 4M

$\sec x = 1 + \frac{x^2}{2} + \frac{x^4}{24}(5)$ 1M

$\sec x = 1 + \frac{x^2}{2} + \frac{5x^4}{24}$

2 b) Let $k = \lim_{x\to 0} \dfrac{\tan x - x}{x^2 \tan x}$ $\left(\frac{0}{0} \text{ form}\right)$

$$= \lim_{x\to 0} \frac{\tan x - x}{x^2 . \frac{\tan x}{x} . x}$$ 1M

$$= \lim_{x\to 0} \frac{\tan x - x}{x^3} . \lim_{x\to 0} \frac{x}{\tan x}$$

$$= \lim_{x\to 0} \frac{\tan x - x}{x^3} . 1$$

$$= \lim_{x\to 0} \frac{\sec^2 x - 1}{3x^2} = \lim_{x\to 0} \frac{\tan^2 x}{3x^2}$$ 3M

$$= \frac{1}{3} \lim_{x\to 0} \left(\frac{\tan x}{x}\right)^2 = \frac{1}{3} \cdot 1$$ 1M

$$\boxed{k = \frac{1}{3}}$$

c) Let $k = \lim_{x\to 0} \left(\dfrac{\tan x}{x}\right)^{1/x^2}$ (1^∞ form)

$$\log_e k = \lim_{x\to 0} \frac{\log\left(\frac{\tan x}{x}\right)}{x^2}$$ $\left(\frac{0}{0} \text{ form}\right)$

Apply L Hospital rule

$$\log_e k = \lim_{x\to 0} \frac{\frac{1}{\frac{\tan x}{x}} \frac{x \sec^2 x - \tan x}{x^2}}{2x}$$ 2M

$$\log_e k = \lim_{x\to 0} 1. \frac{x \sec^2 x - \tan x}{2x^3}$$ $\left(\frac{0}{0} \text{ form}\right)$

$$= \lim_{x\to 0} \frac{x(2\sec^2 x \tan x) + \sec^2 x - \sec^2 x}{6x^2}$$ 2M

$$\log_e k = \lim_{x\to 0} \frac{1}{3}(\sec^2 x)\left(\frac{\tan x}{x}\right) = \frac{1}{3}$$ 1M

$$\boxed{k = e^{1/3}}$$

3 ⓐ

$$A = \begin{bmatrix} 1 & 2 & 4 & 3 \\ 2 & 4 & 6 & 8 \\ 4 & 8 & 12 & 16 \\ 1 & 2 & 3 & 4 \end{bmatrix} \begin{matrix} R_2 \to R_2 - 2R_1 \\ R_3 \to R_3 - 4R_1 \\ R_4 \to R_4 - R_1 \end{matrix}$$ 2M

$$\sim \begin{bmatrix} 1 & 2 & 4 & 3 \\ 0 & 0 & -2 & 2 \\ 0 & 0 & -4 & 4 \\ 0 & 0 & -1 & 1 \end{bmatrix} \begin{matrix} R_3 \to -2R_2 + R_3 \\ R_4 \to -\frac{R_2}{2} + R_4 \end{matrix}$$ 2M

$$\sim \begin{bmatrix} 1 & 2 & 4 & 3 \\ 0 & 0 & 1 & -1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \quad \rho(A) = 2$$ 1M

ⓑ

$$[A:B] = \begin{bmatrix} 1 & 1 & 1 & : & 6 \\ 1 & 2 & 3 & : & 10 \\ 1 & 2 & \lambda & : & \mu \end{bmatrix} \begin{matrix} R_2 \to R_2 - R_1 \\ R_3 \to R_3 - R_1 \end{matrix}$$

$$\sim \begin{bmatrix} 1 & 1 & 1 & : & 6 \\ 0 & 1 & 2 & : & 4 \\ 0 & 1 & \lambda-1 & : & \mu-6 \end{bmatrix} R_3 \to R_3 - R_2$$

$$\sim \begin{bmatrix} 1 & 1 & 1 & : & 6 \\ 0 & 1 & 2 & : & 4 \\ 0 & 0 & \lambda-3 & : & \mu-10 \end{bmatrix}$$ 2M

a) Unique solⁿ: $\rho(A) = \rho(A:B) = 3$ 1M

$\lambda - 3 \neq 0$ & $\mu - 10 = 0$

$\lambda \neq 3$ & $\mu = 10$

b) Infinite solⁿ: $\rho(A) = \rho(A:B) = r < 3$ 1M

$\lambda - 3 = 0$ & $\mu - 10 = 0$

$\lambda = 3$, $\mu = 10$

c) No solⁿ: $\rho(A) \neq \rho(A:B)$ 1M

~~$\lambda \neq 3$~~ & $\mu \neq 10$

3 c)

$x = \frac{1}{20}[17 - y + 2z]$ 2M

$y = \frac{1}{20}[-18 - 3x + z]$

$z = \frac{1}{20}[25 - 2x + 3y]$

$x = y = z = 0$

$x^{(1)} = 0.85$ $\quad x^{(2)} = 1.0025$ $\quad x^{(3)} = 0.99997 \simeq 1$ 2M

$y^{(1)} = -1.0275$ $\quad y^{(2)} = -0.9998$ $\quad y^{(3)} = -1.0000 \simeq -1$

$z^{(1)} = 1.0109$ $\quad z^{(2)} = 0.9998$ $\quad z^{(3)} = 1.0000 \simeq 1$ 1M

Thus $x = 1$, $y = -1$, $z = 1$ is the solⁿ

4 a)

$$[A:B] = \begin{bmatrix} 1 & 2 & 1 & : & 3 \\ 2 & 3 & 2 & : & 5 \\ 3 & -5 & 5 & : & 2 \end{bmatrix} \begin{matrix} R_2 \to R_2 - 2R_1 \\ R_3 \to R_3 - 3R_1 \end{matrix}$$

PRINCIPAL
SIET., TUMAKURU

$$\sim \begin{bmatrix} 1 & 2 & 1 & : & 3 \\ 0 & -1 & 0 & : & -1 \\ 0 & -11 & 2 & : & -7 \end{bmatrix} R_3 \to R_3 + 11R_2$$ 2M

$$\sim \begin{bmatrix} 1 & 2 & 1 & : & 3 \\ 0 & -1 & 0 & : & -1 \\ 0 & 0 & 2 & : & 4 \end{bmatrix}$$ 2M

$x = -1,\ y = 1,\ z = 2$ is the sol^n. 1M

4 b) $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ & Let $x^{(0)} = [1\ 0\ 0]$

$Ax^{(0)} = 2\begin{bmatrix} 1 \\ 0 \\ 0.5 \end{bmatrix}$

$Ax^{(1)} = 2.5\begin{bmatrix} 1 \\ 0 \\ 0.8 \end{bmatrix}$

$Ax^{(2)} = 2.8\begin{bmatrix} 1 \\ 0 \\ 0.93 \end{bmatrix}$

$Ax^{(3)} = 2.93\begin{bmatrix} 1 \\ 0 \\ 0.98 \end{bmatrix}$

$Ax^{(4)} = 2.98\begin{bmatrix} 1 \\ 0 \\ 0.99 \end{bmatrix}$

$Ax^{(5)} = 2.99\begin{bmatrix} 1 \\ 0 \\ 0.997 \end{bmatrix}$

$Ax^{(6)} = 2.997\begin{bmatrix} 1 \\ 0 \\ 0.999 \end{bmatrix}$ 4M

Largest Eigen value $\lambda = 3$
Eigen vector is $[1\ 0\ 1]^T$ 1M

4 c) $|A - \lambda I| = 0$ 1M

$\begin{vmatrix} -19-\lambda & 7 \\ -42 & 16-\lambda \end{vmatrix} = 0. \Rightarrow \lambda = 2, -5$ are eigen values 1M

Case (i): put $\lambda = 2$

Then $X_1 = [1, 3]^T$ 1M

Case (ii): put $\lambda = -5$ Then $x_2 = [1\ 2]^T$

$P = [x_1\ x_2] = \begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix}$ $P^{-1} = \frac{1}{|P|}\,\text{Adj}\,P$

$|P| = 2 - 3 = -1 \neq 0$ Adj $P = \begin{bmatrix} 2 & -1 \\ -3 & 1 \end{bmatrix}$

$P^{-1}AP = \begin{bmatrix} -2 & 1 \\ 3 & -1 \end{bmatrix}\begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}\begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix}$

$= \begin{bmatrix} 2 & 0 \\ 0 & -5 \end{bmatrix} = D.$ 2M

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
I-semester: II-Internal Assessment Test: MARCH-2021
18MAT11: CALCULUS & LINEAR ALGEBRA

Time: 90 min] (Common to all branches) [Max marks: 30

Note: Answer any TWO full questions choosing ONE full question from each part.

PART-A

1. a) If $u = e^{ax+by} f(ax-by)$ Prove that $b\frac{\partial u}{\partial x} + a\frac{\partial u}{\partial y} = 2abu$ **(CO2) (05 Marks)**

b) If $u = f\left(\frac{x}{y},\frac{y}{z},\frac{z}{x}\right)$ Prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$ **(CO2) (05 Marks)**

c)If $u = \frac{yz}{x}, v = \frac{zx}{y}, w = \frac{xy}{z}$ Show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 4$ **(CO2) (05 Marks)**

OR

2. a)If $x+y+z=u,\ y+z=v\ and\ z=uvw$ find the value of $\frac{\partial(x,y,z)}{\partial(u,v,w)}$ **(CO2) (05 Marks)**

b)Find the extreme values of the function $f(x,y) = x^3 + y^3 - 3x - 12y + 20$ **(CO2) (05 Marks)**

c) Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)\,dx\,dy\,dz$ **(CO3) (05 Marks)**

P.T.O

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
I-semester: II-Internal Assessment Test: MARCH-2021
18MAT11: CALCULUS & LINEAR ALGEBRA

Time: 90 min] (Common to all branches) [Max marks: 30

Note: Answer any TWO full questions choosing ONE full question from each part.

PART-A

1. a) If $u = e^{ax+by} f(ax-by)$ Prove that $b\frac{\partial u}{\partial x} + a\frac{\partial u}{\partial y} = 2abu$ **(CO2) (05 Marks)**

b) If $u = f\left(\frac{x}{y},\frac{y}{z},\frac{z}{x}\right)$ Prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$ **(CO2) (05 Marks)**

c)If $u = \frac{yz}{x}, v = \frac{zx}{y}, w = \frac{xy}{z}$ Show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 4$ **(CO2) (05 Marks)**

OR

2. a)If $x+y+z=u,\ y+z=v\ and\ z=uvw$ find the value of $\frac{\partial(x,y,z)}{\partial(u,v,w)}$ **(CO2) (05 Marks)**

b)Find the extreme values of the function $f(x,y) = x^3 + y^3 - 3x - 12y + 20$ **(CO2) (05 Marks)**

c) Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)\,dx\,dy\,dz$ **(CO3) (05 Marks)**

P.T.O

PRINCIPAL
SIET., TUMAKURU.

PART-B

3. a) A rectangular box open at the top is to have a volume of 32 cubic feet. Find its dimensions, if the total surface area is minimum. **(CO2) (05 Marks)**

b) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dx\,dy\,dz}{\sqrt{1-x^2-y^2-z^2}}$ **(CO3) (05 Marks)**

c) If $u = f(r)$ where $r = \sqrt{x^2+y^2+z^2}$ then show that $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2} = f^{11}(r)+\frac{2}{r}f^{1}(r)$ **(CO3) (05 Marks)**

OR

4. a) Solve $ye^{xy}dx+(xe^{xy}+2y)dy=0$ **(CO4) (05 Marks)**

b) Solve $\frac{dy}{dx}+\frac{y\cos x+\sin y+y}{\sin x+x\cos y+x}=0$ **(CO4) (05 Marks)**

c) Solve $(4xy+3y^2-x)dx+x(x+2y)dy=0$ **(CO4) (05 Marks)**

PART-B

3. a) A rectangular box open at the top is to have a volume of 32 cubic feet. Find its dimensions, if the total surface area is minimum. **(CO2) (05 Marks)**

b) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dx\,dy\,dz}{\sqrt{1-x^2-y^2-z^2}}$ **(CO3) (05 Marks)**

c) If $u = f(r)$ where $r = \sqrt{x^2+y^2+z^2}$ then show that $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2} = f^{11}(r)+\frac{2}{r}f^{1}(r)$ **(CO3) (05 Marks)**

OR

4. a) Solve $ye^{xy}dx+(xe^{xy}+2y)dy=0$ **(CO4) (05 Marks)**

b) Solve $\frac{dy}{dx}+\frac{y\cos x+\sin y+y}{\sin x+x\cos y+x}=0$ **(CO4) (05 Marks)**

c) Solve $(4xy+3y^2-x)dx+x(x+2y)dy=0$ **(CO4) (05 Marks)**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
I-semester: II-Internal Assessment Test: MARCH-2021
18MAT11: CALCULUS & LINEAR ALGEBRA

Time: 90 min] (Common to all branches) [Max marks: 30

SCHEME OF EVALUATION

① ⓐ

$$u = e^{ax+by} \cdot f(ax-by)$$

$$\frac{\partial u}{\partial x} = a e^{ax+by} \cdot f'(ax-by) + au \longrightarrow$$ 1 Mark

$$\frac{\partial u}{\partial y} = -b e^{ax+by} \cdot f'(ax-by) + bu. \longrightarrow$$ 1 Mark

$$\boxed{b \frac{\partial u}{\partial x} + a \frac{\partial u}{\partial y} = 2abu.} \longrightarrow$$ 3 Marks

ⓑ

$$u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$$

$$\left.\begin{aligned} x \frac{\partial u}{\partial x} &= \frac{x}{y} \frac{\partial u}{\partial p} - \frac{z}{x} \frac{\partial u}{\partial r} \\ y \frac{\partial u}{\partial y} &= \frac{y}{z} \frac{\partial u}{\partial q} - \frac{x}{y} \frac{\partial u}{\partial p} \\ z \frac{\partial u}{\partial z} &= \frac{z}{x} \frac{\partial u}{\partial r} - \frac{y}{z} \frac{\partial u}{\partial q} \end{aligned}\right\} \longrightarrow$$ 3 Marks

$$\boxed{x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0} \longrightarrow$$ 2 Marks

ⓒ

$$\frac{\partial(u,v,w)}{\partial(x,y,z)} = \begin{vmatrix} -\frac{yz}{x^2} & \frac{z}{x} & \frac{y}{x} \\ \frac{z}{y} & -\frac{zx}{y^2} & \frac{x}{y} \\ \frac{y}{z} & \frac{x}{z} & -\frac{xy}{z^2} \end{vmatrix} = 4 \longrightarrow$$ 5 Marks

$$\boxed{\frac{\partial(u,v,w)}{\partial(x,y,z)} = 4}$$

PRINCIPAL
SIET., TUMAKURU

② ⓐ $J = \dfrac{\partial(x,y,z)}{\partial(u,v,w)} = \begin{vmatrix} 1 & -1 & 0 \\ -vw & (1-uw) & -uv \\ vw & uw & uv \end{vmatrix} = uv$ $\longrightarrow$ 5 Marks

$\boxed{J = uv}$

ⓑ $f(x,y) = x^3 + y^3 - 3x - 12y + 20$

$f_x = 3x^2 - 3, \quad f_y = 3y^2 - 12$ $\longrightarrow$ 1 Mark

$\therefore (1,2), (1,-2), (-1,2), (-1,-2) \rightarrow$ stationary points

$A = f_{xx}, \ B = f_{xy}, \ C = f_{yy}$

$(1,2) \rightarrow$ Minimum point $\Rightarrow 2$ $\longrightarrow$ 2 Marks

$(-1,2)$ & $(1,-2) \rightarrow$ saddle point.

$(-1,-2) \rightarrow$ Maximum point $\Rightarrow 38$ $\longrightarrow$ 2 Marks

ⓒ $I = \int_{z=-1}^{1} \int_{x=0}^{z} \int_{y=x-z}^{x+z} (x+y+z)\, dy\, dx\, dz$

$I = \int_{z=-1}^{1} \int_{x=0}^{z} (2xz + 2xz + 2z^2)\, dx\, dz$ $\longrightarrow$ 2 Marks

$I = \int_{z=-1}^{1} (2z^3 + 2z^3)\, dz$ $\longrightarrow$ 2 Marks

$I = \left[z^4\right]_{z=-1}^{1} = 0$

$\boxed{I = 0}$ $\longrightarrow$ 1 Mark

③ ⓐ $V = xyz = 32, \quad S = xy + 2yz + 2zx$ $\longrightarrow$ 1 Mark

$F = (xy + 2yz + 2zx) + \lambda(xyz)$

$\dfrac{-(y+2z)}{yz} = -\dfrac{(x+2z)}{xz} = -\dfrac{(2y+2x)}{xy}$ $\longrightarrow$ 2 Marks

$x = y = 2z$.

$\boxed{x = 4, \ y = 4, \ z = 2}$ $\longrightarrow$ 2 Marks

③ⓑ

$$I=\int_{x=0}^{1}\int_{y=0}^{\sqrt{1-x^2}}\int_{z=0}^{\sqrt{1-x^2-y^2}}\frac{dz\,dy\,dx}{\sqrt{1-x^2-y^2-z^2}}$$

$K=\sqrt{1-x^2-y^2}$ $\longrightarrow$ 1 Mark

$$I=\int_{x=0}^{1}\int_{y=0}^{\sqrt{1-x^2}}\left[\sin^{-1}\frac{z}{K}\right]_{z=0}^{K}dy\,dx$$

$$I=\frac{\pi}{2}\int_{x=0}^{1}\sqrt{1-x^2}\,dx$$ $\longrightarrow$ 3 Marks

$$\boxed{I=\frac{\pi^2}{8}}$$ $\longrightarrow$ 1 Mark

ⓒ

$$\frac{\partial r}{\partial x}=\frac{x}{r}$$

$$\frac{\partial u}{\partial x}=f'(r)\cdot\frac{x}{r}$$

$\longrightarrow$ 1 Mark

$$\frac{\partial^2 u}{\partial x^2}=\frac{f'(r)}{r^3}(r^2-x^2)+f''(r)\cdot\frac{x^2}{r^2}$$

Mly $$\frac{\partial^2 u}{\partial y^2}=\frac{f'(r)}{r^3}(r^2-y^2)+f''(r)\cdot\frac{y^2}{r^2}$$

$$\frac{\partial^2 u}{\partial z^2}=\frac{f'(r)}{r^3}(r^2-z^2)+f''(r)\cdot\frac{z^2}{r^2}$$

$\longrightarrow$ 2 Marks

$$\therefore\ \boxed{\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}=f''(r)+\frac{2}{r}f'(r)}$$ $\longrightarrow$ 2 Marks

④ⓐ

$$\frac{\partial M}{\partial y}=ye^{xy}x+e^{xy}=\frac{\partial N}{\partial x}$$ $\longrightarrow$ 1 Mark

$$\int M\,dx+\int N(y)\,dy=c.$$

$\longrightarrow$ 2 Marks

$$\int y e^{xy}dx+\int 2y\,dy=c$$

$\longrightarrow$ 2 Marks

$$\boxed{e^{xy}+y^2=c}$$

PRINCIPAL
SIET., TUMAKURU

ⓑ $M = y\cos x + \sin y + y$ & $N = \sin x + x\cos y + x$

$\frac{\partial M}{\partial y} = \cos x + \cos y + 1 = \frac{\partial N}{\partial x}$ $\longrightarrow$ 2 Marks

$\int M\,dx + \int N(y)\,dy = c.$ $\longrightarrow$ 1 Mark

$\boxed{y\sin x + x\sin y + xy = c}$ $\longrightarrow$ 2 Marks

ⓒ $M = 4xy + 3y^2 - x$ & $N = x^2 + 2xy$

$\frac{\partial M}{\partial y} = 4x + 6y$ & $\frac{\partial N}{\partial x} = 2x + 2y$ $\longrightarrow$ 1 Mark

$\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} = 2(x+2y) \rightarrow$ Close to N

$\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right) = \frac{2}{x} = f(x)$ $\longrightarrow$ 2 Marks

$e^{\int f(x)\,dx} = x^2$

$\boxed{x^4y + x^3y^2 - \frac{x^4}{4} = c}$ $\longrightarrow$ 2 Marks

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
I-semester: III Internal assessment Test:APRIL-2021
18MAT11-Calculus and Linear algebra **(Common to A, B & C sections)**

Time: 90 min] **Note:** Answer any **2 full** questions from **each** part [Max marks:30

PART-A

1.a) Find the orthogonal trajectories of family of curves $\frac{x^2}{a^2}+\frac{y^2}{b^2+\lambda}=1$, where λ is the parameter. **(CO4)(5marks)**

b) If the temperature of the air is 30^0C 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 a temperature of 40^0C. **(CO4)(5marks)**

c) A series circuit with resistance R, inductance L and electromotive force E is governed by the differential equation $L\frac{di}{dt}+Ri=E$ where L and R are constants and initially the current i is zero. Find the current at any time t. **(CO4)(5marks)**

OR

2.a) Solve: $\frac{dy}{dx}-\frac{dx}{dy}=\frac{x}{y}-\frac{y}{x}$ **(CO4)(5marks)**

b) Modify the following equation into Clairaut's form. Hence obtain the associated general and singular solution

$xp^2-py+ky+a=0$ **(CO4)(5marks)**

c) Solve the equation $(px-y)(py+x)=2p$ by reducing into Clairaut's form taking the substitution $X=x^2, Y=y^2$ **(CO4)(5marks)**

P.T.O

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
I-semester: III Internal assessment Test:APRIL-2021
18MAT11-Calculus and Linear algebra **(Common to A, B & C sections)**

Time: 90 min] **Note:** Answer any **2 full** questions from **each** part [Max marks:30

PART-A

1.a) Find the orthogonal trajectories of family of curves $\frac{x^2}{a^2}+\frac{y^2}{b^2+\lambda}=1$, where λ is the parameter. **(CO4)(5marks)**

b) If the temperature of the air is 30^0C 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 a temperature of 40^0C. **(CO4)(5marks)**

c) A series circuit with resistance R, inductance L and electromotive force E is governed by the differential equation $L\frac{di}{dt}+Ri=E$ where L and R are constants and initially the current i is zero. Find the current at any time t. **(CO4)(5marks)**

OR

2. a) Solve: $\frac{dy}{dx}-\frac{dx}{dy}=\frac{x}{y}-\frac{y}{x}$ **(CO4)(5marks)**

b) Modify the following equation into Clairaut's form. Hence obtain the associated general and singular solution

$xp^2-py+ky+a=0$ **(CO4)(5marks)**

c) Solve the equation $(px-y)(py+x)=2p$ by reducing into Clairaut's form taking the substitution $X=x^2, Y=y^2$ **(CO4)(5marks)**

P.T.O

PRINCIPAL
SIET., TUMAKURU.

PART-B

3 a) Evaluate $\iint xy(x+y)dydx$ taken over the area between $y = x^2 \ and \ y = x$ (CO3)(5marks)

b) Prove that $\beta(m,n) = \frac{\Gamma m \Gamma n}{\Gamma m+n}$

(CO3(5marks)

c) Show that $\int_0^{\pi/2} \frac{d\theta}{\sqrt{sin\theta}} \times \int_0^{\pi/2} \sqrt{sin\theta}\, d\theta = \pi$ (CO3)(5marks)

OR

4 a) Prove with usual notations $tan\emptyset = r\frac{d\theta}{dr}$ (CO1)(5mark

b) Find the angle between radius vector and the tangent for the polar curve $\frac{2a}{r} = 1 - cos\theta \ at \ \theta = \frac{2\pi}{3}$ (CO1)(5marks)

c) Find the radius of curvature for the Folium of De-cartes $x^3 + y^3 = 3axy$ at the point$\left(\frac{3a}{2}, \frac{3a}{2}\right)$ on it. (CO1)(5marks)

PART-B

3 a) Evaluate $\iint xy(x+y)dydx$ taken over the area between $y = x^2 \ and \ y = x$ (CO3)(5marks)

b) Prove that $\beta(m,n) = \frac{\Gamma m \Gamma n}{\Gamma m+n}$

(CO3(5marks)

c) Show that $\int_0^{\pi/2} \frac{d\theta}{\sqrt{sin\theta}} \times \int_0^{\pi/2} \sqrt{sin\theta}\, d\theta = \pi$ (CO3)(5marks)

OR

4 a) Prove with usual notations $tan\emptyset = r\frac{d\theta}{dr}$ (CO1)(5marks)

b) Find the angle between radius vector and the tangent for the polar curve $\frac{2a}{r} = 1 - cos\theta \ at \ \theta = \frac{2\pi}{3}$ (CO1)(5marks)

c) Find the radius of curvature for the Folium of De-cartes $x^3 + y^3 = 3axy$ at the point$\left(\frac{3a}{2}, \frac{3a}{2}\right)$ on it. (CO1)(5marks)

III^{rd} internal Assessment Test - APRIL 2021

18MAT11 - Calculus & Linear Algebra

① ⓐ diff w.r.t x

$\frac{2x}{a^2} + \frac{2yy_1}{b^2+\lambda} = 0$ where $y_1 = \frac{dy}{dx}$

$\frac{x}{a^2} = \frac{-yy_1}{b^2+\lambda}$ —② (or) $\frac{x^2-a^2}{a^2} = \frac{-y^2}{b^2+\lambda}$ —③

2M

dividing ② by ③

$\frac{x}{x^2-a^2} = \frac{y_1}{y}$

Replace $y_1 = \frac{dy}{dx}$ by $-\frac{dx}{dy}$

$y\,dy = -\frac{(x^2-a^2)}{x}\,dx$

$\int y\,dy = -\int x\,dx + a^2 \int \frac{dx}{x} + C \Rightarrow \boxed{x^2+y^2-2a^2\log x - b = 0}$, $b = 2C$

5M

ⓑ $T = t_2 + (t_1 - t_2)e^{-kt}$

1M

$t_1 = 100,\ t_2 = 30,\ T = 70,\ t = 15$

$70 = 30 + 70e^{-15k} \Rightarrow k = \frac{1}{15}\log_e(1.75) = 0.0373$

2M

When $T = 40°$, $t = ?$

$40 = 30 + 70e^{-0.0373t}$ (or) $t = \frac{\log_e 7}{0.0373} = 52.17 \approx 52.2$ minutes

2M

ⓒ $\frac{di}{dt} + \frac{R}{L}i = \frac{E}{L}$

1M

$ie^{\int \frac{R}{L}dt} = \int \frac{E}{L}e^{\int \frac{R}{L}dt}\,dt + c$

$ie^{\frac{Rt}{L}} = \frac{E}{L}\frac{e^{\frac{R}{L}t}}{R/L} + C$

$i = \frac{E}{R} + Ce^{-(Rt/L)}$

3M

PRINCIPAL
SIET., TUMAKURU.

$i = 0$ at $t = 0$

$c = -E/R$

$\therefore \boxed{i = \frac{E}{R}[1 - e^{-Rt/L}]}$

2M

② ⓐ $p-\frac{1}{p}=\frac{x}{y}-\frac{y}{x}$

$\frac{p^2-1}{p}=\frac{x}{y}-\frac{y}{x}$

$p^2-p\left(\frac{x}{y}-\frac{y}{x}\right)-1=0$

$$p=\frac{\left(\frac{x}{y}-\frac{y}{x}\right)\pm\sqrt{\left(\frac{x}{y}-\frac{y}{x}\right)^2+4}}{2}$$

$p=\frac{x}{y}$ or $\frac{-y}{x}$ — 2M

$\frac{dy}{dx}=\frac{x}{y}$

$x\,dx-y\,dy=0$

$\int x\,dx-\int y\,dy=k$

$\underline{x^2-y^2-c=0}$, $c=2k$

$\frac{dy}{dx}=-\frac{y}{x}$

$\frac{dy}{y}=-\frac{dx}{x}$

$\int\frac{dy}{y}+\int\frac{dx}{x}=k$

$\log y+\log x=k$

$\log(xy)=\log c$

$\underline{xy-c=0}$

General Solution is $(x^2-y^2-c)(xy-c)=0$ — 3M

ⓑ $y=\frac{p(xp+k)+a}{p}$

$y=px+\left(k+\frac{a}{p}\right)$

General Solution, $\boxed{y=cx+\left(k+\frac{a}{c}\right)}$ — 2M

diff w.r.t c partially

$0=x-\frac{a}{c^2}$ (or) $c=\sqrt{a/x}$

Singular Solution, $y=\sqrt{a/x}\,x+k+a(\sqrt{x}/a)$ or $\boxed{(y-k)^2=4ax}$ — 3M

ⓒ $\frac{dX}{dx}=2x$ $\frac{dY}{dy}=2y$

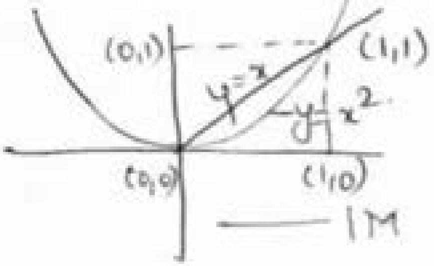
$P=\frac{dy}{dx}=\frac{dy}{dY}\frac{dY}{dX}\frac{dX}{dx}=\frac{1}{2y}P\,2x=\frac{\sqrt{X}}{\sqrt{Y}}P$ — 1M

Consider $(px-y)(py+x)=2p$

$\left(\frac{\sqrt{X}}{\sqrt{Y}}P\sqrt{X}-\sqrt{Y}\right)\left(\frac{\sqrt{X}}{\sqrt{Y}}P\sqrt{Y}+\sqrt{X}\right)=2\frac{\sqrt{X}}{\sqrt{Y}}P$

$\Rightarrow PX-Y=\frac{2P}{P+1}$ (or) $Y=cX-\frac{2c}{c+1}$ (or) $y^2=cx^2-\frac{2c}{c+1}$ — 4M

③



— 1M

ⓐ $x^2 = x$ (or) $x(x-1) = 0 \Rightarrow x = 0, x = 1$.

$y = 0, y = 1 \Rightarrow (0,0)$ & $(1,1)$

$$I = \iint_R xy(x+y)\,dy\,dx.$$

$$= \int_{x=0}^{1} \int_{y=x^2}^{x} (x^2y + xy^2)\,dy\,dx.$$

$$= \int_{x=0}^{1} \left\{ x^2\left[\frac{y^2}{2}\right]_{y=x^2}^{x} + x\left[\frac{y^3}{3}\right]_{y=x^2}^{x} \right\} dx.$$ — 3M

$$= \int_{x=0}^{1} \left(\frac{x^4}{2} - \frac{x^6}{2} + \frac{x^4}{3} - \frac{x^7}{3}\right) dx.$$

$$= \left(\frac{x^5}{10} - \frac{x^7}{14} + \frac{x^5}{15} - \frac{x^8}{24}\right)_{x=0}^{1} = \underline{\underline{3/56}}$$ — 1M

ⓑ Book work : $\beta(m,n) = \frac{\Gamma m\,\Gamma n}{\Gamma m+n}$. — 5M

ⓒ $I_1 = \int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} = \int_0^{\pi/2} \sin^{-1/2}\theta \cos^0\theta\,d\theta = \frac{1}{2}\beta\left(\frac{1}{4}, \frac{1}{2}\right)$ — 1M

$I_2 = \int_0^{\pi/2} \sqrt{\sin\theta}\,d\theta = \int_0^{\pi/2} \sin^{1/2}\theta \cos^0\theta\,d\theta = \frac{1}{2}\beta\left(\frac{3}{4}, \frac{1}{2}\right)$ — 1M

$\left\{ \int_0^{\pi/2} \sin^p\theta \cos^q\theta\,d\theta = \frac{1}{2}\beta\left(\frac{p+1}{2}, \frac{q+1}{2}\right) \right\}$ — 1M

$$I_1 \times I_2 = \frac{1}{4}\,\beta(1/4, 1/2) \times \beta(3/4, 1/2)$$

$$= \frac{1}{4}\,\frac{\Gamma 1/4\,\Gamma 1/2}{\Gamma 3/4} \times \frac{\Gamma 3/4\,\Gamma 1/2}{\Gamma 5/4}$$

$$= \frac{1}{4}\,\Gamma 1/4\,\sqrt{\pi} \cdot \frac{\sqrt{\pi}}{1/4\,\Gamma 1/4} = \underline{\underline{\pi}}$$ — 2M

PRINCIPAL
SIET., TUMAKURU

④ ⓐ $\tan\phi = r\frac{d\theta}{dr}$: Book Work. —— 5M.

ⓑ $2a/r = 1-\cos\theta$.

$\log 2a - \log r = \log(1-\cos\theta)$ —— 1M.

$-\frac{1}{r}\frac{dr}{d\theta} = \frac{2\sin(\theta/2)\cos(\theta/2)}{2\sin^2(\theta/2)}$.

$-\cot\phi = \cot(\theta/2)$ $\boxed{\phi = -\theta/2}$ —— 3M

at $\theta = 2\pi/3$, $\boxed{\phi = -\pi/3 \text{ or } 60^\circ}$ —— 1M

ⓒ diff w.r.t x

$3x^2 + 3y^2\frac{dy}{dx} = 3a\left(x\frac{dy}{dx} + y\right)$

$y_1 = \frac{ay - x^2}{y^2 - ax}$. —— 1M

At $(3a/2, 3a/2)$, $y_1 = \frac{3a^2/2 - 9a^2/4}{9a^2/4 - 3a^2/2} = -1$. —— 1M

$y_2 = \frac{(y^2-ax)(ay_1 - 2x) - (ay - x^2)(2yy_1 - a)}{(y^2-ax)^2}$ —— 1M

At $(3a/2, 3a/2)$, $y_2 = \frac{-3a^3 - 3a^3}{(9a^4/16)} = \frac{-32}{3a}$. —— 1M

$\rho = \frac{(1+y_1^2)^{3/2}}{y_2}$.

$= \frac{(1+1)^{3/2}}{-32/3a} = \frac{2\sqrt{2}\,3a}{-32} = \frac{-3a}{8\sqrt{2}}$. —— 1M.

$\boxed{|\rho| = 3a/8\sqrt{2}}$

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
III-semester: I-Internal assessment Test: DEC-2021
18MAT31 Transform calculus, Fourier series and Numerical Techniques.
(Common to ALL BRANCHES)

Note: 1. Answer any two full questions choosing one from each part **2.** All questions carry Equal marks

Time: 90min] **PART-I** [**Max marks**:30

1.a) Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ in $0 \leq x \leq 2\pi$. Hence deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + --- = \frac{\pi}{4}$ **(CO2)(5M)**

b) Obtain the Fourier series for $f(x) = e^{-x}$ in the interval $0 < x < 2$ **(CO2)(5M)**

c) Find a cosine half range series for $f(x) = (x-1)^2 , 0 \leq x \leq 1$ **(CO2)(5M)**

OR

2. a) Sketch the graph of the function $f(x) = |x|$ in $-\pi \leq x \leq \pi$ and obtain its Fourier series.
Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + --$ **(CO2)(5M)**

) Obtain the Fourier series for function $f(x) = \begin{cases} 1 + \frac{4x}{3} \ in \ \frac{-3}{2} < x \leq 0 \\ 1 - \frac{4x}{3} \ in \ 0 \leq x < \frac{3}{2} \end{cases}$. Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + --$
(CO2)(5M)

c) Obtain the constant term and the coefficients of the first cosine and sine terms in the Fourier expansion of y from the table. **(CO2)(5M)**

x	0	1	2	3	4	5
y	9	18	24	28	26	20

[P.T.O]

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF MATHEMATICS
III-semester: I-Internal assessment Test: DEC-2021
18MAT31 Transform calculus, Fourier series and Numerical Techniques.
(Common to ALL BRANCHES)

Note: 1. Answer any two full questions choosing one from each part2. All questions carry Equal marks

ne: 90min] **PART-I** [**Max marks**:30

1.a) Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ in $0 \leq x \leq 2\pi$. Hence deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + --- = \frac{\pi}{4}$ **(CO2)(5M)**

b) Obtain the Fourier series for $f(x) = e^{-x}$ in the interval $0 < x < 2$ **(CO2)(5M)**

c) Find a cosine half range series for $f(x) = (x-1)^2, 0 \leq x \leq 1$ **(CO2)(5M)**

OR

2. a) Sketch the graph of the function $f(x) = |x|$ in $-\pi \leq x \leq \pi$ and obtain its Fourier series.
Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + --$ **(CO2)(5M)**

b) Obtain the Fourier series for function $f(x) = \begin{cases} 1 + \frac{4x}{3} \ in \ \frac{-3}{2} < x \leq 0 \\ 1 - \frac{4x}{3} \ in \ 0 \leq x < \frac{3}{2} \end{cases}$. Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + --$
(CO2)(5M)

c) Obtain the constant term and the coefficients of the first cosine and sine terms in the Fourier expansion of y from the table. **(CO2)(5M)**

x	0	1	2	3	4	5
y	9	18	24	28	26	20

PRINCIPAL
SIET., TUMAKURU.

[P.T.O]

PART-II

3.a) Find the Fourier series of $f(x) = \begin{cases} 1+\frac{2x}{\pi} & in -\pi < x \le 0 \\ 1-\frac{2x}{\pi} & in\, 0 \le x < \pi \end{cases}$ Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + - -$ **(CO2)(5M)**

b) Find the Fourier series of the periodic function defined by $f(x) = 2x - x^2$ in the interval $0 < x < 3$ **(CO2)(5M)**

c) Obtain the sine half range Fourier series of $f(x) = x^2$ in $0 < x < \pi$ **(CO2)(5M)**

OR

4.a) Find a Fourier series of $f(x) = x - x^2$ in $-\pi \le x \le \pi$ .Hence deduce that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + - -$ **(CO2)(5M)**

b) Obtain the cosine half range series for $f(x) = x(l - x); 0 \le x \le l$ **(CO2)(5M)**

c) The following table gives the variations of a periodic current over a period. **(CO2)(5M)**

t secs	0	$T/_6$	$T/_3$	$T/_2$	$2T/_3$	$5T/_6$	T
A amps	9.0	18.2	24.4	27.8	27.5	22.0	9.0

Find numerically the direct current part of the variable current and obtain the amplitudes up to the second harmonic.

PART-II

3.a) Find the Fourier series of $f(x) = \begin{cases} 1+\frac{2x}{\pi} & in -\pi < x \le 0 \\ 1-\frac{2x}{\pi} & in\, 0 \le x < \pi \end{cases}$ Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + - -$ **(CO2)(5M)**

b) Find the Fourier series of the periodic function defined by $f(x) = 2x - x^2$ in the interval $0 < x < 3$ **(CO2)(5M)**

c) Obtain the sine half range Fourier series of $f(x) = x^2$ in $0 < x < \pi$ **(CO2)(5M)**

OR

4.a) Find a Fourier series of $f(x) = x - x^2$ in $-\pi \le x \le \pi$ .Hence deduce that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + - -$ **(CO2)(5M)**

b) Obtain the cosine half range series for $f(x) = x(l - x); 0 \le x \le l$ **(CO2)(5M)**

c) The following table gives the variations of a periodic current over a period. **(CO2)(5M)**

t secs	0	$T/_6$	$T/_3$	$T/_2$	$2T/_3$	$5T/_6$	T
A amps	9.0	18.2	24.4	27.8	27.5	22.0	9.0

Find numerically the direct current part of the variable current and obtain the amplitudes up to the second harmonic.

I-Internal Assesment Test Dec 2021
Scheme of Evaluation

①

18MAT31: Transform calculus, Fousies Series and Numesical Techniques

1
a) $f(x) = \frac{\pi - x}{2} \quad 0<x<2\pi$

$f(2\pi - x) = \frac{\pi-(2\pi-x)}{2} = \frac{\pi-2\pi+x}{2} = \frac{-\pi+x}{2}$

$f(2\pi-x) = -\frac{(\pi-x)}{2} = -f(x)$

∴ f^n is odd and hence $a_0 = a_n = 0$.

Then the F.S of $f(x)$ is $f(x) = \sum b_n \sin nx$ 2M

$b_n = \frac{1}{\pi}\int_0^{2\pi} f(x) \sin nx \, dx$

$= \frac{1}{\pi}\int_0^{2\pi} \underset{\text{I}}{\left(\frac{\pi-x}{2}\right)} \underset{\text{II}}{\sin nx} \, dx$

$= \frac{1}{2\pi n}[-\pi \cos 2n\pi - \pi \cos 0] = \frac{-1}{2\pi n}[-\pi-\pi]$ 2M

$\boxed{b_n = \frac{1}{n}}$

$f(x) = \sum \frac{1}{n} \sin nx$

put $x = \pi/2$ $\quad f(\pi/2) = \sum \frac{1}{n} \sin\left(\frac{n\pi}{2}\right)$ 1M

$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \cdots$

$f(x) = \bar{e}^{x} \quad 0 x < 2$

The pesiod of $f(x) = 2-0=2 \quad 2l = 2 \quad l=1$ 1M

$f(x) = \frac{a_0}{2} + \sum a_n \cos n\pi x + \sum b_n \sin n\pi x$

where $a_0 = \int_0^2 \bar{e}^{x} dx = -\bar{e}^{x}\Big|_0^2 = -(\bar{e}^{2}-1) = 1 - \frac{1}{e^2}$

$= \frac{e^2-1}{e^2}$

$a_n = \int_0^2 \bar{e}^{x} \cos n\pi x \, dx$

$= \frac{\bar{e}^{x}}{1+n^2\pi^2}(-\cos n\pi x + n\pi \sin n\pi x)\Big|_0^2$

PRINCIPAL
SIET., TUMAKURU.

$= \frac{-1}{1+n^2\pi^2}\left[\bar{e}^{x}\cos n\pi x\right]\Big|_0^2 \qquad \sin 2n\pi = 0 = \sin 0$

$= \frac{-1}{1+n^2\pi^2}\{\bar{e}^{2}\cos 2n\pi - 1\} = \frac{-1}{1+n^2\pi^2}\left(\frac{1}{e^2} - 1\right)$ 2M

$$a_n = \frac{e^2-1}{e^2(1+n^2\pi^2)}$$

$$b_n = \int_0^2 e^{-x} \sin n\pi x \, dx$$

$$= \frac{e^{-x}}{1+n^2\pi^2} (-\sin n\pi x - n\pi \cos n\pi x) \Big|_0^2$$

$$= \frac{-n\pi}{1+n^2\pi^2} \left[e^{-x} \cos n\pi x \right]\Big|_0^2 = \frac{-n\pi}{1+n^2\pi^2} \left(\frac{1}{e^2} - 1\right)$$

$$= \frac{n\pi (e^2-1)}{e^2(1+n^2\pi^2)}$$

$$f(x) = \frac{e^2-1}{e^2} + \sum \frac{e^2-1}{e^2(1+n^2\pi^2)} \cos n\pi x$$ 2M

---

c) F.C.S. $f(x) = \frac{a_0}{2} + \sum a_n \cos n\pi x$

$$a_0 = \frac{2}{1} \int_0^1 f(x)\,dx = 2\int_0^1 (x-1)^2 dx = 2 \left.\frac{(x-1)^3}{3}\right|_0^1$$ 2M

$$\boxed{a_0 = \frac{2}{3}}$$

$$a_n = 2 \int_0^1 (x-1)^2 \cos n\pi x \, dx$$

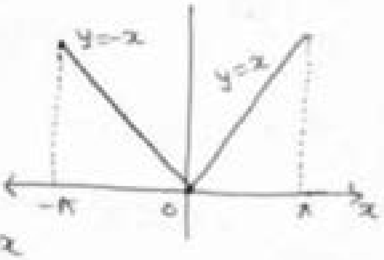
$$= 2 \left[(x-1)^2 \frac{\sin n\pi x}{n\pi} - 2(x-1) \cdot \frac{(-\cos n\pi x)}{n^2\pi^2} + 2 \frac{(-\sin n\pi x)}{n^3\pi^3} \right]\Big|_0^1$$

$$\boxed{a_n = \frac{4}{n^2\pi^2}}$$ 2M

$$f(x) = \frac{1}{3} + \frac{4}{\pi^2} \sum \frac{1}{n^2} \cos nx$$ 1M

---

2 ⓐ $f(x) = |x| = \begin{cases} -x & -\pi \le x \le 0 \\ +x & 0 \le x \le \pi \end{cases}$ 1M



F.S. of $f(x)$

$$f(x) = \frac{a_0}{2} + \sum a_n \cos nx + \sum b_n \sin nx$$

$f(x) = |x|$

$f(-x) = |-x| = |x| = f(x)$

$f(-x) = f(x)$ f^n is even & $b_n = 0$. 1M

$$a_0 = \frac{2}{\pi}\int_0^{\pi} f(x)\,dx = \frac{2}{\pi}\int_0^{\pi} x\,dx$$

$$= \frac{\cancel{2}}{\pi}\cdot\frac{x^2}{\cancel{2}}\Big|_0^{\pi} = \pi$$

$$a_n = \frac{2}{\pi}\int_0^{\pi} x\cos nx\,dx$$

$$= \frac{2}{\pi}\left[x\frac{\sin nx}{n} - 1\cdot\frac{(-\cos nx)}{n^2}\right]\Big|_0^{\pi}$$

$$= \frac{-2}{\pi n^2}[1-(-1)^n]$$ 3M

$$f(x) = \frac{\pi}{2} - \frac{2}{\pi}\sum \frac{1}{n^2}[1-(-1)^n]\cos nx \text{ — ①}$$

put $x=0$.

$$f(0) = \frac{\pi}{2} - \frac{2}{\pi}\sum\frac{1}{n^2}[1-(-1)^n]$$

$$\frac{\pi^2}{8} = \frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots$$ 1M

---

b)

$$f(x) = \begin{cases} 1+4x/3 & -3/2<x<0 \\ 1-4x/3 & 0<x<3/2 \end{cases}$$

Period of $f(x) = 3/2-(-3/2) = 3$ $\quad 2l=3$ $\boxed{l=3/2}$

$\phi(x) = 1+4x/3 \qquad \psi(x) = 1-\frac{4x}{3}$

$\phi(-x) = 1-4x/3 = \psi(x)$. $\therefore$ f^n is even & $b_n=0$ 1M

$$f(x) = \frac{a_0}{2} + \sum a_n\cos\left(\frac{n\pi x}{l}\right)$$

$$a_0 = \frac{2}{l}\int_0^{l} f(x)\,dx = \frac{2}{3/2}\int_0^{3/2}\left(1-\frac{4x}{3}\right)dx$$

$$= \frac{4}{3}\left[x-\frac{4}{3}\frac{x^2}{2}\right]\Big|_0^{3/2} \qquad \boxed{a_0=0}$$

$$a_n = \frac{2}{l}\int_0^{l} f(x)\cos\frac{n\pi x}{l}\,dx = \frac{2}{3/2}\int_0^{3/2}\left(1-\frac{4x}{3}\right)\cos\left(\frac{2n\pi x}{3}\right)dx$$

$$= \frac{4}{3}\left[\left(1-\frac{4x}{3}\right)\frac{\sin\left(\frac{2n\pi x}{3}\right)}{\frac{2n\pi}{3}} - \left(\frac{-4}{3}\right)\frac{\cos\left(\frac{2n\pi x}{3}\right)}{\left(\frac{2n\pi}{3}\right)^2}\right]\Big|_0^{3/2}$$

$$= \frac{4}{3}\cdot\frac{-4}{3}\cdot\frac{9}{4n^2\pi^2}\left[\cos\frac{2n\pi x}{3}\right]\Big|_0^{3/2}$$

$$= \frac{4}{n^2\pi^2}[1-(-1)^n] \Rightarrow \boxed{\frac{8}{n^2\pi^2} = a_n}$$ 3M

PRINCIPAL
SIET., TUMAKURU.

$$f(x) = \frac{8}{\pi^2} \sum \frac{1}{n^2} \cos\left(\frac{2n\pi x}{3}\right)$$

put $x=0$.

$$\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$$ 1M

c) length of interval $= 6-0=6$ $\quad 2l=6 \quad l=3$.

$$y=f(x) = \frac{a_0}{2} + a_1 \cos\frac{\pi x}{3} + b_1 \sin\frac{\pi x}{3}$$ 1M

$$= \frac{a_0}{2} + a_1 \cos\theta + b_1 \sin\theta \qquad \left[\theta = \frac{\pi x}{3}\right]$$

$\sum y = 125 \qquad \sum y\cos\theta = -25 \qquad \sum y \sin\theta = -3.464$

$a_0 = \frac{2}{N} \sum y = 41.67 \qquad \frac{a_0}{2} = 20.835$

$a_1 = \frac{2}{N} \sum y \cos\theta = -8.333$

$b_1 = \frac{2}{N} \sum y \sin\theta = -1.155$ 3M

$y = 20.835 + (-8.333)\cos\theta + (-1.155)\sin\theta$ 1M

---

3 ⓑ

3/b) $f(x) = 2x - x^2 \qquad 0<x<3$

period of $f(x) = 3-0=3$ $\boxed{l=3/2}$ 1M

$$f(x) = \frac{a_0}{2} + \sum a_n \cos\left(\frac{2n\pi x}{3}\right) + \sum b_n \sin\left(\frac{2n\pi x}{3}\right)$$

$$a_0 = \frac{2}{3}\int_0^3 f(x)\,dx = \frac{2}{3}\int_0^3 (2x-x^2)\,dx \quad \boxed{a_0=0}$$

$$a_n = \frac{2}{3}\int_0^3 (2x-x^2)\cos\left(\frac{2n\pi x}{3}\right)dx \quad \boxed{a_n = -\frac{9}{n^2\pi^2}}$$ 3M.

$$b_n = \frac{2}{3}\int_0^3 (2x-x^2)\sin\left(\frac{2n\pi x}{3}\right)dx \quad \boxed{b_n = \frac{3}{n\pi}}$$

$$f(x) = \frac{-9}{\pi^2}\sum \frac{\cos\left(\frac{2n\pi x}{3}\right)}{n^2} + \frac{3}{\pi}\sum \frac{\sin\left(\frac{2n\pi x}{3}\right)}{n}$$ 1M

3(b) $f(x) = 2x - x^2 \quad 0 < x < 3.$

3 a) $$f(x) = \begin{cases} 1 + \frac{2x}{\pi} & \text{in } -\pi < x < 0 \\ 1 - \frac{2x}{\pi} & \text{in } 0 \le x \le \pi \end{cases}$$

$$f(x) = \frac{a_0}{2} + \sum a_n \cos nx + \sum b_n \sin nx$$

$$a_0 = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x)\, dx = \frac{1}{\pi}\left[\int_{-\pi}^{0} 1 + \frac{2x}{\pi}\, dx + \int_{0}^{\pi} 1 - \frac{2x}{\pi}\, dx\right]$$

$$\boxed{a_0 = 0}$$

$$a_n = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos nx\, dx$$

$$= \frac{1}{\pi}\left[\int_{-\pi}^{0} \left(1 + \frac{2x}{\pi}\right) \cos nx\, dx + \int_{0}^{\pi} \left(1 - \frac{2x}{\pi}\right) \cos nx\, dx\right]$$

$$\boxed{a_n = \frac{4}{\pi^2 n^2}[1 - (-1)^n]}$$

$$b_n = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \sin nx\, dx$$

$$\boxed{b_n = 0}$$

$$f(x) = \sum \frac{4}{\pi^2 n^2}\{1 - (-1)^n\} \cos nx$$

4M

put $x = 0$

$$\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$$

1M

3 c) Half-range F.S.S. $f(x) = \sum b_n \sin nx$

$$b_n = \frac{2}{\pi} \int_{0}^{\pi} x^2 \sin nx\, dx$$

4M.

$$b_n = \frac{2}{\pi}\left\{\frac{(-1)^{n+1}\pi^2}{n} - \frac{2}{n^3}[1 - (-1)^n]\right\}$$

$$f(x) = \sum \frac{2}{\pi}\left\{\frac{(-1)^{n+1}\pi^2}{n} - \frac{2}{n^3}[1 - (-1)^n]\right\} \sin nx$$

1M

PRINCIPAL
S[illegible] TUMAK[illegible]

4 a) $f(x) = x - x^2$ in $-\pi \le x \le \pi$.

$f(x) = \frac{a_0}{2} + \sum a_n \cos nx + \sum b_n \sin nx$

$a_0 = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x)\,dx = \frac{1}{\pi} \int_{-\pi}^{\pi} (x - x^2)\,dx$

$\boxed{a_0 = -\frac{2\pi^2}{3}}$

$a_n = \frac{1}{\pi} \int_{-\pi}^{\pi} (x - x^2) \cos nx\,dx$

$= -\frac{4}{n^2} \cos n\pi = \frac{-4}{n^2} (-1)^n$

$\boxed{a_n = \frac{4(-1)^{n+1}}{n^2}}$

$b_n = \frac{1}{\pi} \int_{-\pi}^{\pi} (x - x^2) \sin nx\,dx$

$\boxed{b_n = \frac{2}{n} (-1)^{n+1}}$ 4M

$x - x^2 = -\frac{\pi^2}{3} + 4 \sum \frac{(-1)^{n+1}}{n^2} \cos nx + 2 \sum \frac{(-1)^{n+1}}{n} \sin nx$

put $x = 0$. 1M

$\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots$

---

b) $f(x) = x(l - x)$ $0 \le x \le l$

$f(x) = \frac{a_0}{2} + \sum a_n \cos \frac{n\pi x}{l}$

$a_0 = \frac{2}{l} \int_{0}^{l} f(x)\,dx = \frac{2}{l} \int_{0}^{l} (lx - x^2)\,dx$

$\boxed{a_0 = \frac{l^2}{36}}$ 2M

$a_n = \frac{2}{l} \int_{0}^{l} (lx - x^2) \cos \frac{n\pi x}{l}\,dx$

$\boxed{a_n = \frac{-2l^2}{n^2\pi^2} [1 + (-1)^n]}$ 2M

$f(x) = \frac{l^2}{6} - \frac{2l^2}{\pi^2} \sum \frac{1}{n^2} [1 + (-1)^n] \cos\left(\frac{n\pi x}{l}\right)$ 1M.

4 c) $\Sigma y = 128.9$ $\quad \Sigma y\cos\theta = -24.65$

$\Sigma y\cos 2\theta = -9.25$

$\Sigma y\sin\theta = -5.9754$

$\Sigma y\sin 2\theta = -0.6062$

3M

$a_0 = \frac{2}{N}\Sigma y = 42.967$

$a_1 = \frac{2}{N}\Sigma y\cos\theta = -8.217$

$b_1 = \frac{2}{N}\Sigma y\sin\theta = -1.9918$

$a_2 = \frac{2}{N}\Sigma y\cos 2\theta = -3.083$

$b_2 = \frac{2}{N}\Sigma y\sin 2\theta = -0.202$

$$y = 21.4835 + (-8.217\cos\theta - 1.9918\sin\theta) + (-3.083\cos 2\theta - 0.202\sin 2\theta)$$

1M

direct current $= 21.4835$

Amplitude of I-harmonic $= \sqrt{a_1^2+b_1^2} = 8.455$

Amplitude of II-harmonic $= \sqrt{a_2^2+b_2^2} = 3.09$

1M

PRINCIPAL
SIET., TUMAKURU.

2021-22 II Sem

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

II Semester: I-Internal assessment test Date: 15-07-2022

Sub: Engineering Chemistry (21CHE22)

Time: 90 minutes Section: A & B Max Marks: 40

Note: 1. Answer any *TWO FULL* questions.

		Module-1	Marks	CO
1	a)	Derive Nernst equation for single electrode potential	(8)	CO 1
	b)	What are reference electrodes? Describe the construction, working and advantages of Calomel electrode.	(7)	CO 1
	c)	Calculate the emf of the cell Fe / Fe^{++} (0.01) // Ag^{+}(0.1) /Ag at 298K if standard electrode potentials of Fe and Ag electrodes are - 0.42 and 0.80 V respectively	(5)	CO 1

(OR)

2	a)	Explain the construction, working and applications of Li-ion battery and mention the uses of Lithium-ion batteries.	(8)	CO 1
	b)	What are Ion Selective Electrodes? Explain the construction and applications of Glass Electrode	(7)	CO 1
	c)	Explain the determination of PH using glass electrode.	(5)	CO 1

		Module-5	Marks	CO
3	a)	Explain the determination of hardness using EDTA titration	(8)	CO 5
	b)	Mention the different sources and impurities present in water	(7)	CO 5
	c)	Write a note on Hardness of water	(5)	CO 5

(OR)

4	a)	Explain the determination of COD of waste water sample	(8)	CO 5
	b)	Explain the Principles and requirements of titrimetric analysis	(7)	CO 5
	c)	In a COD experiment 25 cm^3 of an effluent sample required 8.5 cm^3 of 0.002 M Potassium dichromate for oxidation. Calculate the COD of the sample	(5)	CO 5

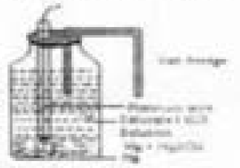
PRINCIPAL
SIET., TUMAKURU.

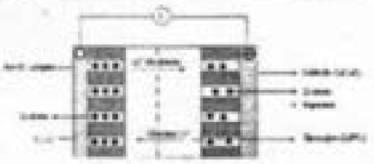
SHRIDEI INSTITUTE OF ENGINEERING AND TECHNOLOGY

II semester: I-Internal assessment test **Date: 15-07-2022**

Scheme of valuation

Sub: Engineering Chemistry (21CHE22) **Section: A & B**

Q.no	Scheme	Marks
1. (a)	**Derive Nernst equation for single electrode potential**	**8Marks**
	The maximum work available from a reversible chemical process is equal to the maximum amount of electrical energy that can be obtained; it shows decrease in free energy. Wmax = – ▲ G	1mark
	There fore $\Delta G = -nFE$ $\boxed{E = \frac{\Delta G}{-nF}}$ $\boxed{E^0 = \frac{\Delta G^0}{-nF}}$	1mark
	Consider the following reversible electrode reaction, $\boxed{M^{n+} + ne^- \rightleftharpoons M}$	1mark
	For the above reaction the equilibrium constant (Kc) can be written as, $K_c = \frac{[M]}{[M^{n+}]}$	1mark
	Kc and ΔG are related according to the following thermodynamic equation $\boxed{\Delta G = \Delta G^0 + RT \ln K_c}$ ----------→1	1mark
	Dividing the equation 1 by – nF and Substituting the value of Kc, $\frac{\Delta G}{-nF} = \frac{\Delta G^0}{-nF} + \frac{RT \ln}{-nF}[M] / [M^{n+}]$ ----------→2 Substituing the values of $\frac{\Delta G}{-nF}$ and $\frac{\Delta G^0}{-nF}$ in equation 3,	1mark
	Equation 3 => $E = E^0 + \frac{RT \ln [M^{n+}]}{nF}$ When [M] = 1	1mark
	$E = E^0 + \frac{2.303RT}{nF}\log_{10}[M^{n+}]$ ——→ Nernst equation	1mark
(b)	**What are reference electrodes? Explain the construction, working and advantages of Calomel electrode.**	**7Marks**
	 Fig and Labeling	1mark
	Explanation	3mark
	Reactions	1mark
	Advantages	1mark
	• Definition: The electrodes which are used to find out the electrode potential of other electrodes • Calomel electrode consisting of a glass container at the bottom of which mercury is placed and above which a layer of mercury and mercurous chloride (called calomel) is placed • 3/4th of bottle is filled with saturated KCl solution. • <u>Calomel Electrode potential depends on the concentration of chloride ions</u>. • The calomel electrode acts as both anode and cathode depending upon the other electrode used. • The platinum wire is used for electrical connections. Salt bridge is used to couple with other half cell. • The calomel electrode can be represented as Hg (l) / $Hg_2 Cl_2$ (S) / Cl^-	1mark

	- When it acts as anode the electrode reactions is, - $2Hg + 2Cl^- \longrightarrow Hg_2Cl_2 + 2e^-$ - When it acts as cathode the electrode reaction is - $Hg_2Cl_2 + 2e^- \longrightarrow 2Hg + 2Cl^-$ **Advantages:** - It can be used to determine the potential of a redox reaction - It is used in corrosion studies	
(c)	**Calculate the emf of the cell Fe / Fe++ (0.01) // Ag+(0.1) /Ag at 298K if standard electrode potentials of Fe and Ag electrodes are – 0.42 and 0.80 V respectively**	**5Marks**
	$E^0cell = E^0 cathode - E^0 anode$ $= E^0 Ag^+/Ag - E^0 Fe^{++}/ Fe$ $= 0.8 - (-0.42)$ $= \mathbf{1.22\ V.}$ $\boxed{Ecell = E^0cell + \frac{0.0591}{n} \log_{10} \frac{[M^{n+}] \text{ at cathode}}{[M^{n+}] \text{ at anode}}}$ $= E^0cell + \frac{0.0591}{n} \log10 \frac{[Ag^+]^2}{[Fe^{++}]}$ $= 1.22 + \frac{0.0591}{2} \log10 \frac{[0.1]^2}{[0.01]}$ $= 1.22 + 0.02955 \log 1$ $= \mathbf{1.22\ V.}$	2mark 1mark 1mark 1mark
2. (a)	**Explain the construction, working and applications of Li-ion battery and mention the uses of Lithium-ion batteries.**	**8Marks**
	 Fig and Labeling Explanation Reactions Advantages - LiCoO2 battery contains anode made-up of layered graphite and contains Lithium atoms in between the layers (Intercalation). - The cathode of the battery is made-up of layered Cobalt oxide and contains Lithium atoms in between the layers. - The cathode and anode are separated by Polymeric separator - Lithium salts such as LiPF6 is used as electrolyte. - During discharge the Lithium atoms undergoes oxidation and moves towards Cathode as Lithium ions. - At Cathode Co4+ ions are reduced to Co3+ ions and Lithium ions enters into the Cobalt oxide ayes as Lithium atoms. The chemical reactions for charge and discharge are as shown below: At Anode: $xLiC \rightleftharpoons C + xLi^+ + xe^-$ At Cathode: $CoO_2 + xLi^+ + xe^- \rightleftharpoons LiCoO_2$ **Net cell reaction** $xLiC + CoO_2 \rightleftharpoons C + LiCoO_2$ Applications of lithium ion batteries: Cellular phones, Portable CD player, Laptops, Portable LCD TVs, Electric vehicles etc.	2mark 3mark 2mark 1mark
(b)	**What are Ion Selective Electrodes? Explain the construction and applications of Glass Electrode**	**7Marks**
	 Fig and Labeling Explanation	2mark 34mark

of the given water sample.

Observation:

Weight of weighing bottle + Na_2EDTA salt (M_1) =...... ....g 2mark
Weight of empty weighing bottle (M_2) =..................g
Weight of Na_2EDTA salt Transferred $(M_1 - M_2)$ =......... ....g

$$\text{Molarity of } Na_2EDTA \text{ Solution} = \frac{\text{Weight of } Na_2EDTA \text{ crystals transferred} \times 4}{\text{Molecular weight of } Na_2EDTA\ (372.24)}$$

$$= \frac{\text{............} \times 4}{372.24}$$

$$= \text{.............} \ M$$

Tabular column: 1mark

Burette readings	Trial 1	Trial 2	Trial
Final burette reading			
Initial burette reading	0.0	0.0	0.0
Volume of Na_2EDTA solution consumed (cm^3)			

Calculation: 2mark

$\boxed{1000\ cm^3\ 1\ M\ EDTA = 100\ g\ (\text{Molecular mass of } CaCO_3 = 100)}$

$$\text{.........}cm^3 \text{ of ....M EDTA} = \frac{\text{...........}cm^3 \times \text{.........}M \times 100}{1000} \text{ g of } CaCO_3$$

$$= \text{...........................} \text{ g of } CaCO_3$$

$$\text{Total hardness of the given water sample} = \frac{\text{................g} \times 10^6}{25} \text{ ppm of } CaCO_3$$

$$= \text{........................ ppm of } CaCO_3$$

(b) **Mention the different sources and impurities present in water** **7Marks**

Impurities in water may be broadly classified into four categories:

I) Dissolved impurities 2mark
II) Suspended impurities 2mark
III) Biological impurities 2mark
IV) Dissolved gases. 2mark

I) Dissolved impurities: Dissolved impurities includes salts like bicarbonates, chlorides, and sulphates of calcium and magnesium impart hardness of water. Oxides of Mn, Fe, Pb and Ar may also be present in water.

II) Suspended impurities: Suspended impurities are the dispersion of the solid particles, which can be removed by filtration or settling.
They are of two types:-
  a. Inorganic suspended impurities: These include sediments, clay and sand.
  b. Organic suspended impurities: These include leaves, branches, twigs, animals, and a host of decaying or dead waste.

III) Biological impurities: These includes organisms such as bacteria , protozoans, viruses etc , which causes diseases such as cholera, Typhoid

IV) Dissolved gases: Dissolved gases like ammonia and hydrogen sulphide produces a bad odor to water. Dissolved oxygen, nitrogen oxides and carbon dioxide lead to boiler corrosion.

Applications 1mark -
Definition 1mark

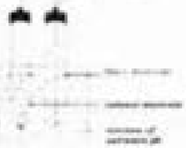
These are the electrodes, which responds and develops a potential against to specific ions only while ignoring the other ions present in the solution. Ex: Glass electrode.

- Glass electrode is H+ ions sensitive electrode and widely used for pH determinations.
- It consisting of a long glass tube at the bottom of which a thin and delicate glass bulb is present.
- The glass bulb is made up of special type of glass (12 % Na2O, 6% of Cao, 72% of SiO2) with low melting point and high electrical conductance.
- The glass bulb is filled with 0.1.M HCl solution.
- Ag / AgCl is used as a internal reference electrode.
- The glass electrode can be represented as
  Ag/AgCl (s) /0.1M (HCl) / Glass.

Applications: It is widely used in the determination of PH

(c) **Explain the determination of PH using glass electrode.** **5Marks**

Fig and Labeling 2mark
Explanation 3mark



To determine pH of unknown solution the glass electrode is combined with secondary reference electrode such as calomel electrode and the glass - calomel electrode assembly is dipped in the solution whose pH is to be determined.

The two electrodes are connected to potentiometer or pH meter.

The combined electrodes can be represented as.

Hg(l) /Hg_2Cl_2(S)/Saturated KCl //solution of unknown PH/glass/0.1M HCl/AgCl (s)/ Ag

The emf of the above cell is given by

E cell = E Cathode – E Anode

E cell = E Glass – E Calomel (since EGlass =E^0G–0.0591 PH)

E cell = E^0G–0.0591 pH - E Calomel

$$PH = \frac{E^0Glass - E\ Calomel - E\ cell}{0.0591}$$

3.(a) **Explain the determination of hardness using EDTA titration** **8Marks**

Procedure: 3mark

Weigh out the given disodium salt of EDTA crystal accurately into a 250 ml volumetric flask. Dissolve in distilled water and dilute up to the mark. Mix well.

$$\text{Molarity of EDTA} = \frac{\text{Weight of } Na_2EDTA \text{ taken x 4}}{\text{Molecular Weight of EDTA (372.24)}}$$

Burette : Standard Na_2EDTA Solution
Conical flask : 25 ml water sample + 3 ml of NH_3–NH_4Cl buffer Solution (PH=10) + 2-3 drops of Eriochrome black – T
Indicator : Eriochrome black – T
Color change : Wine red to clear blue
From the volume of Na2EDTA consumed calculate the total hardness

(c) Write a note on Hardness of water **5Marks**

Water which does not produce more lather with soap is termed as hard water. It is classified into two types as follows. 1mark

i) Temporary hardness

ii) Permanent hardness

i) Temporary hardness: Temporary hardness of water is caused by bicarbonates of calcium and magnesium. It can be removed by boiling. During boiling the bicarbonates decompose into carbonates and hydroxides which are insoluble and deposit at the bottom of the vessel. 2mark

$Ca(HCO_3)_2 \rightarrow CaCO_3\downarrow + H_2O + CO_2\uparrow$

$Mg(HCO_3)_2 \rightarrow Mg(OH)_2\downarrow + 2CO_2\uparrow$

Temporary hardness can also be removed by adding hydrated lime to precipitate insoluble carbonate.

$Ca(HCO_3)_2 + Ca(OH)_2 \rightarrow 2CaCO_3\downarrow + 2H_2O$

$Mg(HCO_3)_2 + Ca(OH)_2 \rightarrow Mg(OH)_2\downarrow + 2CaCO_3\downarrow + 2H_2O$

Permanent hardness: Permanent hardness is caused due to the presence of chlorides and sulphates of calcium and magnesium. This type of hardness cannot be removes by boiling of water or by adding hydrated lime. It can be eliminated by water softening techniques like lime-soda process, Zeolite, Ion exchange resin, reverse osmosis etc. 2mark

4. (a) Explain the determination of COD of waste water sample **8Marks**

Procedure: 3mark

PART – A: Preparation of standard mohr's salt (FAS) solution:

1. Weigh out given mohr's salt (FAS) accurately and transfer into a funnel placed over 250 cm³ volumetric flask.
2. Add one test tube of dilute H_2SO_4 and ion exchange water dilute up to the mark and mix well.
3. Calculate the normality of mohr's salt (FAS)

PART – B: Determination of COD:

1. Pipette out 25 cm³ of the waste water sample into a 250 cm³ conical flask.
2. Add 10 cm³ standard potassium dichromate solution.
3. Add 1 test tube of 1:1 sulphuric acid.
4. Add 2-3 drops of ferroin indicator.
5. Titrate against the mohr's salt solution until the solution turns bluish green to reddish brown (Brick red).

PART – C: Blank titration:

Perform the blank titration by titrating 10 cm³ of $K_2Cr_2O_7$ solution against mohr's salt solution without using waste water sample. Calculate the COD of water sample as given below.

Observation:

Weight of weighing bottle + FAS = W1 = ...g

Weight of empty weighing bottle = W2 = ...g

Weight of FAS transferred (W) = W_1-W_2 = ...g

$$\text{Normality of FAS} = \frac{\text{Weight of FAS salt x 4}}{\text{Equivalent weight of FAS (392)}}$$

$$= \frac{\quad\text{x 4}}{392}$$

2mark

= .... N

Tabular column:

Burette readings	Trial 1	Trial 2	Trial 3

Tabular column:

Burette readings	Trial 1	Trial 2	Trial 3
Final burette reading			
Initial burette reading	0.0	0.0	0.0
Volume of FAS consumed (cm^3)			

Calculation: 1mark

Volume of FAS solution consumed = ...cm^3 (b)

The blank titrate value = ...cm^3 (a)

1000 cm^3 of 1N Mohr's salt solution = 1equivalent of oxygen i.e., 8 grams of oxygen

$$(a-b)\ cm^3 \text{ of ------- N Mohr's salt solution} = \frac{N_{FAS} \times (a-b) \times 8000}{25}$$ 2mark

COD = ... mg of oxygen / dm^3

(b) **Explain the Principles and requirements of titrimetric analysis** 7Marks

Principles of titrimetric analysis are as follows: 5mark

- The one solution to be analyzed contains an unknown amount of chemicals.
- The reagent of known concentration reacts with chemical of unknown amount in the presence of an indicator to show the end-point. This is the point which shows the completion of the reaction.
- The volumes are measured by a titration which completes the reaction between reagent and solution.
- The volume and concentration of reagent used in the titration give the amount of reagent in moles.
- The amount of unknown chemical in the measured volume of solution is calculated by using the mole ratio of the equation.

The amount of unknown chemical in the original sample is calculated by the amount of unknown chemical in the measured volume.

Requirements of titrimetric analysis

- The following glass wares are used for Titrimetric analysis 2mark
  i) Burette
  ii) Volumetric flask
  iii) Conical flak
  iv) Pipette
  v) Funnel

(c) **In a COD experiment 25 cm^3 of an effluent sample required 8.5 cm^3 of 0.002 M Potassium dichromate for oxidation. Calculate the COD of the sample** 5Marks

i) 1000 cm^3 of 1M $K_2Cr_2O_7$ solution contains 294 g of $K_2Cr_2O_7$ 2mark

$$8.5\ cm^3 \text{ of } 0.002\ M\ K_2Cr_2O_7 \text{ solution contains } \frac{294\ g \times 8.5 \times 0.002}{1000 \times 1}$$

= 4.998 mg

ii) $K_2Cr2O_7 + H_2SO_4 \longrightarrow K_2SO_4 + Cr_2(SO_4)_3 + 4H_2O + 3[O]$

294 g of $K_2Cr_2O_7$ $\underline{=}$ 48 g of oxygen. 2mark

$$4.998 \text{ mg of } K_2Cr2O_7 \underline{=} \frac{48 \times 4.998}{294} = 0.816 \text{ mg of oxygen}$$

	iii) COD of the effluent sample $= \frac{0.816 \times 1000}{25}$ $= 32.64$ mg of oxygen / dm^3	1mark

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

II Semester: CIE II-Internal assessment test Date: 16-08-2022

Sub: Engineering Chemistry (21CHE22)

Time: 90 minutes Section: A & B Max Marks: 40

Note:	1.	Answer any *TWO FULL* questions.

		Module-2	Marks	CO
1	a)	Explain the affect of following factors on the rate of corrosion a) ratio of anodic to Cathodic area b) Nature of corrosion product c) Temperature	(8)	CO 2
	b)	Define corrosion? Explain the Electrochemical theory of corrosion	(7)	CO 2
	c)	Explain the process of galvanization	(5)	CO 2

(OR)

2	a)	What is differential aeration corrosion? Explain water line and pitting corrosion	(8)	CO 2
	b)	What is Cathodic protection? Explain sacrificial anodic protection method	(7)	CO 2
	c)	What is differential metal corrosion? Explain with an example	(5)	CO 2

		Module-3	Marks	CO
3	a)	Explain the theory, Instrumentation and applications of Colorimetry	(8)	CO 3
	b)	Explain the titration curves for mixture of Strong acid and weak acid with a strong base	(7)	CO 3
	c)	Explain the synthesis, Properties and applications of Polyurethanes	(5)	CO 3

(OR)

4	a)	Explain the theory, Instrumentation and applications of Potentiometry	(8)	CO 3
	b)	What are Conducting polymers? Explain the mechanism of conduction in Poly aniline. And mention the applications of conducting poly aniline	(7)	CO 3
	c)	Explain the synthesis and applications of Kevlar fibres	(5)	CO 3

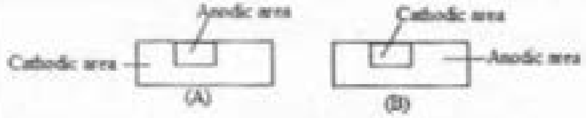
PRINCIPAL
SIET., TUMAKURU

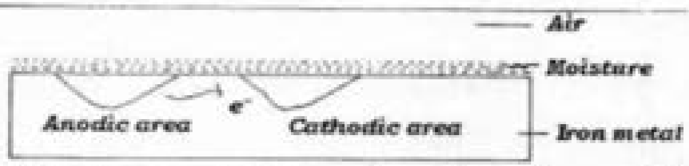
SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

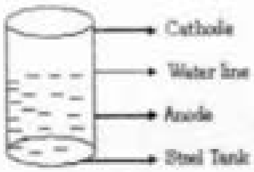
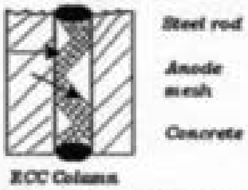
II Semester: CIE II-Internal assessment test　Date: 16-08-2022

Scheme of valuation

Sub: Engineering Chemistry (21CHE22)　**Section: A & B**

Q.no	Scheme	Marks
1. (a)	**Explain the affect of following factors on the rate of corrosion a) ratio of anodic to Cathodic area b) Nature of corrosion product c) Temperature**	8Marks
	a) ratio of anodic to Cathodic area	3mark
	b) Nature of corrosion product	3mark
	c) Temperature	2mark
	a) Ratio of Anodic to Cathodic areas: If a metal has small anodic and large cathodic area the rate of corrosion increases and vice versa. This is because when anodic area is small the electrons liberated during oxidation are completely consumed on large cathodic surface for the reduction reactions and rate of corrosion increases.  b) Nature of corrosion product: If the nature of corrosion product formed on the metal surface is protective in nature (i.e., thin, invisible, uniform and adherent), it prevents the further corrosion of metal. If the corrosion product on the metal surface is non- protective in nature (i.e., thick, visible, non-uniform and non-adherent), it does not prevent the corrosion of metal is and it leads to further corrosion of metal. **Example:** In oxidizing environment metals like Al, Cr, Ti etc. forms protective metal oxide films on their surfaces which prevent further corrosion of metals. Metals like Zn, Fe, Mg, etc .do not form protective layer on their surfaces and are readily under goes corrosion c) Temperature: Increases in temperature results in an increase in the conductance of the aqueous medium and rate of corrosion also increases and vice versa.	
(b)	**Define corrosion? Explain the Electrochemical theory of corrosion**	7Marks
	Corrosion is defined as the destruction or deterioration of a metal or its alloy and consequent loss of metal, caused due to direct chemical action or electrochemical reactions with its environment. Electrochemical theory of corrosion According to electrochemical theory, corrosion of metals occurs due to the following changes, when they are exposed to the environment.	1mark
	1) A large number of minute galvanic cells are formed which acts as anodic and cathodic areas.	1mark
	2) At anodic area the metal undergoes oxidation and electrons are liberated which migrates towards cathodic region $\underset{\text{Metal}}{M} \longrightarrow \underset{\text{Metal ions}}{M^{n+}} + ne^-$ Ex: when iron is exposed to the environment it undergoes oxidation as $Fe \longrightarrow Fe^{2+} + 2e-$	1mark
		1mark

		
	3) At Cathodic area reduction reactions takes place as follows a) In acidic and de-aerated medium: Hydrogen ions are reduced to hydrogen gas by reacting with electrons. $2H^+ + 2e^- \longrightarrow H_2$	1mark
	b) In alkaline and de-aerated medium: Moisture of the environment reacts with electrons producing hydroxyl ions and Hydrogen gas at cathode. $2H_2O + 2e^- \longrightarrow 2OH^- + H_2$	1mark
	c) In neutral and aerated medium: Moisture of the environment reacts with electrons and Oxygen and produces hydroxyl ions at cathode. $2H_2O + O_2 + 4e^- \longrightarrow 4OH^-$	
	4) Formation of corrosion product: The hydroxyl ions formed at Cathodic area reacts with metal ions (M^{n+} ions) formed at anodic area and forms metal hydroxides which further reacts with moisture and oxygen forming an insoluble metal oxide corrosion product. $2Fe^{++} + 4OH^- \longrightarrow 2Fe(OH)_2$ $2Fe(OH)_2 + O_2 + nH_2O \longrightarrow Fe_2O_3 . nH_2O$ (rust)	1mark
(c)	**Explain the process of galvanization**	5Marks
	➢ It is a process of coating the Iron metal surface with Zinc metal by hot dipping Method. It involves the following steps.	1mark
	➢ The Iron metal surface is washed with organic solvents to remove oil, grease etc content on the metal surface.	1mark
	➢ Then the metal is passed through dilute sulphuric acid to remove rust and other depositions ➢ Finally the metal is washed with water and dried.	1mark
	➢ The metal is treated with a mixture of aqueous solution of zinc chloride and ammonium chloride and dried ➢ The metal is then dipped in molten Zinc	1mark
	➢ The excess Zinc is removed by passing through the rollers or by wiping.	1mark
2. (a)	**What is differential aeration corrosion? Explain water line and pitting corrosion**	8Marks
	Differential aeration corrosion. This type of corrosion occurs when a metal is exposed to different concentrations of Oxygen. The part of metal which is more exposed to air act as cathode and unaffected. The other part of the metal, which is less, exposed to air act as anode and undergoes corrosion.	1mark
	Example i) Water line corrosion: It is differential aeration type of corrosion observed in Iron water storage tanks, ships, etc. The part of the metal below waterline is exposed to less Oxygen concentration act as anode and undergoes corrosion than the other part which is more exposed to atmospheric Oxygen which acts as cathode. The reactions that occurs are,	2mark
	At anode : $Fe \longrightarrow Fe^{++} + 2e^-$ At cathode : $H_2O + O_2 + 4e^- \longrightarrow 4OH^-$ Corrosion Product: $2Fe^{++} + 4OH^- \longrightarrow 2Fe(OH)_2$ $2Fe(OH)_2 + O_2 + 2H_2O \longrightarrow 2(Fe_2O_3 . 3H_2O)$ rust.	1mark

		1mark
	Example ii) Pitting corrosion: Pitting corrosion occurs when small particle like dust, mud etc get deposited on metals surface. The portion of metal covered by the dust or other particles is less aerated and acts as anode. The other portion of the metal exposed to more oxygen of the environment act as cathodic region. Corrosion takes place at the portion below dust and a small pit is formed. Then the rate of corrosion increases due to small anodic area and large cathodic area. The reactions that occurs are, At anode : $Fe \longrightarrow Fe^{++} + 2e-$ At cathode : $H_2O + O_2 + 4e^- \longrightarrow 4OH^-$ Corrosion Product: $2Fe^{++} + 4OH^- \longrightarrow 2Fe(OH)_2$ $2Fe(OH)_2 + O_2 + 2H_2O \longrightarrow 2(Fe_2O_3 . 3H_2O)$ rust.	2mark
		1mark
(b)	**What is Cathodic protection? Explain sacrificial anodic protection method**	**7Marks**
	Cathodic protection is a method in which the metal to be protected from corrosion is made as cathode by attaching more active anodic metal to it. The following methods are used to protect the metal from corrosion by Cathodic protection.	1mark
	a) Sacrificial anodic protection method. In this method the more active metals like Zn, Mg, and Al etc are used as anodic metals and attached to the base metal(metal tobe protected from corrosion). The anodic metals being more reactive undergoes corrosion but base metal remains unaffected .The sacrificial anodes have to be replaced from time to time after complete corrosion. The method is used for protecting buried pipeline, ship hulls, industrial water tank steel rods in RCC columns. Several hundred kilometers long zinc wire is buried along oil pipe line in Alaska is an example for sacrificial anodic protection method	5mark
	 	1mark
(c)	**What is differential metal corrosion? Explain with an example**	**5Marks**
	- This type corrosion occurs when two different metals are in contact with each other due to the formation of galvanic cell.	1mark
	The metal having less standard reduction potential value acts as anode and under goes oxidation by liberates electrons, which migrates to the cathodic region. The other metal having high SRP value acts as cathode and reduction reaction takes places on its surface forming OH- ions. The anodic metal undergoes corrosion and cathodic metal is unaffected. The rate of corrosion depends on the potential difference between the two metals. If the difference is more corrosion occurs faster and vice versa. The reactions that occurs are,	3mark

At anode : $Fe \longrightarrow Fe^{++} + 2e^-$

At cathode : $H_2O + O_2 + 4e^- \longrightarrow 4OH^-$

Corrosion Product: $2Fe^{++} + 4OH^- \longrightarrow 2Fe(OH)_2$

$2Fe(OH)_2 + O_2 + 2H_2O \longrightarrow 2(Fe_2O_3 . 3H_2O)$ **rust.** 1mark

Example: Iron metal in contact with Copper metal
Brass tap in contact with Iron pipe etc.

3.(a) Explain the theory, Instrumentation and applications of Colorimetry **8Marks**

Theory:

- When a monochromatic light of intensity I_0 is incident on a transparent medium, apart I_a of it is absorbed, apart I_r is reflected and the remaining part I_t is transmitted. 2mark

$$I_o = I_a + I_r + I_t$$

For a glass- air interface I_r is negligible. Therefore,

$$I_o = I_a + I_t$$

It/Io = T called the transmittance log 1/T = log Io/It is called the absorbance or optical density A. The relation between absorbance A, concentration c (Expressed in mol/liter)

And path length 1 (expressed in cm) is given by Beer Lambert's law.

A = log Io/It = €Ct

Where C is the molar extinction coefficient, t is the path length. € is a constant for a given substance at a given wavelength. If t- the path length is kept constant, then A œ C. hence a plot of absorbance against concentration gives a straight line.

Instrumentation: colorimeter contains the following components.

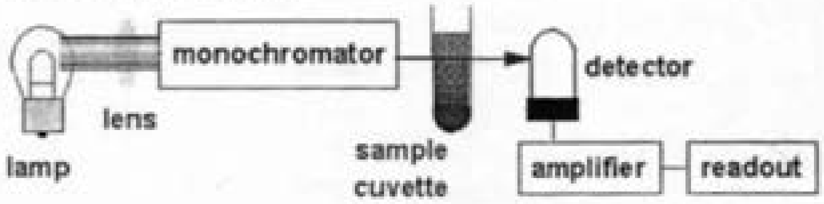
Light source: A tungsten lamp is used as light source for producing wavelength in the visible range 320-700 nm.

Monochromator: These are used to select a light of one wavelength (monochromatic light) and monochromatic light is sent through the sample.

Cuvette: Transparent glass cuvette is used to for reading the OD of samples. 3mark

Detector: The detector detects the wavelength of light that has passed through the sample.

Amplifier: The amplifier increases the signal so that it is easier to read against the background noise.



2mark

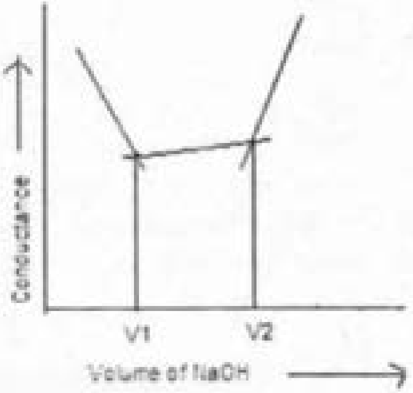
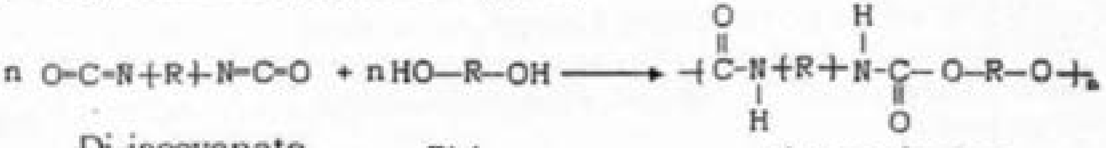
Applications

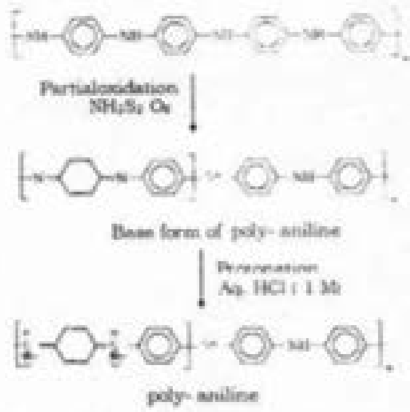
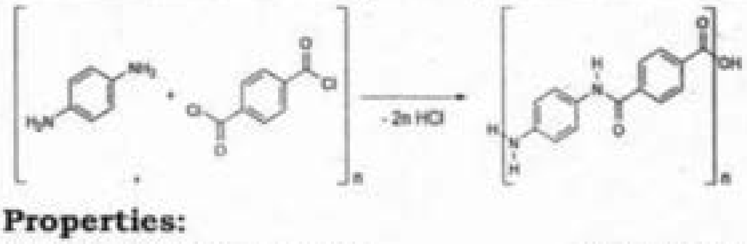
- Colorimeters are widely used to monitor the growth of a bacterial or yeast cultures.
- Used to measure and monitor the color in various foods and beverages. 1mark
- Certain colorimeters can measure the colors that are used in copy machines, fax machines and printers.

(b) Explain the titration curves for mixture of Strong acid and weak acid with a strong base **7Marks**

1. When a mixture of a weak acid (CH_3COOH) and strong acid (HCl) is titratied against a strong base (NaOH), the conductance decreases upon adding NaOH to acid mixture removal of highly mobile H^+ ions of HCl to form unionized H_2O. 6mark

	Where E^o is the standard potential of the system. The potential of the system is thus controlled by the ratio of the concentration of the oxidized to that of the reduced species in the vicinity of the end point of the titration. This may be followed potentiometrically and a change of potential against volume (titration curve) is characterized by a sudden change of potential at the equivalence point. From the equivalence point the concentration of the sample can be determined. is explained as follows. The reaction that takes place in the determination of Fe^{2+} is $Fe^{2+} \longrightarrow Fe^{3+} + e^-$ $Cr_2O_7^{2-} + 14H^+ + 6e \longrightarrow 2Cr^{3+} + 7H_2O$ Prior to the equivalence point the potential is determined by the Fe^{3+}/Fe^{2+} system and the potential is given by the equation. $E_{cell} = E_{Fe^{2+}} = E^0 + \frac{0.0591}{n} \log \frac{[Fe^{3+}]}{[Fe^{2+}]}$ $= 0.75V + 0.0591 \log \frac{[Fe^{3+}]}{[Fe^{2+}]}$ The potential of the solution will be around 0.75V (since the contribution to the potential by the second term is negligible). At the equivalence point the potential is determined by both E and E^o is given by $E_{cell} = \frac{E^0{}_{Fe^{2+}} + E^0{}_{Cr_2O_7^{2-}}}{2} = \frac{0.75V + 1.33V}{2} = 1.04\ V$ Beyond the equivalence point the potential is determined by $Cr_2O_7^{2-}/ Cr^{3+}$ system given by the equation. $E_{cell} = E_{Cr_2} = E^0{}_{Cr_2O_7^{2-}} / Cr^{3+} + \frac{0.0591}{6} \log \frac{[Cr_2O_7^{2-}]}{[Cr^{3+}]}$ $= 1.33V + \frac{0.0591}{6} \log \frac{[Cr_2O_7^{2-}]}{[Cr^{3+}]}$ Thus an abrupt increase in the potential of the solution in the vicinity of the equivalence point is observed. This makes the equivalence point in the experiment, the potential of the cell is determined with reference to saturated calomel electrode. **Instrumentation:** a) Reference electrode: Calomel electrode is used as reference electrode. b) Indicator electrode: The electrode whose potential is dependent upon the concentration of the ion to be determined is termed as the indicator electrode Example: Platinum electrode **Applications**: 1. Used in analysis of pollutants in water 2. Used in the quality analysis in the food industry. 3. Used in the quality analysis in the pharmaceutical industry. 4. Used as an analytical tool in the paper, drug, textile, paint industries	4mark 2mark 2mark
(b)	**What are Conducting polymers? Explain the mechanism of conduction in Poly aniline. And mention the applications of conducting poly aniline**	**7Marks**
	These are the organic polymers having the conductivity band similar to that of conductors with highly delocalized Pi electron system. Ex: Polyaniline, Polypyrole, Polythiopene, Polyacetylene, etc Conducting polymers are obtained by doping an oxidizing or reducing agent into organic polymers. With the carbon backbone consisting of alternate double bond & single bonds doping results in delocalization of electrons responsible for conduction.	1mark

	$HCl + NaOH \longrightarrow NaCl + H_2O$ 2. The first end point corresponds to the neutralization of strong acid (HCL) as the strong acid is neutralized first because of its complete dissociation. 3. The second end point corresponds to the neutralization of weak acid (CH_3COOH) as the weak acid is neutralized after the strong acid because of Its partial dissociation. $CH_3COOH + NaOH \longrightarrow CH_3COO^- + Na^+ + H_2O$ 4. Further, addition of NaOH after the neutralization raises the conductance steeply due to the presence of OH^- ions. 5. The point of intersection of two lines in the graph gives the equivalence points as shown in the below graph. 	1mark
(c)	**Explain the synthesis, Properties and applications of Polyurethanes**	5Marks
	Ployurethanes are produced by the polymerization of Di-isocyanate and diol or triol by addition polymerization reaction. (or the addition reaction between 2, 4-tolylene di-isocyanate with glycol).	2mark
	$n\ O{=}C{=}N{+}R{+}N{=}C{=}O + n\,HO{-}R{-}OH \longrightarrow {+}\overset{O}{\overset{\Vert}{C}}{-}\underset{H}{\underset{\vert}{N}}{+}R{+}\overset{H}{\overset{\vert}{N}}{-}\underset{O}{\underset{\Vert}{C}}{-}O{-}R{-}O{+}_n$ Di-isocyanate Diol Ployurethanes	1mark
	Properties: i. These can be obtained in the form of foams, fibers, Elastomers, coatings ii. The foams are available in both rigid & flexible forms.	1mark
	Uses: i. Flexible foams are used for cushions in automobiles & furniture. ii. Rigid foams are used to reinforce hallow structural units. iii. Fibers of Polyurethanes are used in lightweight garments and swim suits because of their stretching property. iv. These are used to coat gymnasium floor and dance floor. v. These are used in tire treads and industrial wheels.	1mark
4. (a)	**Explain the theory, Instrumentation and applications of Potentiometry**	8Marks
	Theory: Redox titrations can be carried out potentiometrically using platinum-calomel electrode combination in a manner similar to acid-base neutralizations. For the reaction. Reduced from $\longrightarrow$ oxidized form + n electrons The potential is given by Nernst equation. $E = E^0 + \frac{0.0591}{n} \log \frac{[\text{oxidized form}]}{[\text{reduced form}]}$	

	Mechanism of conduction in Poly aniline  	2mark
	Protonic acid doping: The synthesis of conducting polyaniline is a typical example of this type of doping technique. In this technique current carrying charged species (-/+) are created by the protonation of imine nitrogen. Polyaniline is partially oxidized, first using a suitable oxidizing agent into a base form of aniline which contains alternating reduced and oxidized forms of aniline polymer backbone. This base form of aniline when treated with aqueous HCl (1M) undergoes protonation of imine nitrogen atom, creating current carrying charged sites (+ve) in the polymer backbone. These charges are compensated by anions (Cl^-) of the doping agent, giving the corresponding salt. This type of protonic acid doping of polyaniline results in an increase of conductivity by approximately 09-10 orders of magnitude.	3mark
	Applications of conducting poly Aniline i) Used as conducting tracks on PCB's (Printed Circuit Boards) ii) Used as electrode materials for rechargeable batteries iii) Used in humidity sensors. iv) Used in electrochemical transducers and biosensors. v) Used in artificial nerves and optical computers etc. vi) Used in smart windows which absorb sunlight	1mark
(c)	**Explain the synthesis and applications of Kevlar fibres**	**5Marks**
	Synthesis: Kevlar is synthesized in solution from the monomers 1,4-phenylene-diamine (*para*-phenylenediamine) and terephthaloyl chloride in a condensation reaction yielding hydrochloric acid as a byproduct.	2mark
	 	1mark
	Properties: i) High tensile strength ii) Flame resistance iii) Resistant to chemical action iv) Light in weight v) Low thermal expansion.	1mark
	Applications: Used as an inner lining for some bicycle tires to prevent punctures flame-resistant clothing. heat protective clothing and helmets asbestos replacement (e.g. brake linings) hot air filtration fabrics	1mark

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Chemistry

II Semester: CIE III-Internal assessment test **Date: 30-08-2022**
Sub: Engineering Chemistry (21CHE22)
Time: 120 minutes **Section: A & B** **Max Marks: 100**

Note:	**1.**	**Answer any *FIVE FULL* questions.**

		Module-1	Marks
1	a)	Define Single Electrode Potential. Derive Nernst equation for single electrode potential	(7)
	b)	What are reference electrodes? Describe the construction and working of calomel electrode	(7)
	c)	Calculate the emf of the cell, Fe/Fe^{2+} (0.02M)//Ag^{+} (0.2M)/Ag at 298 K, If standard electrode potentials of Fe and Ag electrodes are -0.44V and 0.8 V respectively. Write the cell reactions.	(6)

(OR)

2	a)	Explain the construction, working and advantages of Li-ion battery.	(7)
	b)	Distinguish between primary, secondary and reserve batteries with examples	(7)
	c)	Explain construction and working of glass electrode	(6)
		Module-2	
3	a)	Define metallic corrosion? Describe the electrochemical theory of corrosion taking iron as an example	(7)
	b)	What is anodizing? Explain the process of Anodizing of Aluminium	(7)
	c)	Explain the factors affecting the rate of corrosion (i) Nature of corrosion product, (ii) Ratio of anodic to cathodic areas & (iii) Temperature	(6)

(OR)

4	a)	What is meant by metal finishing? Mention (any five) technological importance of metal finishing	(7)
	b)	What is electroplating? Explain the electroplating of chromium	(7)
	c)	What is electroless plating? Explain the electroless plating of copper	(6)

		Module-3	
5	a)	Explain the synthesis and application of Polyurethane	(7)
	b)	What are conducting Polymers? Describe the mechanism of conduction in Polyaniline	(7)
	c)	Explain the synthesis and application of Kevlar fibres.	(6)

(OR)

6	a)	What are Carbon nanotubes? Explain the properties and applications of carbon nanotubes.	(7)
	b)	What are Graphenes? Mention their properties and applications.	(7)
	c)	What are Fullerenes? Mention their properties and applications.	(6)

		Module-4	
7	a)	Explain the construction and working of photovoltaic cells	(7)
	b)	Describe the construction and working of Methanol –Oxygen fuel cell	(7)
	c)	Explain the synthesis and application of Polymethyl methacrylate	(6)

(OR)

8	a)	Briefly explain any six basic principles of green chemistry	(7)
	b)	Explain the sources, ill effects of oxides of nitrogen, sulphur dioxide and carbon monoxide	(7)
	c)	Explain the synthesis of Paracetamol by conventional and green route from phenol	(6)
		Module-5	
9	a)	Explain the theory, instrumentation and applications of Colorimetry	(7)
	b)	Write the principles and requirement of titrimetric analysis	(7)
	c)	Define COD? In a COD test, 28.5 cm^3 and 12.5 cm^3 of 0.02 N FAS solutions are required for blank & sample titration respectively. The volume of test sample used was 25 cm^3. Calculate the COD of the sample solution	(6)

(OR)

10	a)	Explain the determination of hardness of water by EDTA method.	(7)
	b)	Explain the theory and instrumentation of potentiometry.	(7)
	c)	Explain the different sources and impurities present in water.	(6)

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

II semester: III-Internal assessment test **Date: 30-08-2022**

Scheme of valuation

Sub: Engineering Chemistry (21CHE22) **Section: A & B**

Q.no	Scheme	Marks
1. (a)	**Define Single Electrode Potential. Derive Nernst equation for single electrode potential**	**7Marks**
	Single Electrode Potential: It is the potential developed at the interface between the metal and the solution when a metal is immersed in a solution of its own ions. The maximum work available from a reversible chemical process is equal to the maximum amount of electrical energy that can be obtained; it shows decrease in free energy.	1mark
	$W_{max} = - \Delta G$ There fore $\Delta G = - nFE$ $\boxed{E = \frac{\Delta G}{-nF}}$ $\boxed{E^0 = \frac{\Delta G^0}{-nF}}$ Consider the following reversible electrode reaction, $\boxed{M^{n+} + ne^- \rightleftharpoons M}$	1mark
	For the above reaction the equilibrium constant [Kc] can be written as, $Kc = \frac{[M]}{[M^{n+}]}$	1mark
	Kc and ΔG are related according to the following thermodynamic equation $\boxed{\Delta G = \Delta G^0 + RT \ln Kc}$ ----------→1 Dividing the equation 1 by – nF and Substituting the value of Kc,	1mark
	$\frac{\Delta G}{-nF} = \frac{\Delta G^0}{-nF} + \frac{RT \ln}{-nF}[M] / [M^{n+}]$ ----------→2	1mark
	Substituing the values of $\frac{\Delta G}{-nF}$ and $\frac{\Delta G^0}{-nF}$ in equation 3, Equation 3 => $E = E^0 + \frac{RT \ln [M^{n+}]}{nF}$ When [M] = 1	1mark
	$E = E^0 + \frac{2.303RT}{nF} \log_{10} [M^{n+}]$ ⟶ Nernst equation	1mark
(b)	**Explain the construction, working and advantages of Calomel electrode.**	**7Marks**
	 Calomel electrode Fig and Labeling Explanation Reactions Advantages	1mark 3mark 1mark 1mark
	• Definition: The electrodes which are used to find out the electrode potential of other electrodes • Calomel electrode consisting of a glass container at the bottom of which mercury is placed and above which a layer of mercury and mercurous chloride (called calomel) is placed • 3/4th of bottle is filled with saturated KCl solution. • Calomel Electrode potential depends on the concentration of chloride ions. • The calomel electrode acts as both anode and cathode depending upon the other electrode used. • The platinum wire is used for electrical connections. Salt bridge is used to couple with other half cell. • The calomel electrode can be represented as $Hg (l) / Hg_2 Cl_2 (S) / Cl^-$ • When it acts as anode the electrode reactions is, • $2Hg + 2Cl^- \longrightarrow Hg_2Cl_2 + 2e^-$	1mark

- When it acts as cathode the electrode reaction is
- $Hg_2Cl_2 + 2e^- \longrightarrow 2Hg + 2Cl^-$

(c) Explain the construction, working and applications of Li-ion battery and mention the uses of Lithium-ion batteries. 6Marks

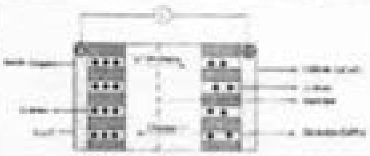


Fig and Labeling	2mark
Explanation	2mark
Reactions	1mark
Advantages	1mark

- LiCoO2 battery contains anode made-up of layered graphite and contains Lithium atoms in between the layers (Intercalation).
- The cathode of the battery is made-up of layered Cobalt oxide and contains Lithium atoms in between the layers.
- The cathode and anode are separated by Polymeric separator
- Lithium salts such as LiPF6 is used as electrolyte.
- During discharge the Lithium atoms undergoes oxidation and moves towards Cathode as Lithium ions.
- At Cathode Co4+ ions are reduced to Co3+ ions and Lithium ions enters into the Cobalt oxide ayes as Lithium atoms.

The chemical reactions for charge and discharge are as shown below:

At Anode: $xLiC \rightleftharpoons C + xLi^+ + xe^-$

At Cathode: $CoO_2 + xLi^+ + xe^- \rightleftharpoons LiCoO_2$

Net cell reaction $xLiC + CoO_2 \rightleftharpoons C + LiCoO_2$

Applications of lithium ion batteries:

Cellular phones, Portable CD player, Laptops, Portable LCD TVs, Electric vehicles etc.

2. (a) Distinguish between primary, secondary and reserve batteries with examples. **7Marks**

a) Primary Batteries: These are the batteries which serve as a source of energy only as long as the active chemical species are present in the battery. These batteries cannot be chargeable as the cell reactions are irreversible. These are designed for only single discharge. 3mark

Ex: Dry Cell (Zn-MnO2), Li-MnO2 Battery etc.,

b) Secondary Batteries: These batteries are chargeable and can be used again and again as the cell reactions are reversible and are often called as reversible batteries. During charging the cell acts like electrolytic cell by converting electric energy into chemical energy, hence these batteries are called as storage batteries. 2mark

Ex: Lead acid battery, Ni-Cd battery, Ni-MH battery, Li-Ion battery etc.

c) Reserved Batteries: The batteries which can be stored as inactive state by separating a key component from the battery and the batter is made active by replacing the key component prior to the applications (usage). The key components of the battery such as electrolyte etc., is separated from the battery and the batteries can be stored for a longer period. 2mark

Ex: Mg – water activated batteries (Mg- AgCl & Mg CuCl), Zn-O2 batteries etc., Batteries etc.

(b) Explain the construction and working of Glass Electrode **7Marks**

Fig and Labeling	1mark
Explanation	3mark
working	3mark

- Glass electrode is H+ ions sensitive electrode and widely used for pH determinations.
- It consisting of a long glass tube at the bottom of which a thin and delicate glass bulb is present.

	• The glass bulb is made up of special type of glass (12 % Na$_2$O, 6% of Cao, 72% of SiO$_2$) with low melting point and high electrical conductance. • The glass bulb is filled with 0.1.M HCl solution. • Ag / AgCl is used as a internal reference electrode. • The glass electrode can be represented as Ag/AgCl (s) /0.1M (HCl) / Glass. **Working:** • When the glass electrode containing 0.1M HCl is dipped in solution of different H+ ion concentration a boundary potential (Eb) is developed across the gel layers of the glass membrane. • The conduction is achieved by the ion exchange between the Na+ ions of the glass and H+ ions of the solution as follows. • $H^+ + Na^+ (glass) \rightleftarrows H^+ (glass) + Na^+$ • The boundary potential (Eb) is due to the difference in the concentration of H+ ion inside the glass bulb (C1) and outside the glass bulb (C2) • Eb = 0.0591 log10 C2/C1 The Glass electrode potential (EG) developed by the glass is given by • EG = Eb + E Ag/AgCl + E asymmetric potential • EG = (Eout-Ein) + E Ag/AgCl + E asymmetric potential • $EG = Eo + \frac{0.0591}{n}\log[C2] - Eo + \frac{0.0591}{n}\log[C1] + E_{Ag/AgCl} + E$ asy. potential • EG = 0.0591 log [H+] + L Where $L = \frac{0.0591}{n}\log[C1] + E_{Ag/AgCl} + E$ (asymmetric potential • EG = -0.0591 PH + L (PH=-log10 [H+] • EG = L -0.0591 PH or EGlass =E^0G– 0.0591 PH	
(c)	**For the cell, Fe/Fe^{2+} (0.01M)//Ag+ (0.1M)/Ag write the cell reaction and calculate the emf of the cell at 298K, if standard electrode potentials of Fe and Ag electrodes are -0.44V and 0.8 V respectively.**	**6Marks**
	At Anode: $Fe (S) \rightarrow Fe^{++} (aq) + 2e^-$ At Cathode: $2Ag^+ (aq) + 2e^- \rightarrow 2Ag (S)$ $E^0cell = E^0 cathode - E^0 anode$ $= E^0 Ag^+/Ag - E^0 Fe^{++}/Fe$ $= 0.8 - (-0.42)$ **= 1.22 V.** $\boxed{Ecell = E^0cell + \frac{0.0591}{n}\log_{10}\frac{[M^{n+}] \text{ at cathode}}{[M^{n+}] \text{ at anode}}}$ $= E^0cell + \frac{0.0591}{n}\log10 \frac{[Ag^+]^2}{[Fe^{++}]}$ $= 1.22 + \frac{0.0591}{2}\log10 \frac{[0.1]^2}{[0.01]}$ = 1.22 + 0.02955 log 1 **= 1.22 V**	1mark 1mark 1mark 1mark 1mark 1mark
3.(a)	**Define metallic corrosion? Describe the electrochemical theory of corrosion taking iron as an example**	**7Marks**
	Corrosion is defined as the destruction or deterioration of a metal or its alloy and consequent loss of metal, caused due to direct chemical action or electrochemical reactions with its environment. Electrochemical theory of corrosion According to electrochemical theory, corrosion of metals occurs due to the following changes, when they are exposed to the environment.	1mark

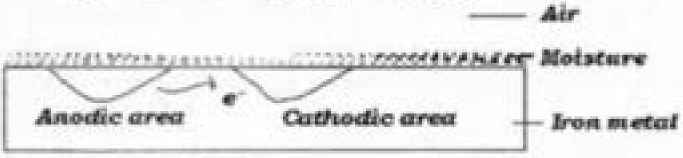
1) A large number of minute galvanic cells are formed which acts as anodic and cathodic areas. 1mark

2) At anodic area the metal undergoes oxidation and electrons are liberated which migrates towards cathodic region 1mark

$$\underset{\text{Metal}}{M} \longrightarrow \underset{\text{Metal ions}}{M^{n+}} + ne^-$$

Ex: when iron is exposed to the environment it undergoes oxidation as

$$Fe \longrightarrow Fe^{2+} + 2e-$$



1mark

3) At Cathodic area reduction reactions takes place as follows

a) In acidic and de-aerated medium: Hydrogen ions are reduced to hydrogen gas by reacting with electrons.

$$2H^+ + 2e^- \longrightarrow H_2$$

b) In alkaline and de-aerated medium: Moisture of the environment reacts with electrons producing hydroxyl ions and Hydrogen gas at cathode. 1mark

$$2 H_2O + 2e^- \longrightarrow 2OH^- + H_2$$

c) In neutral and aerated medium: Moisture of the environment reacts with electrons and Oxygen and produces hydroxyl ions at cathode.

$$2 H_2O + O_2 + 4e^- \longrightarrow 4OH^-$$

1mark

4) Formation of corrosion product: The hydroxyl ions formed at Cathodic area reacts with metal ions (M^{n+} ions) formed at anodic area and forms metal hydroxides which further reacts with moisture and oxygen forming an insoluble metal oxide corrosion product.

$$2Fe^{++} + 4OH^- \longrightarrow 2Fe\,(OH)_2$$

$$2Fe\,(OH)_2 + O_2 + nH_2O \longrightarrow Fe_2O_3.\ nH_2O \text{ (rust)}$$

1mark

(b) Explain the factors affecting the rate of corrosion (i) Nature of corrosion product, (ii) Ratio of anodic to cathodic areas & (iii) pH **7Marks**

i) Nature of corrosion product 2mark
ii) ratio of anodic to Cathodic area 2mark
ii) Ph 2mark

i) Nature of corrosion product:

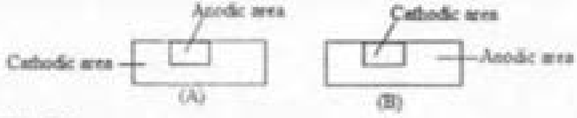
If the nature of corrosion product formed on the metal surface is protective in nature (i.e., thin, invisible, uniform and adherent), it prevents the further corrosion of metal.

If the corrosion product on the metal surface is non- protective in nature (i.e., thick, visible, non-uniform and non-adherent), it does not prevent the corrosion of metal is and it leads to further corrosion of metal.

Example: In oxidizing environment metals like Al, Cr, Ti etc. forms protective metal oxide films on their surfaces which prevent further corrosion of metals. Metals like Zn, Fe, Mg, etc .do not form protective layer on their surfaces and are readily under goes corrosion

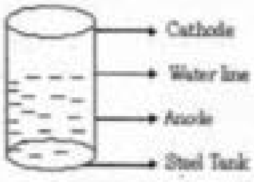
ii) Ratio of Anodic to Cathodic areas:

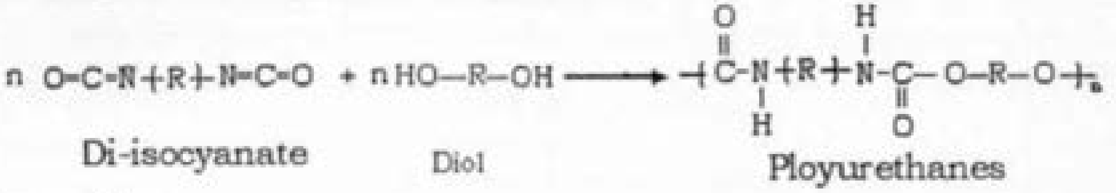
If a metal has small anodic and large cathodic area the rate of corrosion increases and vice versa. This is because when anodic area is small the electrons liberated during oxidation are completely consumed on large cathodic surface for the reduction reactions and rate of corrosion increases.

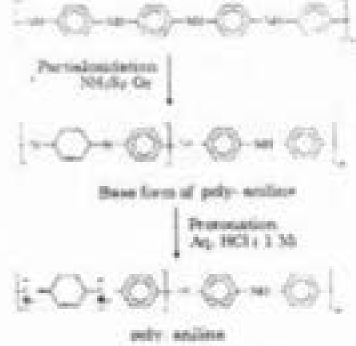


iii) Ph

In general at lower PH value the rate of corrosion is more and at higher pH

	value (more than pH = 10) the rate of corrosion ceases due to the formation of protective coating of hydrous oxides on the metal. Corrosion rate is maximum between PH 3 and 10 in presence of oxygen	
(c)	**Explain: (i) Differential metal corrosion & (ii) Water-line corrosion**	**6Marks**
	(i) Differential metal corrosion. (Galvanic corrosion) • This type corrosion occurs when two different metals are in contact with each other due to the formation of galvanic cell. • The metal having less standard reduction potential value acts as anode and under goes oxidation by liberates electrons, which migrates to the cathodic region. • The other metal having high SRP value acts as cathode and reduction reaction takes places on its surface forming OH- ions. • The anodic metal undergoes corrosion and cathodic metal is unaffected. • The rate of corrosion depends on the potential difference between the two metals. If the difference is more corrosion occurs faster and vice versa. • The reactions that occurs are, At anode : $Fe \longrightarrow Fe^{++} + 2e-$ At cathode : $H_2O + O_2 + 4e^- \longrightarrow 4OH^-$ Corrosion Product: $2Fe^{++} + 4OH^- \longrightarrow 2Fe(OH)_2$ $2Fe(OH)_2 + O_2 + 2H_2O \longrightarrow 2(Fe_2O_3 . 3H_2O)$ rust. **Example:** Iron metal in contact with Copper metal Brass tap in contact with Iron pipe etc. **(ii) Water line corrosion:** It is differential aeration type of corrosion observed in Iron water storage tanks, ships, etc. The part of the metal below waterline is exposed to less Oxygen concentration act as anode and undergoes corrosion than the other part which is more exposed to atmospheric Oxygen which acts as cathode. The reactions that occurs are, At anode : $Fe \longrightarrow Fe^{++} + 2e-$ At cathode : $H_2O + O_2 + 4e^- \longrightarrow 4OH^-$ Corrosion Product: $2Fe^{++} + 4OH^- \longrightarrow 2Fe(OH)_2$ $2Fe(OH)_2 + O_2 + 2H_2O \longrightarrow 2(Fe_2O_3 . 3H_2O)$ rust. 	3mark 3mark
4. (a)	**What is meant by metal finishing? Mention (any five) technological importance of metal finishing**	**7Marks**
	It is a process of modifying surface properties of metals by deposition of a layer of another metal or polymer on its surface by the formation of an oxide film The main technological importance of metal finishing include 1. Imparting the metal surface to higher corrosion resistance. 2. Imparting improved wear resistance. 3. Providing electrical and thermal conducting surface. 4. Imparting thermal re sistance and hardness. 5. Providing optical and thermal reflectivity.	2mark 5mark
(b)	**What is electroplating? Explain the electroplating of chromium**	**7Marks**
	It is a process of deposition of a metal by electrolysis, over the surface of substrate. Plating bath Chromic acid and H_2SO_4 in 100:1 proportion. Temperature 45-60°C. Current Density $100\text{-}200mA/Cm^2$. Anode Insoluble anodes Pb-Sb or Pb-Sn coated with PbO_2.	1mark

	Cathode Object to be plated. Chromium anodes are therefore not used in Cr plating for following reason. - Chromium metal passivate strongly in acid sulphate medium & - Chromium anode gives rise to Cr (III) ions on dissolution. In presence of large concentration of Cr (III) ions, a black Cr deposit is obtained. Anodic reaction: $H_2Cr_2O_7 \longrightarrow Cr_2O_7^{--} + 2H^+ + 2e^-$ $Cr_2O_7^{--} + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$ Cathodic reactions: $Cr^{3+} + 3e- \longrightarrow Cr$	5mark 1mark
(c)	**What is electroless plating? Explain the electroless plating of copper**	**6Marks**
	It is process of deposition of a metal from its salt solution on a catalytically active surface of a substrate by using suitable reducing agent and without using electrical energy. Metal ions + Reducing agent → Metal + Oxidized product Plating bath Solution: $CuSO_4.5\,H_2O$ (12 g per dm³), NaOH (15 g per/L Rochelle salt (14 g per dm³), EDTA (15 g per dm³) Reducing Agent : Formaldehyde (8 g per dm³) Complexing agent : EDTA Solution. P^H : 11 - 12 Temperature : 25 °c At Anode : $2HCHO + 4OH^- \rightarrow 2HCOO^- + 2H_2O + H_2 + 2e^-$ At Cathode : $Cu^{2+} + 2e^- \rightarrow Cu$ Overall reactions : $4OH^- + Cu^{2+} + 2HCHO \rightarrow Cu + 2HCOO^- + 2H_2O + H_2$	1mark 5mark
5. (a)	**Explain the synthesis and application of Polyurethane**	**7Marks**
	Ployurethanes are produced by the polymerization of Di-isocyanate and diol or triol by addition polymerization reaction. (or the addition reaction between 2, 4-tolylene di-isocyanate with glycol).  $n\ O{=}C{=}N{+}R{+}N{=}C{=}O + n\,HO{-}R{-}OH \longrightarrow {+}\overset{\overset{O}{\|}}{C}{-}\underset{\underset{H}{\vert}}{N}{+}R{+}\overset{\overset{H}{\vert}}{N}{-}\underset{\underset{O}{\|}}{C}{-}O{-}R{-}O{+}_n$ **Properties:** i. These can be obtained in the form of foams, fibers, Elastomers, coatings ii. The foams are available in both rigid & flexible forms. **Uses:** i. Flexible foams are used for cushions in automobiles & furniture. ii. Rigid foams are used to reinforce hallow structural units. iii. Fibers of Polyurethanes are used in lightweight garments and swim suits because of their stretching property. iv. These are used to coat gymnasium floor and dance floor. v. These are used in tire treads and industrial wheels.	3mark 2mark 1mark 1mark
(b)	**Describe the mechanism of conduction in Polyaniline and factors influencing conduction in organic polymers**	**7Marks**
	Conducting polymers are obtained by doping an oxidizing or reducing agent into organic polymers. With the carbon backbone consisting of alternate double bond & single bonds doping results in delocalization of electrons responsible for conduction. Mechanism of conduction in Poly aniline	



2mark

4mark

Protonic acid doping:

The synthesis of conducting polyaniline is a typical example of this type of doping technique. In this technique current carrying charged species (-/+) are created by the protonation of imine nitrogen.

Polyaniline is partially oxidized, first using a suitable oxidizing agent into a base form of aniline which contains alternating reduced and oxidized forms of aniline polymer backbone. This base form of aniline when treated with aqueous HCl (1M) undergoes protonation of imine nitrogen atom, creating current carrying charged sites (+ve) in the polymer backbone. These charges are compensated by anions (Cl^-) of the doping agent, giving the corresponding salt.

1mark

This type of protonic acid doping of polyaniline results in an increase of conductivity by approximately 09-10 orders of magnitude.

factors influencing conduction in organic polymers

i

(c) Explain any two size dependent properties of nanomaterials **6Marks**

Properties	**Examples**
Catalytic	Better catalytic efficiency **through** higher surface-to-volume ratio
Electrical	Increased electrical conductivity in ceramics and magnetic nanocomposites, increased **electric** resistance in metals
Magnetic	Increased magnetic coercivity up to a critical grain size, superparamagnetic behaviour
Optical	Spectral shift of optical absorbtion and fluorescence properties, increased quantum efficiency of semiconductor crystals

6mark

6. (a) What are nanomaterials? Explain the synthesis of nanomaterial by sol gel process **7Marks**

Sol-gel technique is an important bottom-up approach for the synthesis of Nanomaterials and it consists of a following steps.

1mark
3mark
3mark

1. Preparation of sol: A sol is prepared by dispersing precursors in solvent.
2. Conversion of sol into gel: The sol is further converted into a gel by hydrolysis and condensation of precursors.

Hydrolysis : -

$M (OC_2H_5)_4 + X H_2O \rightarrow M (OC_2H_5)_4 - X (OH)_X + X C_2H_5OH$

Condensation:

$M (OC_2H_5)_4 - X (OH)X + M (OC_2H_5)_4 - X (OH)X \rightarrow (OC_2H_5)_4 - X (OH)X - 1$
$M - O - M (OH)X - 1 (OC_2H_5)_4 - X + H_2O$

3. Aging of a gel: Gel on aging for a known period of time, finally condenses

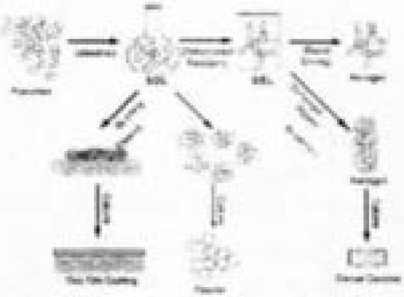
to nanoscale clusters of metal hydroxides

4. Removal of solvent: The solvent can be removed from gel by evaporative drying

5. Heat treatment: The obtained sample is heated at high temperature from nanoparticles

Applications

Used in optics and electronics
(bio) sensors, medicine
(e.g. controlled drug, chromatography)
ultra filtration
reverse osmosis.

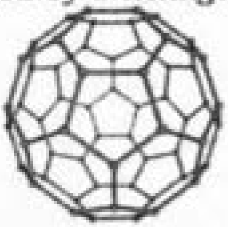


(b) Write a note on Fullerenes. Mention its applications **7Marks**

A fullerene is any molecule composed of carbon in the form of a hollow sphere, ellipsoid, tube, and many other shapes. Spherical fullerenes are also called bucky balls, and they resemble the balls used in football (soccer). Cylindrical ones are called carbon nanotubes or bucky tubes. Fullerenes are similar in structure to graphite, which is composed of stacked graphene sheets of linked hexagonal rings, but they may also contain pentagonal (or sometimes heptagonal) rings. 4mark

Structure of C60 Fullerene

Contains 60 carbon atoms
12 Pentagon rings and 20 Hexagon rings
Each pentagon ring is surrounded by 5 hexagon rings
Each Hexagon ring is surrounded by 3 hexagon rings and 3 pentagon rings



1mark

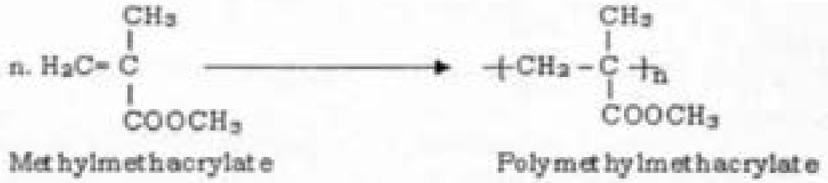
Applications of Fullerenes

1) Polymer composite of C60 molecule is used in making organic photovolatic cells. 1mark
2) Fullerenes have been extensively used for several biomedical applications including the design of high-performance MRI contrast agents,
3) X-Ray imaging contrast agents,
4) Photodynamic therapy, drug and gene delivery.

(c) Explain the synthesis and applications of Poly Methyl Methacrylate **6Marks**

Plexi glass is the trade name of polymethyl methacrylate. The monomers used for the preparation of plexi glass are methyl methacrylate. Plexi glass is prepared by emulsion polymerization method at 60 to $70^{o}{}_{C}$ in presence of trace of H_2O_2 or Acetyl peroxide as initiator. 3mark

2mark

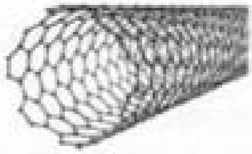


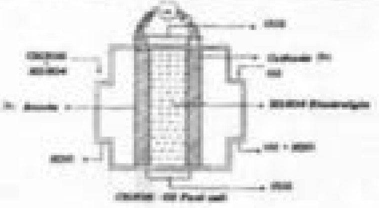
$$n.\ H_2C=\overset{\displaystyle CH_3}{\underset{\displaystyle COOCH_3}{C}} \longrightarrow -\!\!\left[CH_2-\overset{\displaystyle CH_3}{\underset{\displaystyle COOCH_3}{C}}\right]\!\!-_n$$

Methylmethacrylate   Polymethylmethacrylate

Properties:

i. Plexi glass is a white transparent thermoplastic

	ii. It has got high optical clarity iii. It is resistant to chemical action Applications: i. It is used in the preparation of aircraft windows. ii. Attractive sign boards. iii. Manufacturing of transparent moulded articles & tubes. iv. Lenses for automobiles, artificial eyes	1mark
7. (a)	**Explain the synthesis, properties & applications of Kevlar Fibre**	**7Marks**
	Synthesis: Kevlar is synthesized in solution from the monomers 1,4-phenylene-diamine (*para*-phenylenediamine) and terephthaloyl chloride in a condensation reaction yielding hydrochloric acid as a byproduct.  **Properties:** i) High tensile strength ii) Flame resistance iii) Resistant to chemical action iv) Light in weight v) Low thermal expansion. **Applications:** Used as an inner lining for some bicycle tires to prevent punctures flame-resistant clothing. heat protective clothing and helmets asbestos replacement (e.g. brake linings) hot air filtration fabrics	3mark 2mark 2mark
(b)	**Explain the properties and applications of Carbon nanotubes**	**7Marks**
	Carbon nanotubes (CNTs) are allotropes of carbon. These cylindrical carbon molecules have interesting properties that make them potentially useful in many applications in nanotechnology, electronics, optics and other fields of materials science. These are classified into Single walled nanotubes: These are carbon nanotubes which are formed by the rolling of one layer of graphitic sheets. Multi walled nanotubes: These are carbon nanotubes which are formed by the rolling of many layers of graphitic sheets.  **Properties of Carbon Nanotubes** CNTs exhibit high electrical conductivity and high thermal conductivity. Have low density and very high mechanical strength. The structure of CNTs is of SP2 carbon - carbon bonds which are stronger than the SP3 bonds found in diamond. CNTs have Very High Tensile Strength	5mark 1mark 1mark
(c)	**Describe the construction and working of Methanol –Oxygen fuel cell**	**6Marks**
	It consists of two electrodes made up of platinum as anode and cathode and in between the electrodes H_2SO_4 is placed as a electrolyte. Methanol and H_2SO_4 is supplied at the anode and pure oxygen gas is supplied at the cathode. The methanol is oxidized to CO_2 & H_2O with the liberation of 1.20v of electrical energy.	3mark



2mark

The cell reactions are as follows.

At anode : $CH_3OH + H_2O \longrightarrow CO_2 + 6H^+ + 6e^-$

At cathode : $\frac{3}{2} O_2 + 6H^+ + 6e^- \longrightarrow 3H_2O$

NCR : $CH_3OH + \frac{3}{2} O_2 \longrightarrow CO_2 + 2H_2O$

1mark

Applications:

1) Used in Military applications.
2) Used for large scale power production stations.

8. (a) Explain the construction and working of photovoltaic cells **7Marks**

A typical silicon photovoltaic cell is composed of a thin layer of phosphorus doped. (n-type) semiconductor on the top and a thick layer boron doped p-type semiconductor at the bottom. Hence a p-n junction is formed.

A metallic grid forms one of the electrical current contacts of the diode and allows light to fall on the semiconductor between the grid lines.

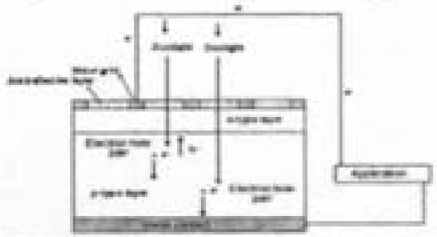
An antireflective layer (TiO_2 or silicon nitride) between the grid lines increases the amount of light transmitted.

When light radiation falls on the p-n junction, electron – hole pairs are generated by the absorption of the sun radiation.

The electrons are moves and collect at the n-type end and the holes moves to p-type end.

When these two ends are electrically connected through a conductor, photoelectric current is produced.

5mark



2mark

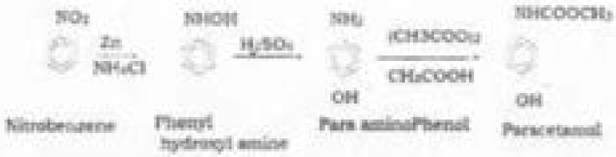
(b) Explain the synthesis of Paracetamol by conventional and green route from phenol **7Marks**

conventional route synthesis of Paracetamol 4mark

The reduction of nitrobenzene by zinc and ammonium chloride gives phenyl hydroxylamine

When phenylhydroxylamine is treated with sulfuric acid it gives para aminophenol

When para aminophenol is acetylated by a mixture of acetic anhydride and glacial acetic acid to give paracetamol



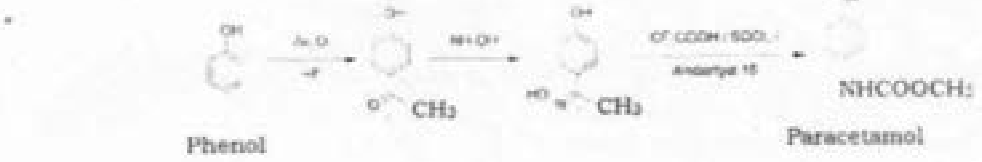
Green route synthesis of Paracetamol

Green Synthesis of paracetamol by Hoechst-Celanese includes

Direct acylation of phenol with acetic anhydride catalyzed by HF,

3mark

Conversion of the ketone to a ketoxime with hydroxylamine,
Acid-catalyzed Beckmann rearrangement to give the amide



(c) **Briefly explain any six basic principles of green chemistry** **6Marks**

1. Waste Prevention. It is better to prevent waste formation than to treat it after it is formed. 1mark
2. Atom economy. Design synthetic methods to maximize incorporation of all material used into final product. 1mark 1mark
3. Less hazardous chemical synthesis: Design chemical synthesis as safe as possible. use or generate materials of low human toxicity and environmental impact. 1mark
4. Design safer chemicals. Chemical product design should reduce toxicity and eco friendly. 1mark
5. Energy efficiency. Energy requirements should be minimized by conducting synthesis at ambient temperature and pressure. 1mark
6. Smart catalysis. Use of suitable catalysts instead of stoichiometric reagents in reactions to reduce time, waste and energy.

9. (a) Explain the theory, instrumentation and applications of flame photometry **7Marks**

Theory: Redox titrations can be carried out potentiometrically using platinum-calomel electrode combination in a manner similar to acid-base neutralizations. For the reaction. 3mark

$$\text{Reduced from} \longrightarrow \text{oxidized form} + \text{n electrons}$$

The potential is given by Nernst equation.

$$E = E^0 + \frac{0.0591}{n} \log \frac{[\text{oxidized form}]}{[\text{reduced form}]}$$

Where E° is the standard potential of the system. The potential of the system is thus controlled by the ratio of the concentration of the oxidized to that of the reduced species in the vicinity of the end point of the titration. This may be followed potentiometrically and a change of potential against volume (titration curve) is characterized by a sudden change of potential at the equivalence point. From the equivalence point the concentration of the sample can be determined.

is explained as follows. The reaction that takes place in the determination of Fe^{2+} is

$$Fe^{2+} \longrightarrow Fe^{3+} + e^-$$

$$Cr_2O_7^{2-} + 14H^+ + 6e \longrightarrow 2Cr^{3+} + 7H_2O$$

Prior to the equivalence point the potential is determined by the Fe^{3+}/Fe^{2+} system and the potential is given by the equation.

$$E_{eq} = E_{Fe}^{2-} = E^0 + \frac{0.0591}{n} \log \frac{[Fe^{3+}]}{[Fe^{2+}]}$$

$$= 0.75V - 0.0591 \log \frac{[Fe^{3+}]}{[Fe^{2+}]}$$

The potential of the solution will be around 0.75V (since the contribution to the potential by the second term is negligible). At the equivalence point the potential is determined by both E and E° is given by

$$E_{eq} = \frac{E^0{}_{Fe}{}^{2-} + E^0\,Cr_2O_7^{-2}}{2} = \frac{0.75V + 1.33V}{2} = 1.04\ V$$

Beyond the equivalence point the potential is determined by $Cr_2O_7^{2-}$ / Cr^{3+} system given by the equation.

	$E_{ind} = E_{cr_2} = E^\circ Cr_2O_7^{2-} / Cr^{3+} - \frac{0.0591}{6} \log \frac{[Cr_2O_7^{2-}]}{[Cr^{3+}]}$ $= 1.33V + \frac{0.0591}{6} \log \frac{[Cr_2O_7^{2-}]}{[Cr^{3+}]}$ Thus an abrupt increase in the potential of the solution in the vicinity of the equivalence point is observed. This makes the equivalence point in the experiment, the potential of the cell is determined with reference to saturated calomel electrode.	2mark
	Instrumentation: a) Reference electrode: Calomel electrode is used as reference electrode. b) Indicator electrode: The electrode whose potential is dependent upon the concentration of the ion to be determined is termed as the indicator electrode Example: Platinum electrode Applications: 1. Used in analysis of pollutants in water 2. Used in the quality analysis in the food industry. 3. Used in the quality analysis in the pharmaceutical industry. 4. Used as an analytical tool in the paper, drug, textile, paint industries etc	2mark
(b)	**Write the principles and requirement of titrimetric analysis**	**7Marks**
	Principles of titrimetric analysis are as follows: • The one solution to be analyzed contains an unknown amount of chemicals. • The reagent of known concentration reacts with chemical of unknown amount in the presence of an indicator to show the end-point. This is the point which shows the completion of the reaction. • The volumes are measured by a titration which completes the reaction between reagent and solution. • The volume and concentration of reagent used in the titration give the amount of reagent in moles. • The amount of unknown chemical in the measured volume of solution is calculated by using the mole ratio of the equation. • The amount of unknown chemical in the original sample is calculated by the amount of unknown chemical in the measured volume.	4mark
	Requirement of titrimetric analysis • Reaction must be stoichiometric. • Titrant must react rapidly with the analyte so that the time required between additions of reagent is minimized. • Chemical reaction must be simple and should take place quantitatively according to a definite equation to form known products. • The reaction should be instantaneous under the experimental conditions maintained. • The reaction should take place essentially to completion under the experimental conditions maintained. • The end point should be well defined either between the reacting substances or by the use of an indicator. • The following glass wares are used for Titrimetric analysis i) Burette ii) Volumetric flask iii) Conical flak iv) Pipette	3mark
(c)	**In a COD test, 30.5 cm³ and 15.5 cm³ of 0.05 N FAS solutions are required for blank & sample titration respectively. The volume of test sample used was 25 cm³. Calculate the COD of the sample solution**	**6Marks**
	COD of the effluent sample = N X(a-b) X8000	2mark

$$= \frac{0.05 \text{ X}(30.5\text{-}15.5) \text{ X}8000}{25}$$ 2mark

$= 240$ mg of O_2 / dm^3 2mark

10. (a) Explain the determination of hardness of water by EDTA method. **7Marks**

Procedure:

Weigh out the given disodium salt of EDTA crystal accurately into a 250 ml volumetric flask. Dissolve in distilled water and dilute up to the mark. Mix well.

$$\text{Molarity of EDTA} = \frac{\text{Weight of } Na_2EDTA \text{ taken x 4}}{\text{Molecular Weight of EDTA (372.24)}}$$ 3mark

Burette : Standard Na_2EDTA Solution

Conical flask : 25 ml water sample + 3 ml of NH_3–NH_4Cl buffer Solution (P^H=10) + 2-3 drops of Eriochrome black – T.

Indicator : Eriochrome black – T

Color change : Wine red to clear blue

From the volume of Na_2EDTA consumed calculate the total hardness of the given water sample.

Observation: 2mark

Weight of weighing bottle + Na_2EDTA salt (M_1) =...... ....g
Weight of empty weighing bottle (M_2) =.................g
Weight of Na_2EDTA salt Transferred (M_1- M_2) =......... ....g

$$\text{Molarity of } Na_2EDTA \text{ Solution} = \frac{\text{Weight of } Na_2EDTA \text{ crystals transferred x 4}}{\text{Molecular weight of } Na_2EDTA \text{ (372.24)}}$$

$$= \frac{\text{............ x 4}}{372.24}$$

$= \text{............. M}$ 2mark

Tabular column:

Burette readings	Trial 1	Trial 2	Trial 3
Final burette reading			
Initial burette reading	0.0	0.0	0.0
Volume of Na_2EDTA solution consumed (cm³)			

Calculation:

$\boxed{\text{1000 cm}^3 \text{ 1 M EDTA = 100 g (Molecular mass of } CaCO_3 = 100)}$

$$\text{.........cm}^3 \text{ of ....M EDTA} = \frac{\text{..........cm}^3 \text{ x ....M x 100}}{1000} \text{ g of } CaCO_3$$

$= \text{..........................}$ g of $CaCO_3$

$$\text{Total hardness of the given water sample} = \frac{\text{...............g x } 10^6}{25} \text{ ppm of } CaCO_3$$

$= \text{........................}$ ppm of $CaCO_3$

(b) Explain the theory and instrumentation of potentiometry. **7Marks**

Theory: Redox titrations can be carried out potentiometrically using platinum-calomel electrode combination in a manner similar to acid-base neutralizations. For the reaction.

Reduced from ⟶ oxidized form + n electrons

The potential is given by Nernst equation.

$$E = E^{\circ} - \frac{0.0591}{n} \log \frac{[\text{oxidized form}]}{[\text{reduced form}]}$$

Where E° is the standard potential of the system. The potential of the system is thus controlled by the ratio of the concentration of the oxidized to that of the reduced species in the vicinity of the end point of the titration. This may be followed potentiometrically and a change of potential against volume (titration curve) is characterized by a sudden change of potential at the equivalence point. From the equivalence point the concentration of the sample can be determined. 4mark

is explained as follows. The reaction that takes place in the determination of Fe^{2+} is

$$Fe^{2+} \longrightarrow Fe^{3+} + e^{-}$$

$$Cr_2O_7^{2-} + 14H^{+} + 6e \longrightarrow 2Cr^{3+} + 7H_2O$$

Prior to the equivalence point the potential is determined by the Fe^{3+}/Fe^{2+} system and the potential is given by the equation.

$$E_{cell} = E_{Fe^{2+}} = E^{\circ} + \frac{0.0591}{n} \log \frac{[Fe^{3+}]}{[Fe^{2+}]}$$

$$= 0.75V + 0.0591 \log \frac{[Fe^{3+}]}{[Fe^{2+}]}$$

The potential of the solution will be around 0.75V (since the contribution to the potential by the second term is negligible). At the equivalence point the potential is determined by both E and E° is given by

$$E_{cell} = \frac{E^{\circ}{}_{Fe^{2+}} + E^{\circ}{}_{Cr_2O_7^{2-}}}{2} = \frac{0.75V + 1.33V}{2} = 1.04\ V$$

Beyond the equivalence point the potential is determined by $Cr_2O_7^{2-}/\ Cr^{3+}$ system given by the equation.

$$E_{cell} = E_{Cr_2} = E^{\circ}Cr_2O_7^{2-} / Cr^{3+} + \frac{0.0591}{6} \log \frac{[Cr_2O_7^{2-}]}{[Cr^{3+}]}$$

$$= 1.33V + \frac{0.0591}{6} \log \frac{[Cr_2O_7^{2-}]}{[Cr^{3+}]}$$

Thus an abrupt increase in the potential of the solution in the vicinity of the equivalence point is observed. This makes the equivalence point in the experiment, the potential of the cell is determined with reference to saturated calomel electrode.

Instrumentation:

a) Reference electrode: Calomel electrode is used as reference electrode. 3mark

b) Indicator electrode: The electrode whose potential is dependent upon the concentration of the ion to be determined is termed as the indicator electrode

Example: Platinum electrode

(c) Define the following units of standard solution.
i) Molarity ii) Normality iii) ppm **6Marks**

i) Molarity (M): It is defined as the number of moles of solute per liter of solution.

$$\text{Molarity} = \frac{\text{no. of moles of solute}}{\text{volume of solution in liters}}$$ 2mark

ii) Normality (N): It is defined as the number of gram equivalents (equivalent weight in grams) of a solute present per liter of the solution. 2mark

$$\text{normality} = \frac{\text{no. of gram equivalents}}{\text{volume of solution in liters}}$$

iii) Parts per million (ppm): It is the number of parts of solute per million parts of the solution (10^6). 2mark

PRINCIPAL
SIET., TUMAKURU.

SHRIDEI INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Chemistry

I Semester: CIE III-Internal assessment test Date: 26-04-2022

Sub: Engineering Chemistry (21CHE12)

Time: 120 minutes Section: C & D Max Marks: 100

Note:	i.	**Answer any *FIVE FULL* questions.**

		Module-1	Marks
1	a)	Define Single Electrode Potential. Derive Nernst equation for single electrode potential	(7)
	b)	Describe the construction and working of calomel electrode	(7)
	c)	Explain the construction and working of Li-ion battery, mention its applications	(6)

(OR)

2	a)	Distinguish between primary, secondary and reserve batteries with examples.	(7)
	b)	Explain construction and working of glass electrode	(7)
	c)	For the cell, Fe/Fe^{2+} (0.01M)//Ag+ (0.1M)/Ag write the cell reaction and calculate the emf of the cell at 298K, if standard electrode potentials of Fe and Ag electrodes are -0.44V and 0.8 V respectively.	(6)

		Module-2	
3	a)	Define metallic corrosion? Describe the electrochemical theory of corrosion taking iron as an example	(7)
	b)	Explain: (i) Differential metal corrosion & (ii) Water-line corrosion	(7)
	c)	What is electroplating? Explain the electroplating of chromium	(6)

(OR)

4	a)	What is meant by metal finishing? Mention (any five) technological importance of metal finishing	(7)
	b)	What is electroless plating? Explain the electroless plating of copper	(7)
	c)	Explain the factors affecting the rate of corrosion (i) Nature of corrosion product, (ii) Ratio of anodic to cathodic areas & (iii) pH	(6)

		Module-3	
5	a)	Explain the synthesis and application of Polyurethane	(7)
	b)	Describe the mechanism of conduction in Polyaniline and factors influencing conduction in organic polymers	(7)
	c)	Explain any two size dependent properties of nanomaterials	(6)

(OR)

6	a)	What are nanomaterials? Explain the synthesis of nanomaterial by sol gel process	(7)
	b)	Write a note on Fullerenes. Mention its applications	(7)
	c)	Explain the synthesis and applications of Poly Methyl Methacrylate	(6)

		Module-4	
7	a)	Explain the synthesis, properties & applications of Kevlar Fibre	(7)
	b)	Explain the properties and applications of Carbon nanotubes	(7)
	c)	Describe the construction and working of Methanol –Oxygen fuel cell	(6)

(OR)

8	a)	Explain the construction and working of photovoltaic cells	(7)
	b)	Explain the synthesis of Paracetamol by conventional and green route from phenol	(7)
	c)	Briefly explain any six basic principles of green chemistry	(6)
		Module-5	
9	a)	Explain the theory, instrumentation and applications of flame photometry	(7)
	b)	Write the principles and requirement of titrimetric analysis	(7)
	c)	In a COD test, 30.5 cm^3 and 15.5 cm^3 of 0.05 N FAS solutions are required for blank & sample titration respectively. The volume of test sample used was 25 cm^3. Calculate the COD of the sample solution	(6)

(OR)

10	a)	Explain the determination of hardness of water by EDTA method.	(7)
	b)	Explain the theory and instrumentation of potentiometry.	(7)
	c)	Define the following units of standard solution. i) Molarity ii) Normality iii) ppm	(6)

PRINCIPAL
SIET., TUMAKURU

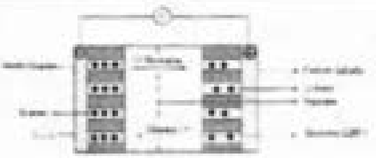
SHRIDEI INSTITUTE OF ENGINEERING AND TECHNOLOGY

I semester:III-Internal assessment test **Date: 26-04-2022**

Scheme of valuation

Sub: Engineering Chemistry (21CHE12) **Section: C & D**

Q.no	Scheme	Marks
1. (a)	**Define Single Electrode Potential. Derive Nernst equation for single electrode potential**	**7Marks**
	Single Electrode Potential: It is the potential developed at the interface between the metal and the solution when a metal is immersed in a solution of its own ions. The maximum work available from a reversible chemical process is equal to the maximum amount of electrical energy that can be obtained; it shows decrease in free energy.	1mark
	Wmax = – ▲ G There fore $\Delta G = -nFE$ $\boxed{E = \frac{\Delta G}{-nF}}$ $\boxed{E^{\circ} = \frac{\Delta G^{\circ}}{-nF}}$ Consider the following reversible electrode reaction, $\boxed{M^{n+} + ne^{-} \rightleftharpoons M}$	1mark
	For the above reaction the equilibrium constant (Kc) can be written as, $Kc = \frac{[M]}{[M^{n+}]}$	1mark
	Kc and ΔG are related according to the following thermodynamic equation $\boxed{\Delta G = \Delta G^{0} + RT \ln Kc}$ -----------------→1 Dividing the equation 1 by – nF and Substituting the value of Kc,	1mark
	$\frac{\Delta G}{-nF} = \frac{\Delta G^{o}}{-nF} + \frac{RT \ln}{-nF}[M]/[M^{n+}]$ ---------------→2	1mark
	Substituting the values of $\frac{\Delta G}{-nF}$ and $\frac{\Delta G^{o}}{-nF}$ in equation 3,	1mark
	Equation 3 => $E = E^{o} + \frac{RT \ln [M^{n+}]}{nF}$ When [M] = 1 $E = E^{o} + \frac{2.303RT}{nF}\log_{10}[M^{n+}]$ ——→ Nernst equation	1mark
(b)	**Explain the construction, working and advantages of Calomel electrode.**	**7Marks**
	 Fig and Labeling Explanation Reactions Advantages	1mark 3mark 1mark 1mark
	• Definition: The electrodes which are used to find out the electrode potential of other electrodes	1mark
	• Calomel electrode consisting of a glass container at the bottom of which mercury is placed and above which a layer of mercury and mercurous chloride (called calomel) is placed • 3/4th of bottle is filled with saturated KCl solution. • Calomel Electrode potential depends on the concentration of chloride ions. • The calomel electrode acts as both anode and cathode depending upon the other electrode used. • The platinum wire is used for electrical connections. Salt bridge is used to couple with other half cell. • The calomel electrode can be represented as Hg (l) / $Hg_2 Cl_2$ (S) / Cl^- • When it acts as anode the electrode reactions is,	

	• $2Hg + 2Cl^- \longrightarrow Hg_2Cl_2 + 2e^-$ • When it acts as cathode the electrode reaction is • $Hg_2Cl_2 + 2e^- \longrightarrow 2Hg + 2Cl^-$	
(c)	**Explain the construction, working and applications of Li-ion battery and mention the uses of Lithium-ion batteries.**	**6Marks**
	 Fig and Labeling Explanation Reactions Advantages • LiCoO2 battery contains anode made-up of layered graphite and contains Lithium atoms in between the layers (Intercalation). • The cathode of the battery is made-up of layered Cobalt oxide and contains Lithium atoms in between the layers. • The cathode and anode are separated by Polymeric separator • Lithium salts such as LiPF6 is used as electrolyte. • During discharge the Lithium atoms undergoes oxidation and moves towards Cathode as Lithium ions. • At Cathode Co4+ ions are reduced to Co3+ ions and Lithium ions enters into the	2mark 2mark 1mark 1mark
	Cobalt oxide ayes as Lithium atoms. The chemical reactions for charge and discharge are as shown below: At Anode: $xLiC \rightleftarrows C + xLi^+ + xe-$ At Cathode: $CoO_2 + xLi^+ + xe- \rightleftarrows LiCoO_2$ **Net cell reaction** $xLiC + CoO_2 \rightleftarrows C + LiCoO_2$ Applications of lithium ion batteries: Cellular phones, Portable CD player, Laptops, Portable LCD TVs, Electric vehicles etc.	
2. (a)	Distinguish between primary, secondary and reserve batteries with examples.	**7Marks**
	a) Primary Batteries: These are the batteries which serve as a source of energy only as long as the active chemical species are present in the battery. These batteries cannot be chargeable as the cell reactions are irreversible. These are designed for only single discharge. Ex: Dry Cell (Zn-MnO2), Li-MnO2 Battery etc., b) Secondary Batteries: These batteries are chargeable and can be used again and again as the cell reactions are reversible and are often called as reversible batteries. During charging the cell acts like electrolytic cell by converting electric energy into chemical energy, hence these batteries are called as storage batteries. Ex: Lead acid battery, Ni-Cd battery, Ni-MH battery, Li-Ion battery etc. c) Reserved Batteries: The batteries which can be stored as inactive state by separating a key component from the battery and the batter is made active by replacing the key component prior to the applications (usage). The key components of the battery such as electrolyte etc., is separated from the battery and the batteries can be stored for a longer period. Ex: Mg – water activated batteries (Mg- AgCl & Mg CuCl), Zn-O2 batteries etc., Batteries etc.	3mark 2mark 2mark
(b)	**Explain the construction and working of Glass Electrode**	**7Marks**
	 Fig and Labeling Explanation working • Glass electrode is H+ ions sensitive electrode and widely used for pH determinations.	1mark 3mark 3mark

	• It consisting of a long glass tube at the bottom of which a thin and delicate glass bulb is present. • The glass bulb is made up of special type of glass (12 % Na_2O, 6% of Cao, 72% of SiO_2) with low melting point and high electrical conductance. • The glass bulb is filled with 0.1.M HCl solution. • Ag / AgCl is used as a internal reference electrode. • The glass electrode can be represented as Ag/AgCl (s) /0.1M (HCl) / Glass. **Working:** • When the glass electrode containing 0.1M HCl is dipped in solution of different H+ ion concentration a boundary potential (Eb) is developed across the gel layers of the glass membrane. • The conduction is achieved by the ion exchange between the Na+ ions of the glass and H+ ions of the solution as follows. • $\mathrm{H^+ + Na^+ (glass) \rightleftharpoons H^+ (glass) + Na^+}$ • The boundary potential (Eb) is due to the difference in the concentration of H+ ion inside the glass bulb (C1) and outside the glass bulb (C2) • Eb = 0.0591 log10 C2/C1 The Glass electrode potential (EG) developed by the glass is given by • EG = Eb + E Ag/AgCl + E asymmetric potential • EG = (Eout-Ein) + E Ag/AgCl + E asymmetric potential • $EG = Eo + \frac{0.0591 \log}{n} [C2] - Eo + \frac{0.0591 \log}{n} [C1] + E\ Ag/AgCl + E$ asy. potential • EG = 0.0591 log [H+] + L Where $L = \frac{0.0591 \log}{n} [C1] + E\ Ag/AgCl + E$ (asymmetric potential • EG = -0.0591 PH + L (PH=-log10 [H+] • EG = L -0.0591 PH or EGlass $=E^0G - 0.0591$ PH	
(c)	**For the cell, Fe/Fe^{2+} (0.01M)//Ag+ (0.1M)/Ag write the cell reaction and calculate the emf of the cell at 298K, if standard electrode potentials of Fe and Ag electrodes are -0.44V and 0.8 V respectively.**	**6Marks**
	At Anode: $Fe (S) \rightarrow Fe^{++} (aq) + 2e^-$ At Cathode: $2Ag^+ (aq) + 2e^- \rightarrow 2Ag (S)$	1mark
	$E^0cell = E^0 cathode - E^0 anode$ $= E^0 Ag^+/Ag - E^0 Fe^{++}/ Fe$	1mark
	$= 0.8 - (-0.42)$ **= 1.22 V.**	1mark
	$\boxed{Ecell = E^0cell + \frac{0.0591}{n} \log_{10} \frac{[M^{n+}] \text{ at cathode}}{[M^{n+}] \text{ at anode}}}$ $= E^0cell + \frac{0.0591}{n} \log10 \frac{[Ag^+]^2}{[Fe^{++}]}$	1mark
	$= 1.22 + \frac{0.0591}{2} \log10 \frac{[0.1]^2}{[0.01]}$	1mark
	= 1.22 + 0.02955 log 1 **= 1.22 V**	1mark
3.(a)	**Define metallic corrosion? Describe the electrochemical theory of corrosion taking iron as an example**	**7Marks**
	Corrosion is defined as the destruction or deterioration of a metal or its alloy and consequent loss of metal, caused due to direct chemical action or electrochemical reactions with its environment. Electrochemical theory of corrosion	1mark

According to electrochemical theory, corrosion of metals occurs due to the following changes, when they are exposed to the environment.

1) A large number of minute galvanic cells are formed which acts as anodic and cathodic areas. 1mark

2) At anodic area the metal undergoes oxidation and electrons are liberated which migrates towards cathodic region 1mark

$$\underset{\text{Metal}}{M} \longrightarrow \underset{\text{Metal ions}}{M^{n+}} + ne^-$$

Ex: when iron is exposed to the environment it undergoes oxidation as

$$Fe \longrightarrow Fe^{2+} + 2e^-$$

1mark

3) At Cathodic area reduction reactions takes place as follows

a) In acidic and de-aerated medium: Hydrogen ions are reduced to hydrogen gas by reacting with electrons.

$$2H^+ + 2e^- \longrightarrow H_2 \uparrow$$

b) In alkaline and de-aerated medium: Moisture of the environment reacts with electrons producing hydroxyl ions and Hydrogen gas at cathode. 1mark

$$2\,H_2O + 2e^- \longrightarrow 2OH^- + H_2$$

c) In neutral and aerated medium: Moisture of the environment reacts with electrons and Oxygen and produces hydroxyl ions at cathode.

$$2\,H_2O + O_2 + 4e^- \longrightarrow 4OH^-$$

1mark

4) Formation of corrosion product: The hydroxyl ions formed at Cathodic area reacts with metal ions (M^{n+} ions) formed at anodic area and forms metal hydroxides which further reacts with moisture and oxygen forming an insoluble metal oxide corrosion product.

$$2Fe^{++} + 4OH^- \longrightarrow 2Fe(OH)_2$$

$$2Fe(OH)_2 + O_2 + nH_2O \longrightarrow Fe_2O_3.\,nH_2O \text{ (rust)}$$

1mark

(b) **Explain: (i) Differential metal corrosion & (ii) Water-line corrosion** **7Marks**

(i) Differential metal corrosion. (Galvanic corrosion)

- This type corrosion occurs when two different metals are in contact with each other due to the formation of galvanic cell.
- The metal having less standard reduction potential value acts as anode and under goes oxidation by liberates electrons, which migrates to the cathodic region. 4mark
- The other metal having high SRP value acts as cathode and reduction reaction takes places on its surface forming OH- ions.
- The anodic metal undergoes corrosion and cathodic metal is unaffected.
- The rate of corrosion depends on the potential difference between the two metals. If the difference is more corrosion occurs faster and vice versa.
- The reactions that occurs are,

At anode : $Fe \longrightarrow Fe^{++} + 2e^-$

At cathode : $H_2O + O_2 + 4e^- \longrightarrow 4OH^-$

Corrosion Product: $2Fe^{++} + 4OH^- \longrightarrow 2Fe(OH)_2$

$2Fe(OH)_2 + O_2 + 2H_2O \longrightarrow 2(Fe_2O_3.\,3H_2O)$ rust.

Example: Iron metal in contact with Copper metal

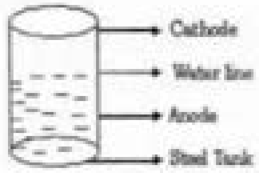
Brass tap in contact with Iron pipe etc.

(ii) Water line corrosion:

It is differential aeration type of corrosion observed in Iron water storage tanks, ships, etc. The part of the metal below waterline is exposed to less Oxygen concentration act as anode and undergoes corrosion than the other part which is more exposed to atmospheric Oxygen which acts as cathode.

The reactions that occurs are,

At anode : $Fe \longrightarrow Fe^{++} + 2e^-$ 3mark

	At cathode : $H_2O + O_2 + 4e^- \longrightarrow 4OH^-$ Corrosion Product: $2Fe^{++} + 4OH^- \longrightarrow 2Fe(OH)_2$ $2Fe(OH)_2 + O_2 + 2H_2O \longrightarrow 2(Fe_2O_3 . 3H_2O)$ rust. 	
(c)	**What is electroplating? Explain the electroplating of chromium**	**6Marks**
	It is a process of deposition of a metal by electrolysis, over the surface of substrate. Plating bath Chromic acid and H_2SO_4 in 100:1 proportion. Temperature $45\text{-}60^0C$. Current Density $100\text{-}200mA/Cm^2$. Anode Insoluble anodes Pb-Sb or Pb-Sn coated with PbO_2. Cathode Object to be plated. Chromium anodes are therefore not used in Cr plating for following reason. • Chromium metal passivate strongly in acid sulphate medium & • Chromium anode gives rise to Cr (III) ions on dissolution. In presence of large concentration of Cr (III) ions, a black Cr deposit is obtained. Anodic reaction: $H_2Cr_2O_7 \longrightarrow Cr_2O_7^{--} + 2H^+ + 2e^-$ $Cr_2O_7^{--} + 14H^+ + 6e^- \longrightarrow 2Cr^{3+} + 7H_2O$ Cathodic reactions: $Cr^{3+} + 3e- \longrightarrow Cr$	1mark 4mark 1mark
4. (a)	**What is meant by metal finishing? Mention (any five) technological importance of metal finishing**	**7Marks**
	It is a process of modifying surface properties of metals by deposition of a layer of another metal or polymer on its surface by the formation of an oxide film The main technological importance of metal finishing include 1. Imparting the metal surface to higher corrosion resistance. 2. Imparting improved wear resistance. 3. Providing electrical and thermal conducting surface. 4. Imparting thermal resistance and hardness. 5. Providing optical and thermal reflectivity.	2mark 5mark
(b)	**What is electroless plating? Explain the electroless plating of copper**	**7Marks**
	It is process of deposition of a metal from its salt solution on a catalytically active surface of a substrate by using suitable reducing agent and without using electrical energy. Metal ions + Reducing agent → Metal + Oxidized product Plating bath Solution: $CuSO_4 . 5 H_2O$ (12 g per dm^3), NaOH (15 g per/L Rochelle salt (14 g per dm^3), EDTA (15 g per dm^3) Reducing Agent : Formaldehyde (8 g per dm^3) Complexing agent : EDTA Solution. P^H : 11 - 12 Temperature : $25\ ^0c$ At Anode : $2HCHO + 4OH^- \rightarrow 2HCOO^- + 2H_2O + H_2 + 2e^-$ At Cathode : $Cu^{2+} + 2e^- \rightarrow Cu$ Overall reactions : $4OH^- + Cu^{2+} + 2HCHO \rightarrow Cu + 2HCOO^- + 2H_2O + H_2$	1mark 6mark
(c)	**Explain the factors affecting the rate of corrosion (i) Nature of corrosion product, (ii) Ratio of anodic to cathodic areas & (iii) pH**	**6Marks**
	i) Nature of corrosion product ii) ratio of anodic to Cathodic area ii) Ph i) Nature of corrosion product: If the nature of corrosion product formed on the metal surface is protective in nature (i.e., thin,	2mark 2mark 2mark

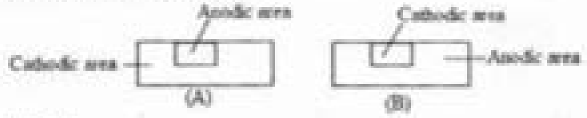
invisible, uniform and adherent), it prevents the further corrosion of metal.

If the corrosion product on the metal surface is non- protective in nature (i.e., thick, visible, non-uniform and non-adherent), it does not prevent the corrosion of metal is and it leads to further corrosion of metal.

Example: In oxidizing environment metals like Al, Cr, Ti etc. forms protective metal oxide films on their surfaces which prevent further corrosion of metals. Metals like Zn, Fe, Mg, etc .do not form protective layer on their surfaces and are readily under goes corrosion

ii) Ratio of Anodic to Cathodic areas:

If a metal has small anodic and large cathodic area the rate of corrosion increases and vice versa. This is because when anodic area is small the electrons liberated during oxidation are completely consumed on large cathodic surface for the reduction reactions and rate of corrosion increases.

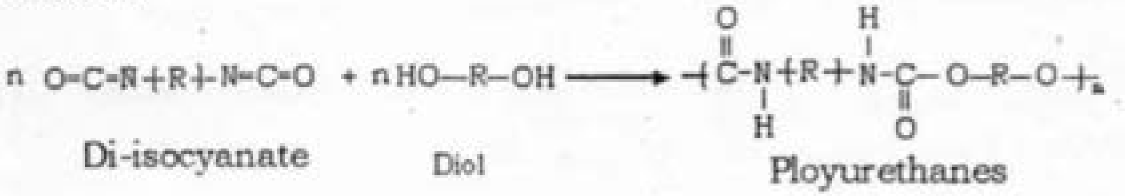


iii) Ph

In general at lower PH value the rate of corrosion is more and at higher pH value (more than pH = 10) the rate of corrosion ceases due to the formation of protective coating of hydrous oxides on the metal. Corrosion rate is maximum between PH 3 and 10 in presence of oxygen

5. (a) **Explain the synthesis and application of Polyurethane** **7Marks**

Ployurethanes are produced by the polymerization of Di-isocyanate and diol or triol by addition polymerization reaction. (or the addition reaction between 2, 4-tolylene di-isocyanate with glycol). 3mark



$$n\ O{=}C{=}N{+}R{+}N{=}C{=}O + n\,HO{-}R{-}OH \longrightarrow {-}\!\left[\overset{O}{\overset{\|}{C}}{-}\underset{H}{\underset{|}{N}}{-}R{-}\overset{H}{\overset{|}{N}}{-}\underset{O}{\underset{\|}{C}}{-}O{-}R{-}O\right]_n$$

2mark

Properties:

i. These can be obtained in the form of foams, fibers, Elastomers, coatings

ii. The foams are available in both rigid & flexible forms. 1mark

Uses:

i. Flexible foams are used for cushions in automobiles & furniture.

ii. Rigid foams are used to reinforce hallow structural units.

iii. Fibers of Polyurethanes are used in lightweight garments and swim suits because of their stretching property. 1mark

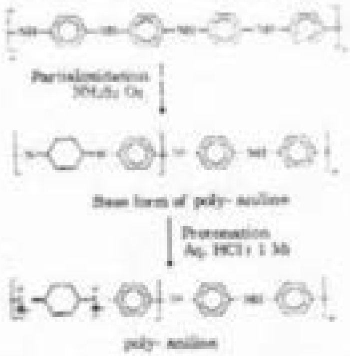
iv. These are used to coat gymnasium floor and dance floor.

v. These are used in tire treads and industrial wheels.

(b) **Describe the mechanism of conduction in Polyaniline and factors influencing conduction in organic polymers** **7Marks**

Conducting polymers are obtained by doping an oxidizing or reducing agent into organic polymers. With the carbon backbone consisting of alternate double bond & single bonds doping results in delocalization of electrons responsible for conduction.

Mechanism of conduction in Poly aniline



2mark

4mark

Protonic acid doping:

The synthesis of conducting polyaniline is a typical example of this type of doping technique. In this technique current carrying charged species (-/+) are created by the protonation of imine nitrogen.

Polyaniline is partially oxidized, first using a suitable oxidizing agent into a base form of aniline which contains alternating reduced and oxidized forms of aniline polymer backbone. This base form of aniline when treated with aqueous HCl (1M) undergoes protonation of imine nitrogen atom, creating current carrying charged sites (+ve) in the polymer backbone. These charges are compensated by anions (Cl^-) of the doping agent, giving the corresponding salt.

1mark

This type of protonic acid doping of polyaniline results in an increase of conductivity by approximately 09-10 orders of magnitude.

factors influencing conduction in organic polymers

(c) **Explain any two size dependent properties of nanomaterials** **6Marks**

Properties	Examples
Catalytic	Better catalytic efficiency through higher surface-to-volume ratio
Electrical	Increased electrical conductivity in ceramics and magnetic nanocomposites, increased electric resistance in metals
Magnetic	Increased magnetic coercivity up to a critical grain size, superparamagnetic behaviour
Optical	Spectral shift of optical absorbtion and fluorescence properties, increased quantum efficiency of semiconductor crystals

6mark

6. (a) **What are nanomaterials? Explain the synthesis of nanomaterial by sol gel process** **7Marks**

Sol-gel technique is an important bottom-up approach for the synthesis of Nanomaterials and it consists of a following steps.

1mark
3mark
3mark

1. Preparation of sol: A sol is prepared by dispersing precursors in solvent.
2. Conversion of sol into gel: The sol is further converted into a gel by hydrolysis and condensation of precursors.

Hydrolysis : -

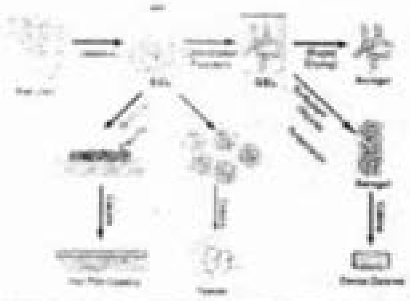
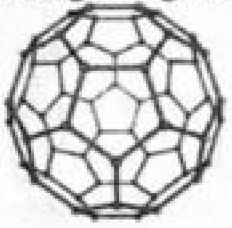
$M\ (OC_2H_5)_4 + X\ H_2O \rightarrow M\ (OC_2H_5)_4 - X\ (OH)_X + X\ C_2H_5OH$

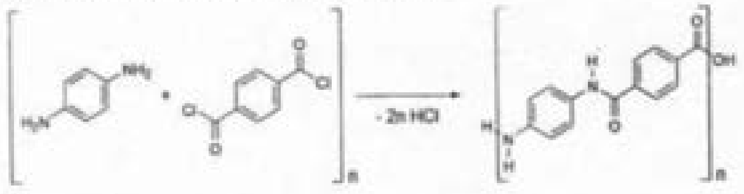
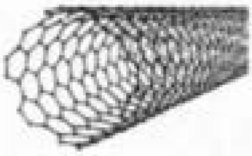
Condensation:

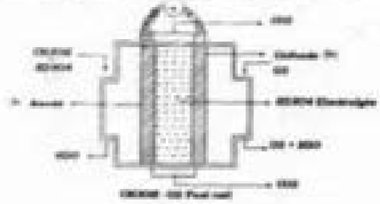
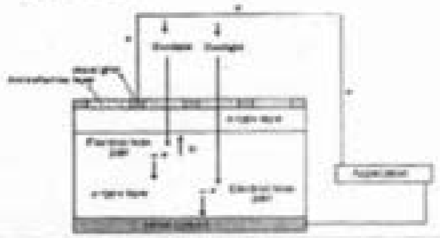
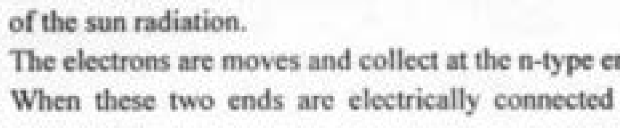
$M\ (OC_2H_5)_4 - X\ (OH)X + M\ (OC_2H_5)_4 - X\ (OH)X \rightarrow (OC_2H_5)_4 - X\ (OH)X - 1$

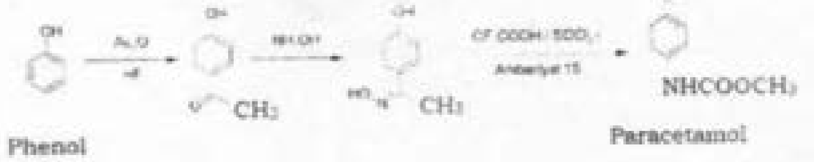
$M - O - M\ (OH)X - 1\ (OC_2H_5)_4 - X + H_2O$

3. Aging of a gel: Gel on aging for a known period of time, finally condenses to nanoscale clusters of metal hydroxides

	4. Removal of solvent: The solvent can be removed from gel by evaporative drying 5. Heat treatment: The obtained sample is heated at high temperature from nanoparticles **Applications** Used in optics and electronics (bio) sensors, medicine (e.g. controlled drug, chromatography) ultra filtration reverse osmosis. 	
(b)	**Write a note on Fullerenes. Mention its applications**	**7Marks**
	A fullerene is any molecule composed of carbon in the form of a hollow sphere, ellipsoid, tube, and many other shapes. Spherical fullerenes are also called bucky balls, and they resemble the balls used in football (soccer). Cylindrical ones are called carbon nanotubes or bucky tubes. Fullerenes are similar in structure to graphite, which is composed of stacked graphene sheets of linked hexagonal rings, but they may also contain pentagonal (or sometimes heptagonal) rings. **Structure of C60 Fullerene** Contains 60 carbon atoms 12 Pentagon rings and 20 Hexagon rings Each pentagon ring is surrounded by 5 hexagon rings Each Hexagon ring is surrounded by 3 hexagon rings and 3 pentagon rings  **Applications of Fullerenes** 1) Polymer composite of C60 molecule is used in making organic photovolatic cells. 2) Fullerenes have been extensively used for several biomedical applications including the design of high-performance MRI contrast agents, 3) X-Ray imaging contrast agents, 4) Photodynamic therapy, drug and gene delivery.	4mark 1mark 1mark
(c)	**Explain the synthesis and applications of Poly Methyl Methacrylate**	**6Marks**
	Plexi glass is the trade name of polymethyl methacrylate. The monomers used for the preparation of plexi glass are methyl methacrylate. Plexi glass is prepared by emulsion polymerization method at 60 to $70^0{}_C$ in presence of trace of H_2O_2 or Acetyl peroxide as initiator.  $n.\ H_2C=\overset{\overset{CH_3}{\mid}}{\underset{\underset{COOCH_3}{\mid}}{C}} \longrightarrow +CH_2-\overset{\overset{CH_3}{\mid}}{\underset{\underset{COOCH_3}{\mid}}{C}}+_n$ Methylmethacrylate Polymethylmethacrylate Properties: i. Plexi glass is a white transparent thermoplastic ii. It has got high optical clarity iii. It is resistant to chemical action Applications:	3mark 2mark

	i. It is used in the preparation of aircraft windows. ii. Attractive sign boards. iii. Manufacturing of transparent moulded articles & tubes. iv. Lenses for automobiles, artificial eyes	1mark
7. (a)	**Explain the synthesis, properties & applications of Kevlar Fibre**	**7Marks**
	Synthesis: Kevlar is synthesized in solution from the monomers 1,4-phenylene-diamine (*para*-phenylenediamine) and terephthaloyl chloride in a condensation reaction yielding hydrochloric acid as a byproduct.  **Properties:** i) High tensile strength ii) Flame resistance iii) Resistant to chemical action iv) Light in weight v) Low thermal expansion. **Applications:** Used as an inner lining for some bicycle tires to prevent punctures flame-resistant clothing. heat protective clothing and helmets asbestos replacement (e.g. brake linings) hot air filtration fabrics	3mark 2mark 2mark
(b)	**Explain the properties and applications of Carbon nanotubes**	**7Marks**
	Carbon nanotubes (CNTs) are allotropes of carbon. These cylindrical carbon molecules have interesting properties that make them potentially useful in many applications in nanotechnology, electronics, optics and other fields of materials science. These are classified into Single walled nanotubes: These are carbon nanotubes which are formed by the rolling of one layer of graphitic sheets. Multi walled nanotubes: These are carbon nanotubes which are formed by the rolling of many layers of graphitic sheets.  **Properties of Carbon Nanotubes** CNTs exhibit high electrical conductivity and high thermal conductivity. Have low density and very high mechanical strength. The structure of CNTs is of SP2 carbon - carbon bonds which are stronger than the SP3 bonds found in diamond. CNTs have Very High Tensile Strength	5mark 1mark 1mark
(c)	**Describe the construction and working of Methanol –Oxygen fuel cell**	**6Marks**
	It consists of two electrodes made up of platinum as anode and cathode and in between the electrodes H_2SO_4 is placed as a electrolyte. Methanol and H_2SO_4 is supplied at the anode and pure oxygen gas is supplied at the cathode. The methanol is oxidized to CO_2 & H_2O with the liberation of 1.20v of electrical energy.	3mark

		2mark
	The cell reactions are as follows. At anode : $CH_3OH + H_2O \longrightarrow CO_2 + 6H^+ + 6e^-$ At cathode : $\frac{3}{2} O_2 + 6H^+ + 6e^- \longrightarrow 3H_2O$ NCR : $CH_3OH + \frac{3}{2} O_2 \longrightarrow CO_2 + 2H_2O$ **Applications:** 1) Used in Military applications. 2) Used for large scale power production stations.	1mark
8. (a)	**Explain the construction and working of photovoltaic cells**	**7Marks**
	A typical silicon photovoltaic cell is composed of a thin layer of phosphorus doped. (n-type) semiconductor on the top and a thick layer boron doped p-type semiconductor at the bottom. Hence a p-n junction is formed. A metallic grid forms one of the electrical current contacts of the diode and allows light to fall on the semiconductor between the grid lines. An antireflective layer (TiO_2 or silicon nitride) between the grid lines increases the amount of light transmitted. When light radiation falls on the p-n junction, electron – hole pairs are generated by the absorption of the sun radiation. The electrons are moves and collect at the n-type end and the holes moves to p-type end. When these two ends are electrically connected through a conductor, photoelectric current is produced.	5mark
		2mark
(b)	**Explain the synthesis of Paracetamol by conventional and green route from phenol**	**7Marks**
	conventional route synthesis of Paracetamol The reduction of nitrobenzene by zinc and ammonium chloride gives phenyl hydroxylamine When phenylhydroxylamine is treated with sulfuric acid it gives para aminophenol When para aminophenol is acetylated by a mixture of acetic anhydride and glacial acetic acid to give paracetamol 	4mark
	Green route synthesis of Paracetamol Green Synthesis of paracetamol by Hoechst-Celanese includes Direct acylation of phenol with acetic anhydride catalyzed by HF, Conversion of the ketone to a ketoxime with hydroxylamine, Acid-catalyzed Beckmann rearrangement to give the amide	3mark



(c) Briefly explain any six basic principles of green chemistry — 6Marks

1. Waste Prevention. It is better to prevent waste formation than to treat it after it is formed. — 1mark
2. Atom economy. Design synthetic methods to maximize incorporation of all material used into final product. — 1mark
3. Less hazardous chemical synthesis: Design chemical synthesis as safe as possible. use or generate materials of low human toxicity and environmental impact. — 1mark
4. Design safer chemicals. Chemical product design should reduce toxicity and eco friendly. — 1mark
5. Energy efficiency. Energy requirements should be minimized by conducting synthesis at ambient temperature and pressure. — 1mark
6. Smart catalysis. Use of suitable catalysts instead of stoichiometric reagents in reactions to reduce time, waste and energy. — 1mark

9. (a) Explain the theory, instrumentation and applications of flame photometry — **7Marks**

Theory: Redox titrations can be carried out potentiometrically using platinum-calomel electrode combination in a manner similar to acid-base neutralizations. For the reaction. — 3mark

$$\text{Reduced from} \longrightarrow \text{oxidized form + n electrons}$$

The potential is given by Nernst equation.

$$E = E^0 + \frac{0.0591}{n} \log \frac{[\text{oxidized form}]}{[\text{reduced form}]}$$

Where E° is the standard potential of the system. The potential of the system is thus controlled by the ratio of the concentration of the oxidized to that of the reduced species in the vicinity of the end point of the titration. This may be followed potentiometrically and a change of potential against volume (titration curve) is characterized by a sudden change of potential at the equivalence point. From the equivalence point the concentration of the sample can be determined.

is explained as follows. The reaction that takes place in the determination of Fe^{2+} is

$$Fe^{2+} \longrightarrow Fe^{3+} + e^-$$

$$Cr_2O_7^{2-} + 14H^+ + 6e \longrightarrow 2Cr^{3+} + 7H_2O$$

Prior to the equivalence point the potential is determined by the Fe^{3+}/Fe^{2+} system and the potential is given by the equation.

$$E_{cell} = E_{Fe^{2+}} = E^0 + \frac{0.0591}{n} \log \frac{[Fe^{3+}]}{[Fe^{2+}]}$$

$$= 0.75V + 0.0591 \log \frac{[Fe^{3+}]}{[Fe^{2+}]}$$

The potential of the solution will be around 0.75V (since the contribution to the potential by the second term is negligible). At the equivalence point the potential is determined by both E and E° is given by

$$E_{cell} = \frac{E^0{}_{Fe^{2+}} + E^0\, Cr_2O_7^{-2}}{2} = \frac{0.75V + 1.33V}{2} = 1.04\ V$$

Beyond the equivalence point the potential is determined by $Cr_2O_7^{2-}/\ Cr^{3+}$ system given by the equation.

$$E_{cell} = E_{Cr_2} = E^0 Cr_2O_7^{-2}\ /\ Cr^{3+} + \frac{0.0591}{6} \log \frac{[Cr_2O_7^{-2}]}{[Cr^{3+}]}$$

$$= 1.33V + \frac{0.0591}{6} \log \frac{[Cr_2O_7^{-2}]}{[Cr^{3+}]}$$

Thus an abrupt increase in the potential of the solution in the vicinity of the equivalence point is observed. This makes the equivalence point in the experiment, the potential of the cell is determined with reference to saturated calomel electrode.

	Instrumentation: a) Reference electrode: Calomel electrode is used as reference electrode. b) Indicator electrode: The electrode whose potential is dependent upon the concentration of the ion to be determined is termed as the indicator electrode Example: Platinum electrode Applications: 1. Used in analysis of pollutants in water 2. Used in the quality analysis in the food industry. 3. Used in the quality analysis in the pharmaceutical industry. 4. Used as an analytical tool in the paper, drug, textile, paint industries etc	2mark 2mark
(b)	**Write the principles and requirement of titrimetric analysis**	**7Marks**
	Principles of titrimetric analysis are as follows: • The one solution to be analyzed contains an unknown amount of chemicals. • The reagent of known concentration reacts with chemical of unknown amount in the presence of an indicator to show the end-point. This is the point which shows the completion of the reaction. • The volumes are measured by a titration which completes the reaction between reagent and solution. • The volume and concentration of reagent used in the titration give the amount of reagent in moles. • The amount of unknown chemical in the measured volume of solution is calculated by using the mole ratio of the equation. • The amount of unknown chemical in the original sample is calculated by the amount of unknown chemical in the measured volume. **Requirement of titrimetric analysis** • Reaction must be stoichiometric. • Titrant must react rapidly with the analyte so that the time required between additions of reagent is minimized. • Chemical reaction must be simple and should take place quantitatively according to a definite equation to form known products. • The reaction should be instantaneous under the experimental conditions maintained. • The reaction should take place essentially to completion under the experimental conditions maintained. • The end point should be well defined either between the reacting substances or by the use of an indicator. • The following glass wares are used for Titrimetric analysis i) Burette ii) Volumetric flask iii) Conical flak iv) Pipette	4mark 3mark
(c)	**In a COD test, 30.5 cm^3 and 15.5 cm^3 of 0.05 N FAS solutions are required for blank & sample titration respectively. The volume of test sample used was 25 cm^3. Calculate the COD of the sample solution**	**6Marks**
	COD of the effluent sample $= \frac{N X(a-b) X8000}{V}$ $= \frac{0.05 X(30.5-15.5) X8000}{25}$ $= 240$ mg of O_2 / dm^3	2mark 2mark 2mark
10. (a)	**Explain the determination of hardness of water by EDTA method.**	**7Marks**
	Procedure:	

Weigh out the given disodium salt of EDTA crystal accurately into a 250 ml volumetric flask. Djssolve in distilled water and dilute up to the mark. Mix well.

Molarity of EDTA = $\frac{\text{Weight of Na}_2\text{EDTA taken x 4}}{\text{Molecular Weight of EDTA (372.24)}}$ 3mark

Burette : Standard Na_2EDTA Solution

Conical flask : 25 ml water sample + 3 ml of NH_3–NH_4Cl buffer

Solution (P^H=10) + 2-3 drops of Eriochrome black – T.

Indicator : Eriochrome black – T

Color change : Wine red to clear blue

From the volume of Na_2EDTA consumed calculate the total hardness of the given water sample.

Observation: 2mark

Weight of weighing bottle + Na_2EDTA salt (M_1) =…… ……..g

Weight of empty weighing bottle (M_2) =……………..g

Weight of Na_2EDTA salt Transferred (M_1- M_2) =……… …….g

Molarity of Na_2EDTA Solution = $\frac{\text{Weight of Na}_2\text{EDTA crystals transferred x 4}}{\text{Molecular weight of Na}_2\text{EDTA (372.24)}}$

= $\frac{\text{………… x 4}}{372.24}$

= ………….. M 2mark

Tabular column:

Burette readings	Trial 1	Trial 2	Trial 3
Final burette reading			
Initial burette reading	0.0	0.0	0.0
Volume of Na_2EDTA solution consumed (cm^3)			

Calculation:

$\boxed{1000\ cm^3\ 1\ M\ EDTA = 100\ g\ (\text{Molecular mass of } CaCO_3 = 100)}$

………cm^3 of …….M EDTA = $\frac{\text{……….}cm^3 \text{ x ……..M x 100}}{1000}$ g of $CaCO_3$

=……………………… g of $CaCO_3$

Total hardness of the given water sample = $\frac{\text{……………..g x } 10^6}{25}$ ppm of $CaCO_3$

= ……………………. ppm of $CaCO_3$

(b) Explain the theory and instrumentation of potentiometry. **7Marks**

Theory: Redox titrations can be carried out potentiometrically using platinum-calomel electrode combination in a manner similar to acid-base neutralizations. For the reaction.

Reduced from $\longrightarrow$ oxidized form + n electrons

The potential is given by Nernst equation.

$$E = E^0 - \frac{0.0591}{n} \log \frac{[\text{oxidized form}]}{[\text{reduced form}]}$$

Where E^o is the standard potential of the system. The potential of the system is thus controlled by the ratio of the concentration of the oxidized to that of the reduced species in the vicinity of the end point of the titration. This may be followed potentiometrically and a change of 4mark

	potential against volume (titration curve) is characterized by a sudden change of potential at the equivalence point. From the equivalence point the concentration of the sample can be determined. is explained as follows. The reaction that takes place in the determination of Fe^{2+} is $Fe^{2+} \longrightarrow Fe^{3+} + e^-$ $Cr_2O_7^{2-} + 14H^+ + 6e \longrightarrow 2Cr^{3+} + 7H_2O$ Prior to the equivalence point the potential is determined by the Fe^{3+}/Fe^{2+} system and the potential is given by the equation. $E_{cell} = E_{Fe^{2+}} = E^0 + \dfrac{0.0591}{n} \log \dfrac{[Fe^{3+}]}{[Fe^{2+}]}$ $= 0.75V + 0.0591 \log \dfrac{[Fe^{3+}]}{[Fe^{2+}]}$ The potential of the solution will be around 0.75V (since the contribution to the potential by the second term is negligible). At the equivalence point the potential is determined by both E and E^0 is given by $E_{cell} = \dfrac{E^0_{Fe^{2+}} + E^0_{Cr_2O_7^{-2}}}{2} = \dfrac{0.75V + 1.33V}{2} = 1.04\ V$ Beyond the equivalence point the potential is determined by $Cr_2O_7^{2-}/Cr^{3+}$ system given by the equation. $E_{cell} = E_{Cr_2} = E^0_{Cr_2O_7^{-2}/Cr^{3+}} + \dfrac{0.0591}{6} \log \dfrac{[Cr_2O_7^{-2}]}{[Cr^{3+}]}$ $= 1.33V + \dfrac{0.0591}{6} \log \dfrac{[Cr_2O_7^{-2}]}{[Cr^{3+}]}$ Thus an abrupt increase in the potential of the solution in the vicinity of the equivalence point is observed. This makes the equivalence point in the experiment, the potential of the cell is determined with reference to saturated calomel electrode. Instrumentation: a) Reference electrode: Calomel electrode is used as reference electrode. b) Indicator electrode: The electrode whose potential is dependent upon the concentration of the ion to be determined is termed as the indicator electrode Example: Platinum electrode	3mark
(c)	**Define the following units of standard solution. i) Molarity ii) Normality iii) ppm**	**6Marks**
	i) Molarity (M): It is defined as the number of moles of solute per liter of solution. $\textbf{Molarity} = \dfrac{\textbf{no. of moles of solute}}{\textbf{volume of solution in liters}}$ **ii) Normality (N):** It is defined as the number of gram equivalents (equivalent weight in grams) of a solute present per liter of the solution. $\textbf{normality} = \dfrac{\textbf{no. of gram equivalents}}{\textbf{volume of solution in liters}}$ **iii) Parts per million (ppm):** It is the number of parts of solute per million parts of the solution (10^6).	2mark 2mark 2mark

PRINCIPAL
SIET., TUMAKURU

SHRIDEVI

Shridevi Institute of Engineering and Technology, Tumkur-06

I Semester: CIE I Internal Assessment Test:14/02/2022

21PHY12-Engineering Physics

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, $m_e = 9.1 \times 10^{-31}$ kg,
Charge of electron, $e = 1.602 \times 10^{-19}$ C, Boltzmann constant, $K = 1.38 \times 10^{-23}$ J/K

1 a. Write the assumption of Planck's law of radiation. Deduce wein's law and Rayleigh-Jeans law from Planck's law of radiation. **(CO2 08 Marks)**

b. Set up time independent one dimensional schrodinger wave equation. **(CO2 08 Marks)**

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. **(CO2 04 Marks)**

OR

2 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 one dimensional potential well of infinite height. **(CO2 08 Marks)**

A particle of mass 940 MeV/c² has a kinetic energy 0.5 KeV. Find the de-broglie wavelength. (c is the velocity of light). **(CO2 04 Marks)** P.T.O

H.O.D
Dept. of Physics
S.I.E.T., TUMKUR -6

PRINCIPAL

3 a. Explain the Assumptions and Success of Quantum free electron theory. **(CO4 08 Marks)**

b. Derive the expression for electrical conductivity of semiconductors. **(CO4 08 Marks)**

c. Calculate the probability of an electron occupying an energy level 0.02eV above the Fermi level at 200K and 400K. **(CO4 04 Marks)**

OR

4 a. Define Fermi factor & Discuss the variation of Fermi factor with Temperature and effect on occupancy of energy levels. **(CO4 08 Marks)**

b. What is Hall Effect? Obtain the expression for Hall voltage in terms of Hall co-efficient. **(CO4 08 Marks)**

c. The conductivity and hall coefficient of an n – type silicon specimen are $112\Omega m^{-1}$ and $1.25 \times 10^{-3} m^{3} c^{-1}$ respectively, calculate charge carrier concentration and electron mobility. **(CO4 04 Marks)**

10/02/2022

Question number	Schme of Evaluation Sub:- Engineering Physics Sub.code:-21PHY12	Marks

1 a) Assumption :-

* Each oscillator has an Energy given by integral multiple of hν where h is plancks constant and ν is frequency of radiation.

$E = nh\nu$ ——— ②

* An oscillator may lose or gain energy by emitting or obsearing respectively a radiation of frequency ν where $\nu = \Delta E/h$ ΔE is difference in energy of the oscillator before and after the emission or absorbing take place ——— ②

$$U_\lambda d_\lambda = \frac{8\pi hc}{\lambda^5}\left[\frac{1}{e^{h\nu/kT}-1}\right] d\lambda$$

Reduce of plancks law to weins law and rayleigh Jeans law.

$$U_\lambda d\lambda = \frac{8\pi hc}{\lambda^5}\left[\frac{1}{e^{h\nu/kT}-1}\right] d\lambda$$

——— ②

case (i) for shorter wavelengths $\nu = c/\lambda$ is large

when ν is large $e^{h\nu/kT}$ is very large

$$U_\lambda d\lambda = \frac{8\pi hc}{\lambda^5}\left[\frac{1}{e^{hc/\lambda kT}}\right] d\lambda$$

$$U_\lambda d\lambda = C_1 \lambda^{-5} e^{\left(\frac{-C_2}{\lambda T}\right)} d\lambda$$ 08

case (ii) for longer wavelength $\nu = c/\lambda$ is small —— ②

$$U_\lambda d\lambda = \left[\frac{8\pi kT}{\lambda^4}\right] d\lambda$$

b] $\lambda = \frac{h}{mv}$ —— ①

$$\psi = A e^{i(kx - \omega t)}$$ —— ①

$$\frac{d^2\psi}{dx^2} = \frac{1}{v^2}\frac{d^2\psi}{dt^2}$$ —— ① 08

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

$$KE = \frac{p^2}{2m}$$ —— ①

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

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

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

c. Given data.

$a = 1A^0 = 1 \times 10^{-10} m$

$E_1 = ?$ $E_2 = ?$

we have relation

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

for $n = 1$ ground state

$$E_1 = \frac{h^2}{8ma^2} = \frac{6.626 \times 10^{-34}}{8 \times 9.11 \times 10^{-31} \times (1 \times 10^{-10})^2}$$

$$E_1 = 6.023 \times 10^{-18} J.$$

$$E_1 = \frac{6.023 \times 10^{-18}}{1.602 \times 10^{-19}} eV$$

$$E_1 = 37.60 eV.$$

and $n = 2$ for first excited state

$$E_2 = 4 \times 37.60$$

$$E_2 = 150.4 eV.$$

2.a) State Heisenberg's uncertainty principle. Show that electron cannot exist inside the nucleus

Statement :- If any determination of a of the position and momentum of the corresponding particle the product of the corresponding uncertainities inherently present in the measurement is greater than (or) equal to $h/4\pi$ — ②

Non existance of electron in the atomic nucleus. 08

$$E = mc^2 \quad — ①$$

$$E = \frac{m_0c^2}{\sqrt{1 - \frac{v^2}{c^2}}} \quad — ①$$

$$p^2c^2 = \frac{m_0^2v^2c^4}{c^2 - v^2} \quad — ①$$

$$E^2 = p^2c^2 + m_0^2c^4 \quad — ①$$

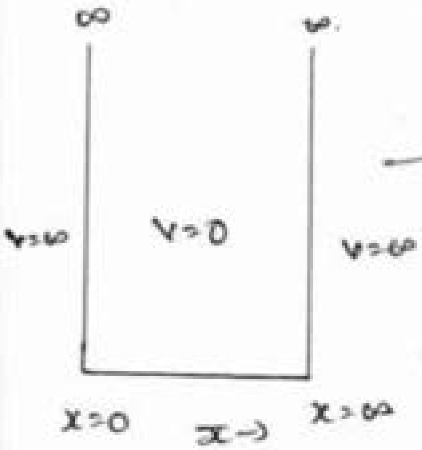
$$\Delta P \geq \frac{h}{4\pi\Delta x}$$

$$\Delta P \geq 1.1 \times 10^{-20}\ kg\,ms^{-1} \quad — ①$$

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

$$E \geq 20.6\ MeV \quad — ①$$

2.b) obtain Energy values and normalised wave function with respect to a particle in a one dimensional potential well of infinite height



— ②

Inside the well (V=0) time independent Schrodinger's Equation is given by

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

$$\frac{d^2\psi}{dx^2} + k^2\psi = 0 \qquad k^2 = \frac{8\pi^2 m}{h^3} E$$

— ①

08.

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

$$C = 0 \qquad D\sin ka = 0$$

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

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

$$E = \frac{k^2h^2}{8\pi^2 m} \qquad E_n = \frac{n^2h^2}{8ma^2}. \quad \text{— ①}$$

Normalization wave function

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

— ① — ①

$$D^2 = \frac{2}{a} \qquad D = \sqrt{\frac{2}{a}} \quad \text{— ①}$$

A particle of mass 940 mev/c² has a K.E 0.5kev Find the de-Broglie wavelength.

2.(a) **Given data**

$$m = 940\ \text{mev}/c^2$$

$$= \frac{940 \times 10^{+6} \times 1.602 \times 10^{-19}}{(3 \times 10^8)^2}$$

$$= 1.6732 \times 10^{-27}\ \text{kg}.$$

$$K.E = 0.5\ \text{kev}$$

$$= 0.5 \times 10^3 \times 1.60 \times 10^{-19}$$

$$= 8.01 \times 10^{-17}\ \text{J}.$$

formula:- $\lambda = \frac{h}{\sqrt{2mE}}$

$$\lambda = \frac{6.602 \times 10^{-19}}{\sqrt{2(1.6732 \times 10^{-27})(8.01 \times 10^{-17})}}$$

$$\lambda = 1275\ \text{m}$$

3.a) Assumption of quantum free electron theory

* The Energy values of the conduction electron are quantized, the allowed energy values are realised in terms a set of energy values

* The distribution of electrons in the various allowed energy levels occur as per pauli's exclusion principle

* The electron travels with a constant potential inside the metal but confined within it's boundaries

* The attraction between the electrons and the lattice ions and the repulsion between the electrons themselves are ignored. —— ④

Success of quantum free eletron theory

* Specific heat

* Temperature dependence

* electrical conductivity on electron concentration. } ④

08

3. **b)** Explain [illegible]

[illegible]

if N_e is the Number of electron / unit volume and e is the magnitude of electronic charge on the electron. then the current flow / second is the current I

$$I = N_e e A v$$

$$J = \frac{I}{A} = N_e e v$$

$$J = (N_e e \mu_e) E$$

$$J = \sigma E$$

$$\sigma_e = N_e e \mu_e$$

$$\sigma_h = N_h e \mu_n .$$

$$\sigma = \sigma_e + \sigma_h$$

$$= N_e e \mu_e + N_h e \mu_h$$

$$= e (N_e \mu_e + N_h \mu_n)$$

$$N_e = N_h = n_i$$

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

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

3. ④ Given data

$E - E_F = 0.02 eV$

$= 0.02 \times 1.6 \times 10^{-19}$

To find :- (i) $f(E)$ at 200, K

(ii) $f(E)$ at 400 K

Solution :-

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

$$f(E) = \frac{1}{e^{\frac{0.02 \times 1.6 \times 10^{-19}}{1.38 \times 10^{-23} \times 200}} + 1} = 0.24$$

at T = 200 K.

for T = 400 K.

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

4. a) fermi factor is the probability of occupation of a given energy state for a material in thermal Equallibrium.

The dependence of fermi factor on temperature and effecd on occupancy of energy levels

(i) When $T = 0K$. $E < E_F$

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

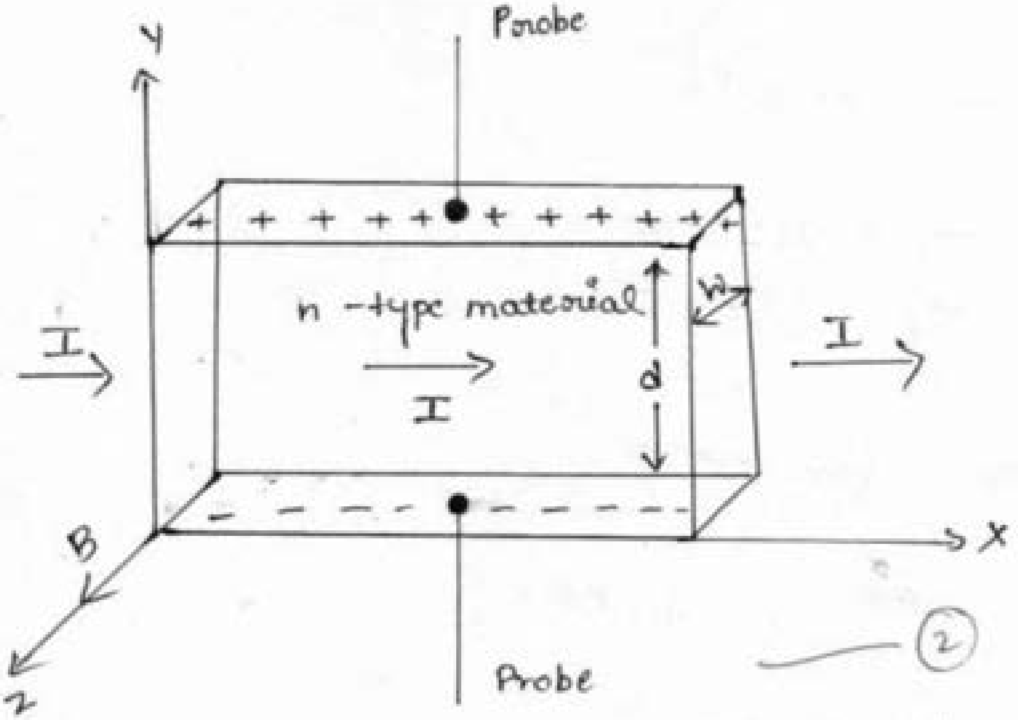
(ii) When $T = 0k$ $E < E_F$

$$f(E) = \frac{1}{e^{\frac{E-E_F}{KT}} + 1} = 0$$

(iii) When $T > 0k$ $E = E_F$

$$f(E) = \frac{1}{e^{\left(\frac{E-E_F}{KT}\right)} + 1} = 0.5.$$

4. b)



— ②

Generation of eletric field due to hall effect

$F_L = -Bev$, $F_H = -eE_H$ — ① 08

$F_L = F_H$ — ①

$E_H = Bv$

$V_H = Bvd$ — ①

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

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

$I = NevA$

$J = nev$ $J = \rho v$ — ①

$v = \frac{I}{\rho w d}$

$V_H = \frac{BI}{V_H w}$ $\rho = \frac{BI}{V_H w}$ — ①

$E_H = R_H J B$ $R_H = 1/\rho$ — ①

4. c) Given data :-

$\sigma_i = 112\ \Omega m^{-1}$

$R_H = 1.25 \times 10^{-3}$

To find out :?

$\mu_e = ?$, $n_i = ?$

$R_H = \frac{1}{ne}$

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

$n = \frac{1}{(1.25\times10^{-3})\ (1.602\times10^{-19})}$.

$= 4.99\times10^{21}$

$\mu_h = \frac{1}{\rho_i N_B e}$

$\sigma_i = \frac{1}{\rho_i}$

$\rho_i = \frac{1}{112} =$

$= 8.92\times10^{-3}$

$\mu_h = \frac{1}{(8.92\times10^{-3})(4.99\times10^{-19})(1.602\times10^{-19})}$

$= 1.40\times10^{39}$.

H.O.D
Dept. of Physics
S.I.E.T., TUMKUR -6.

PRINCIPAL
SIET., TUMAKURU.

Shridevi Institute of Engineering and Technology, Tumkur-06

I Semester: CIE II Internal Assessment Test:24/03/2022

21PHY12-Engineering Physics

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

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

1 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. With a neat diagram explain the construction and working of Reddy shock tube. **(CO1 08 Marks)**

c. For a particle executing SHM, its acceleration is found to be 15 cm/s^2 when it is at 3 cm from its mean position. Calculate time period. **(CO1 04 Marks)**

OR

2 a. What are forced oscillations? Derive the expression for steady state amplitude and phase angle in case of forced oscillation. **(CO1 08 Marks)**

b. What are damped oscillations? Give the theory of damped oscillation and hence discuss the case of critical damping. **(CO1 08 Marks)**

c. The distance between two pressure sensors in a shock tube is 150 mm, the time taken by a shock wave to travel this distance is 0.3 ms, if the velocity of sound under the same condition is 340 m/s. find the mach number of shock wave. **(CO1 04 Marks)**

HOD

H.O.D
Dept. of Physics
S.I.E.T., TUMKUR -6.

Principal

PRINCIPAL
SIET., TUMAKURU.

P T O

3 a. Define fractional Index change (Δ). Derive the expression for Numerical aperture and acceptance angle of an optical fiber. (CO2 08 Marks)

b. Describe different types of optical fiber with neat diagram. (CO2 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. (CO2 04 Marks)

OR

4 a. Define force constant and mention its physical significance. Derive the expression for force constant in series and parallel combination. (CO1 08 Marks)

b. Define attenuation. Explain the types of fiber losses. (CO2 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. (CO2 04 Marks)

HOD

Principal

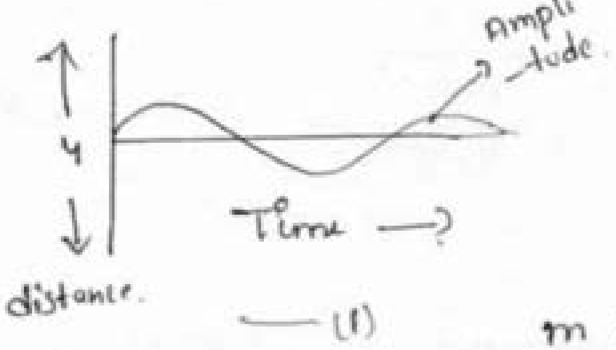
Scheme of Evaluation

Sub :- Engineering Physics Sub code: 21PHY12

1. a) Defination of SHM — (1)

write the characteristics of SHM — (2)

08



— (1)

$$F = -ky.$$

$$F = m\frac{d^2y}{dt^2} \quad — (1)$$

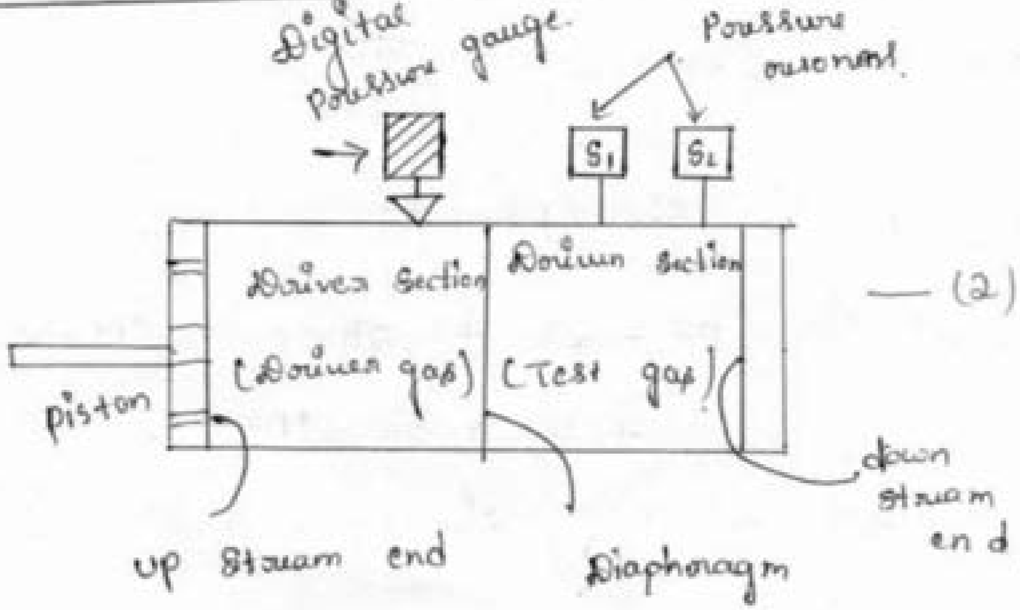
$$m\frac{d^2y}{dt^2} = -ky \quad — (1)$$

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

$$\frac{d^2y}{dt^2} + \frac{k}{m}y = 0 \quad — (1)$$

$$y = a \sin\omega t \quad — (1)$$

1. b)



— (2)

Explanation of construction and working — (3)

application of reddy shock tube. -(3) 08

1.c) Given :- $a = 15\text{cm}/s^2$ $x = 3\text{cm}$

$$\omega = \sqrt{\frac{a}{x}} = \sqrt{\frac{15\times10^{-2}}{3\times10^{-2}}} = 2.24 \text{ rad/s}$$

$$\omega = 2\pi f$$

$$T = \frac{2\pi}{\omega} = \frac{2\times3.142}{2.24} = 2.8 \text{ seconds}$$

2.a) Explination of theory of forced vibrations expression for amplitude and phase

$$\text{Resultant force} = -r\frac{dx}{dt} - kx + F\sin pt$$

$$\text{Resultant force} = m\frac{d^2x}{dt^2}$$

$$x = a\sin(pt - \alpha)$$

$$-ap^2\sin(pt - \alpha) + 2bap\cos(pt - \alpha) + \omega^2 a\sin(pt - \alpha)$$

$$\Rightarrow = F/m \sin(pt)$$

$$\frac{d^2x}{dt^2} + 2b\frac{dx}{dt} + \omega^2 x = 0$$ ——①

$a^2 + 2ab + \omega^2 = 0$ $x_0 = C + D$ ——①

08

$$x = \frac{x_0}{2}\left\{ \left[1 + \frac{b}{\sqrt{b^2-\omega^2}}\right] e^{\left(-b+\sqrt{b^2+\omega^2}\right)t} + \left[1 - \frac{b}{\sqrt{b^2-\omega^2}}\, e^{\left(-b\sqrt{b^2-\omega^2}\right)t}\right] \right\}$$

——①

2.c Given data:-

Distance b/t the two pressure sensors $d = 150\times10^{-3}\,m$

Time taken to travel d is

$t = 0.3\times10^{-3}\,s$

velocity of sound $a = 340\,ms^{-1}$

To find :- $m = ?$

$$U_s = d/t = \frac{150\times10^{-3}}{0.3\times10^{-3}} = 500\,ms^{-1}$$

$$m = \frac{U_s}{a} = \frac{500}{340} = 1.47$$

$$\frac{F}{m} \sin\left[(pt - \alpha) + \alpha \right]$$

$$-ap^2 + a\omega^2 = F/m \ \cos\alpha .$$

$$a = \frac{F/m}{\sqrt{4b^2p^2 + (\omega^2 - p^2)^2}}$$

$$\alpha = \tan^{-1}\left[\frac{2bP}{\omega^2 - p^2}\right]$$

2b] **Damped oscillation** :- it is type of motion Executed by a body subjected to the combined action of both the restoring and resistive forces ——— ②

Theory of damped vibration

resistive force $= -r \dfrac{dx}{dt}$ ——— ①

resulting force $= -kx$ ——— ①

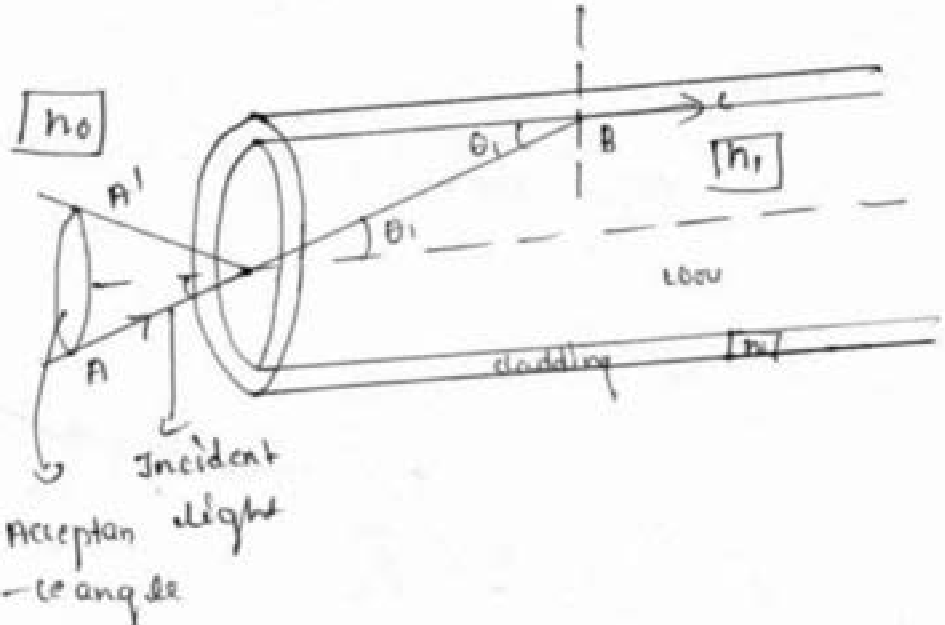
$$m\frac{d^2x}{dt^2} + r\frac{dx}{dt} + kx = 0$$

——— ①

3] a) The ratio of refractive idex diffrence between core and cladding to the refractive index of core

$$\Delta = \frac{n_2 - n_1}{n_1}$$

Numerical aperture and acceptance angle



Snell's law at the point O

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

Snell's law at point B

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

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

$$\sin\theta_0 = \frac{\sqrt{n_1^2 - n_2^2}}{n_0} \qquad n_0 = 1$$

$$NA = \sqrt{n_1^2 - n_2^2} \qquad \sin\theta_i \angle \sqrt{n_1^2 - n_2^2}$$

3.b) Explination of 3 types of optical fiber with diagram,

1. Single mode step index O-F
2. multi mode step index O-F
3. ~~Broad~~ multi mode graded index O-F

3.c) Given data:-

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

To find : $\alpha = ?$

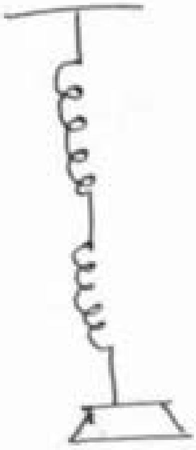
$$\alpha = \frac{-10}{L} \log_{10} \left[\frac{P_{out}}{P_{in}} \right] \text{ dB/km}$$

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

$$\underline{\alpha = 0.915 \text{ dB/km}}$$

4.a). Defination of force constant.

Explination of Physical significance.



According to hook's law.

$$F = -K_1X_1$$

$F = mg$ hence $mg = -K_2 n$

$$x_1 = \frac{-mg}{K_1} \quad x_2 = \frac{-mg}{K_2}$$

$$x_1 + x_2 = \frac{-mg}{K_S}$$

$$\boxed{K_S = \frac{K_1K_2}{K_1+K_2}} \quad \boxed{K_P = K_1 + K_2}$$

4. b] The power loss suffered by the optical signal when it propogates through the fiber.

* absorption

* scattering

* radiation losses.

4.c) Given data :-

$n_1 = 1.50$ $n_2 = 1.48$

$$NA = \sqrt{n_1^2 - n_2^2}$$

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

$$= 0.244$$

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

$$= \sin^{-1}[0.244]$$

$$= 14.122^\circ$$

H.O.D
Dept. of Physics
S.I.E.T., TUMKUR -6.

PRINCIPAL
SIET., TUMAKURU.

Shridevi Institute of Engineering and Technology,
Tumkur-06

I Semester: CIE III Internal Assessment Test:26/04/2022

21PHY12-Engineering Physics

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

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

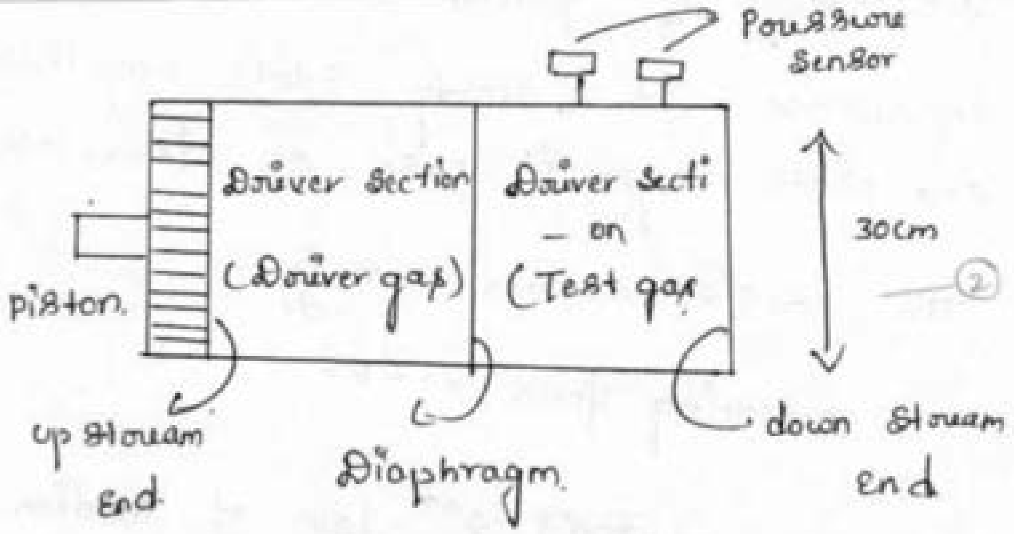
2. Physical constants: Planck's constant h = 6.626 x 10^{-34} JS, Mass of electron m = 9.11 x 10^{-31}kg, Boltzmann constant K = 1.38 x 10^{-23} J/K, Avogadro number charge e = 1.602 x10^{-19}C and velocity of Light C = 3 x 10^{8} m/S.

		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 08 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 04 Marks)**
2	a.	What are forced oscillations? Derive the expression for steady state amplitude and phase angle in case of forced oscillation. **(CO1 08 Marks)**
	b.	What are damped oscillations? Give the theory of damped oscillation and hence discuss the case of critical damping. **(CO1 08 Marks)**
	c.	Compare the Mach number of a Jet fighter traveling with 2000 km hr^{-1} with that of a bullet traveling with a velocity of 400 ms^{-1} in the same medium given the speed of sound in the medium 330 ms^{-1}. **(CO1 04 Marks)**
		Module - 2
3	a.	Write the assumption of Planck's law of radiation. Deduce wein's law and Rayleigh-Jeans law from Planck's law of radiation. **(CO2 08 Marks)**
	b.	Set up time independent one dimensional schrodinger wave equation. **(CO2 08 Marks)**
	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. **(CO2 04 Marks)**
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)**

Dept. of Physics
S.I.E.T., TUMKUR -6.

PRINCIPAL
SIET., TUMAKURU

		Module-3
5	a.	Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein's co-efficient. **(CO3 08 Marks)**
	b.	With a neat diagram derive the expression for numerical aperture and arrive, condition for propagation in an optical fiber. **(CO3 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. **(CO3 04 Marks)**
6	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. **(CO3 08 Marks)**
	b.	Describe different types of optical fiber with neat diagram. **(CO3 08 Marks)**
	c.	The ratio of population of two energy levels is 1.059×10^{-30}. Find the wavelength of light a 330K. **(CO3 08 Marks)**
		Module- 4
7	a.	Deduce the expression for electrical conductivity of a conductor using the quantum free electron theory of a metals **(CO4 08 Marks)**
	b.	Derive Clausius-Mossotti equation. Describe in brief the various types of polarization mechanisms. **(CO4 08 Marks)**
	c.	Calculate the probability that an energy level at 0.2eV below Fermi level is occupied at temperature 500K. **(CO4 04 Marks)**
8	a.	Define Fermi factor & Discuss the variation of Fermi factor with Temperature and effect on occupancy of energy levels. **(CO4 08 Marks)**
	b.	What is Hall Effect? Obtain the expression for Hall voltage in terms of Hall co-efficient. **(CO4 08 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. **(CO4 04 Marks)**
		Module-5
9	a.	With neat diagram describe the principle, construction and working of X-ray difractomet (XRD). **(CO5 08 Marks)**
	b.	With neat diagram describe the principle, construction and working of Scanning Electron Microscope (SEM). **(CO5 08 Marks)**
	c.	X-rays are diffracted in the first order from crystal with d spacing 2.8×10^{-10} m at a glancing angle 60^0. Calculate the wavelength of X-rays. **(CO5 04 Marks)**
10	a.	With neat diagram describe the principle, construction and working of Atomic Force Microscopy (AFM). **(CO5 08 Marks)**
	b.	With neat diagram describe the principle, construction and working of X-ray Photoelectron Spectroscopy (XPS). **(CO5 08 Marks)**
	c.	Determine the wavelength of x-rays for crystal size of 1.188×10^{-6}m, peak width is 0.5^0 and peak position 30^0 for a cubic crystal. Given Scherrer's constant K=0.92. **(CO5 04 Marks)** ***********

Question No	CIE III Internal Assessment Test 26/04/2022 21PHY12 - Engineering Physics	Marks
1] a)	Defination of SHM. —— ② Examples of SHM —— ② Derivation of differential equation of motion for it using hook's law $F = -ky$ —— ① $F = \frac{md^2y}{dt^2}$ —— ① $\frac{d^2y}{dt^2} + \frac{k}{m} y = 0$ —— ① $y = a \sin\omega t$. —— ①	08
1] b)	 —— ② construction of Reddy Shock tube —— ③ working of Reddy Shock tube —— ③	08

1. c) Given :- $r = 0.1 kg / sec$ $a_{max} = ?$

$m = 50 \times 10^{-3} kg$

$F = 1N$

$T = 1 Sec$

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

$$b = \frac{r}{2m} = \frac{0.1}{50 \times 10^{-3} \times 2} = 1$$

$$\omega = 2\pi f \qquad \omega = \frac{2\pi}{T} = \frac{2\pi}{1} = 6.28$$

$$F/m = \frac{1}{50 \times 10^{-3}} = 20 kg / N$$

$$a_{max} = \frac{20}{2 \times 1 \times 6.28} = 1.59m$$

---

2. a) Defination of forced oscillations —— ②

Expression for steady state amplitude and phase angle in case of forced oscillation.

The resistive force $= -r.\frac{dx}{dt}$ —— ①

restoring force $= -kx.$

As per newton's 2^{nd} law of motion.

resultant force $m.\frac{d^2x}{dt^2}$ —— ①

$\frac{r}{m} = 2b$ & $\frac{k}{m} = \omega^2$ —— ①

$\frac{d^2x}{dt^2} = -ap^2 \sin(pt-\alpha)$ —— ①

$2bap = \frac{F}{m}\sin\alpha.$

$a = \frac{F/m}{\sqrt{(\omega^2-p^2)^2 4b^2p^2}}$ —— ①

$\tan\alpha = \frac{2bap}{a(\omega^2-p^2)}$

$\alpha = \tan^{-1}\left[\frac{2bp}{\omega^2-p^2}\right]$ —— ①

08

---

2. b) Defination of damped oscillations —— ②

Explination of theory of damped oscillation.

critical damping :-

Resistive force = $-r\frac{dx}{dt}$. —— ①

Restoring force = $-Kx$. —— ①

as per newton's 2nd law.

Resultant force = $m.\frac{d^2x}{dt^2}$ —— ①

$$\frac{d^2x}{dt^2} + \frac{r}{m}\frac{dx}{dt} + \frac{k}{m}x = 0 \quad \text{——} ①$$

where $\frac{r}{m} = 2b$ & $\omega^2 = \frac{k}{m}$

$$\frac{dx}{dt} = A\alpha e^{\alpha t} \quad \text{——} ①$$

$$Ae^{\alpha t}\left[\alpha^2 + 2b\alpha + \omega^2\right] = 0$$

$$\alpha = -b \pm \sqrt{b^2-\omega^2}$$

$$x = Ce^{-b+(\sqrt{b^2+\omega^2})xt} + De^{(-b-(\sqrt{b^2-\omega^2})xt} \quad \text{——} ①$$

2.c

$$V_{Jet} = \frac{2000\times10^3}{60\times60}$$

$V_{Jet} = 555.55 m/s$

$V_{Bullet} = 400 m/s$

$a = 330\ m/s$

$m_{Jet} = ?$

We have relation jet

$$V_{jet}/a = M_{Jet}.$$

$$\frac{555.55}{330} = 1.68$$

$$\frac{V_{Bullet}}{a} = M_{Bullet} = \frac{400}{300} = 1.21.$$

3. a) Explination of assumption of Planck's law of. radiation. —— ③

Deduction wein's law and rayleigh - jeans law from plack's law of radiation

$$U_\lambda d_\lambda = \frac{8\pi hc}{\lambda^5}\left[\frac{1}{e^{h\nu/KT} + (-1)}\right] d\lambda$$

—— ①

08

case - I $\nu = \frac{c}{\lambda}$

$$U_\lambda d_\lambda = C_1\lambda^{-5}\left[e^{-C_2/\lambda T}\right] d\lambda$$

—— ①

case - II

$$e^{h\nu/KT} \approx 1 + h\nu/KT + \left(\frac{h\nu}{KT}\right)^2$$ —— ①

$$e^{h\nu/KT} \approx 1 + h\nu/KT$$ —— ①

$$U_\lambda d_\lambda = \left[\frac{8\pi KT}{\lambda^4}\right] d\lambda$$ —— ①

---

3. b) Set up of time independent one dimens -ional schrodinger wave equation.

$$\lambda = \frac{h}{mv}$$

$$\psi = A e^{i(kx-\omega t)}$$

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

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

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

$$K.E = \frac{p^2}{2m}$$

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

W.K.T $P.E = V$

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

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

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

3.c) Given data:-

$a = 1 \times 10^{-10} m$

$E_1 = ?$

$E_2 = ?$

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

$$E_1 = \frac{h^2}{8ma^2}$$

$$= \frac{(6.626 \times 10^{-34})^2}{8 \times 9.11 \times 10^{-31} \times (1 \times 10^{-10})^2}$$

$E_1 = \underline{37.60 eV}$

for $n = 2$,

$E_2 = 4E_1 = 4 \times 37.60 = \underline{150.4 eV}$

4.a) Heisenberg's uncertainty principle

i.e. $\Delta x \, \Delta P \geq h/4\pi$ $\qquad \Delta\theta \, \Delta L \geq \frac{h}{4\pi}$.

$\Delta x \, \Delta t \geq h/4\pi$ — ①

According to the uncertainity

$E = mc^2$ — ①

$$E = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \cdot c^2$$ — ①

$$p^2 = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \cdot v$$ — ①

$$c^2 p^2 = \frac{m_0^2 v^2 c^4}{c^2 - v^2}$$ — ①

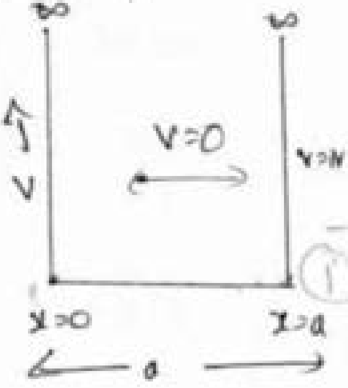
$$E^2 - c^2 p^2 = m_0^2 c^4 \left[\frac{c^2 - v^2}{c^2 - v^2} \right]$$ — ①

$$E^2 = m_0^2 c^4 + p^2 c^2$$ — ①

$\Delta P \geq P$ $\qquad E = \geq 20.6 \times 10^6 \, eV$ — ①

08

4.b) Energy values and normalised wave function with respect to a particle in a one dimensional potential well of infinite height



①

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

$c = 0, \quad \mathcal{D}\sin ka = 0$

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

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

$$E_n = \frac{\left(\frac{n\pi}{a}\right)^2 h^2}{8\pi^2 m} = \frac{n^2h^2}{8ma^2} \quad \text{——} ①$$

① for $n = 1$ $\quad E_{zero}\Big|E_1 = \frac{h^2}{8ma^2}$ 08

② for $n = 2$ $\quad E_2 = 4\times E_1$ —— ②

③ for $n = 3$ $\quad E_3 = 9\times E_1$

$$\int_0^a |\psi_n|^2\, dx = 1 \quad \text{——} ①$$

$$\int_0^a \mathcal{D}^2\cdot \tfrac{1}{2}\left(1-\cos\frac{2n\pi}{a}\cdot x\right) dx = 1 \quad \text{——} ①$$

$$\frac{\mathcal{D}^2}{2}[a] = 1$$

$$\mathcal{D} = \frac{\sqrt{2}}{a} \quad \text{——} ①$$

---

4. c) Given data = $m = 940\ \text{Mev}/c^2$

$= 8.9\times 10^{-3}\,\text{kg}$

$E = 100\,\text{ev}, \Rightarrow 1.602\times 10^{-17}\,\text{J}$

we have relation

$$\lambda = \frac{h}{\sqrt{2mE}} = \frac{6.626\times 10^{-34}}{\sqrt{2\times 8.9\times 10^{-31}\times 1.602\times 10^{-17}}} = 1.24\,\text{A}^\circ.$$

5. a) Expoussion for Energy density of oradiation under Equalleborium condition in terms of Einstein's co-efficient.

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

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

Rate of Stimultanious emission $= B_{21} N_2 U_\gamma$ —— ①

At thermal Equilibrium

Rate of absorbtion = Stimulated Emission + Spontanious emission. —①

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

$$U_\gamma = \frac{A_{21} \cdot N_2}{B_{12} N_1 - B_{21} N_2.} \quad —— ①$$

According to plank's constant.

$$U_\gamma = \frac{8 \pi h \nu^3}{c^3} \left[\frac{1}{e^{h\nu/kT} - 1} \right] \quad —— ①$$

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

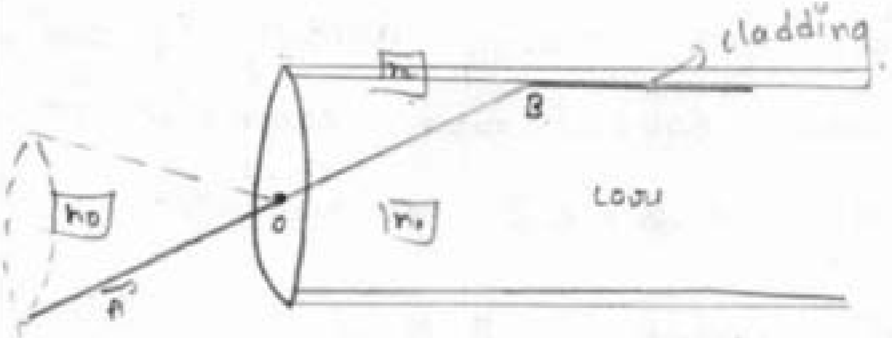
08

5. b. Expoussion for numarical aperture and condition for poropogation in an optical fiber.

we have Snell's law.

$$n_1 \sin \theta_1 = n_2 \sin \theta_2.$$

$$\theta_c = \sin^{-1} \left[\frac{n_2}{n_1} \right]$$



$$n_1 \sin\theta = n_2 \sin\theta_2$$

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

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

$$\sin\theta_0 = \frac{\sqrt{n_1^2-n_2^2}}{n_0} \qquad n_0 = 1$$

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

$$NA = \sin\theta_0$$

$$NA = \sqrt{n_1^2-n_2^2}$$

5.c) Given data:-

$L = 500\,m \rightarrow 0.5\,km.$

$P_{in} = 100\,mW \Rightarrow 100 \times 10^{-3}\,W$

$P_{out} = 90\,mW = 90 \times 10^{-3}\,W$

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

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

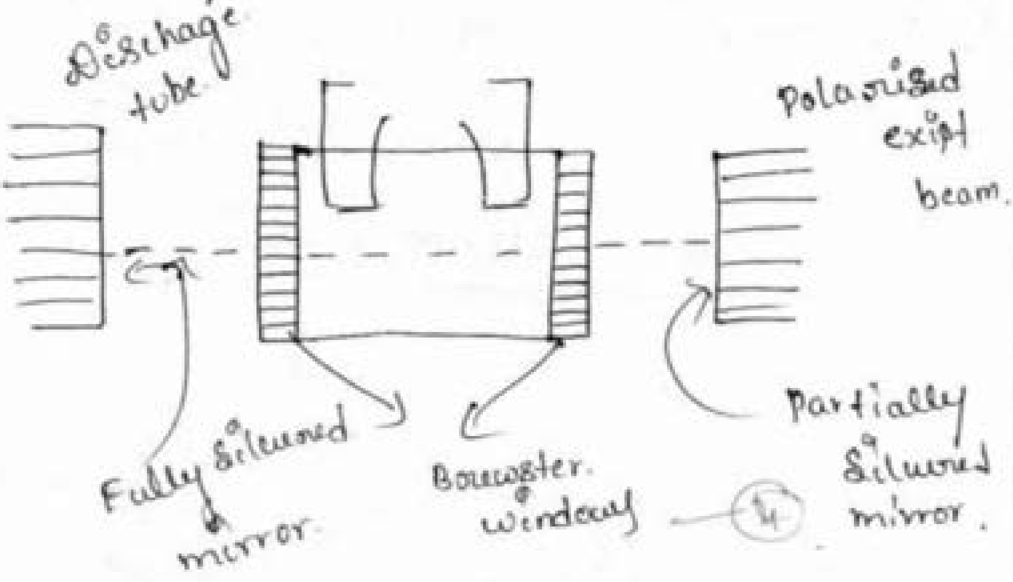
$$\alpha = \underline{0.915\ dB/km}$$

6. a) Three modes of vibration in CO₂ molecule and construction and working of CO₂ laser.

1) Symmetric stretching mode.

2] Asymmetric stretching mode

3) Bending mode. —②



—④

08.

construction of CO₂ laser

working of CO₂ laser. } ④

6. b) different types of optical fiber.

* single mode step index optical fiber. —③

* Multi mode step index optical fiber. —③

* Multi mode graded —②

08.

6c) Given data:-

$\frac{N_2}{N_1} = 1.059 \times 10^{-30}$ T = 330k $\lambda = ?$

from Boltzman law $\frac{N_2}{N_1} = \frac{-\Delta E}{e^{kT}}$

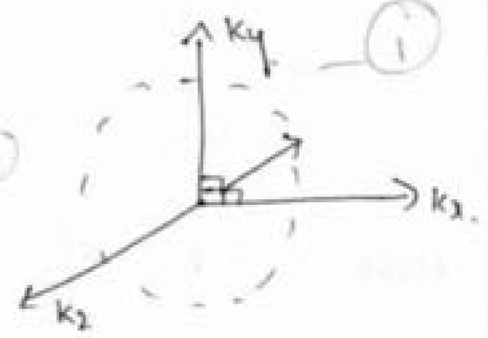
or $\ln \frac{N_2}{N_1} = \frac{-hc}{\lambda kT}$

$$\ln(1.059 \times 10^{-30}) = -\frac{(6.626 \times 10^{-34}) \times (3 \times 10^{8})}{\lambda (1.38 \times 10^{-23})(330)}$$

$\underline{\lambda = 632\,nm}$

---

7) a)



— ①

$V = \frac{p}{m} = \frac{hk}{2\pi m.}$ — ①

$E_r = \frac{h^2}{8\pi^2 m} k_r^2$ — ①

$\lambda = \frac{h}{p}$ $V_d = \frac{hk_F}{2\pi m^*}$ — ①

$F = \frac{dp}{dt} = eE$ $k_F = \frac{2\pi eE}{h}$ — ①

$J = \frac{I}{A}$ — ① $J = ne\left(\frac{hk_F}{2\pi m^*}\right)$ — ①

$\sigma = \frac{J}{E}$ = $\sigma = \frac{ne^2}{m^*}\left(\frac{\lambda}{v_F}\right)$ — ①

08

7. b) classical - mosotti equation.

$$\mu = \alpha_e E_i$$

$$P = N\alpha_e E_i \qquad E_i = \frac{P}{N\alpha_e}$$ — (1/2)

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

$$E_i = E + \gamma \frac{P}{\varepsilon_0}$$ — (1/2)

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

$$\gamma = 1/3$$ — ①

$$\frac{1}{N\alpha_e} = \frac{1}{\varepsilon_0}\left[\frac{1}{(\varepsilon_r - 1)} + \frac{1}{3}\right]$$ — (1/2)

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

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

08

Types of polarization

a) Electronic polarization
b] Ionic polarization
c] orientational polarization

②

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

given data

$T = 500k$, $E_F = 0.2eV$

$f(E) = ?$

$$f(E) = \frac{1}{e^{\frac{-0.02\times1.6\times10^{-19}}{1.38\times10^{-23}\times500}}+1}$$

$$\underline{f(E) = 0.6139}$$

---

8 a) statement of fermi factor. —— ②

variation of fermifactor with temp on occupancy of energy level.

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

(i) $E < E_F$ $f(E) = 1$ —— ②

(ii) $E > E_F$ $f(E) = 0$ —— ②

(iii) $E = E_F$ $f(E) = 0.5$ —— ②

08

8.b) Hall effect and expression for Hall voltage in terms of Hall co-efficient.

$F_L = -Bev$ —— ①

$F_H = -eE_H$ —— ②

$F_L = F_H$ — ①

$-Bev = -eE_H$

$E_H = \frac{V_H}{d}$ $\quad V_H = E_H d.$ — ①

$J = \frac{I}{A}$ $\quad J = \rho v$ $\quad v = \frac{1}{\rho w d}.$ — ①

$V_H = \frac{BI}{\rho w}$ $\quad \rho = \frac{BI}{V_H w}$ — ①

08.

Hall co-efficient :-

$E_H \propto JB$

$E_H = R_H J B$ $\quad R_H = \frac{E_H}{JB}$ — ①

$R_H = \frac{Bv}{\rho v B}$ $\quad R_H = \frac{1}{\rho}.$ — ①

8.c) Given data :-

$f(E) = 1\% = 0.1$

$(E-E_F) = 0.5eV = 0.5 \times 1.6027 \times 10^{-19}$

$= 8.01 \times 10^{-2}$

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

$$0.1 = \frac{1}{e^{\left(\frac{8.01\times10^{-20}}{T(13.8\times10^{-23})}\right)} + 1}$$

$T = \underline{1261.1\ K}$

9.a) Principle, construction, and working of X-ray difractometer (XRD)

Explination Principle — ②

Explination of construction with neat diagram — ③

explination of working — ③

08

9.b) Principle, construction and working of scanning electron microscope (SEM)

Explination of principle — ②

Explination of construction with neat diagram — ③

explination of working — ③

08

9.c) Given data:-

$\theta = 60^0, \quad n = 1, \quad d = 2.8 \times 10^{-10} m$

$$\lambda = \frac{2d \sin\theta}{n}$$

$$\lambda = \frac{2 \times (2.8 \times 10^{-10})(\sin 60^0)}{1}$$

$$\lambda = 4.8 A^0$$

10) a) Principle, construction and working of Atomic force microscopy.

Explination of principle — ②

Explination of construction with neat diagram. — ③

Explination of working. — ③

---

10. b) Principle, construction and working of X-ray Photoelectron Spectroscopy.

Explination of principle. — ②

Explination of construction with neat diagram. — ③

Explination of working. — ③

---

10. c) Given data :-

$D = 1.188 \times 10^{-6}$ m

$B = 0.5^{\circ} = \frac{0.5 \times 3.142}{180} = 8.72 \times 10^{-3}$ rad

$2\theta = 30^{\circ} \Rightarrow \theta = \frac{15^{\circ} \times 3.142}{18} = 0.2618$

$K = 0.92$ $\lambda = ?$

$D = \frac{K\lambda}{B\cos\theta}$ $\lambda = \frac{D \cdot B\cos\theta}{K} = 1.781 \times 10^{-8}$ m.

Shridevi Institute of Engineering and Technology, Tumkur-06

II Semester: CIE I Internal Assessment Test:15/07/2022

21PHY22-Engineering Physics

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

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

2. ***Physical constants,*** **Velocity of light, c = 3×10^8 m/s,**
Planck's constant, h = 6.63×10^{-34} JS, Mass of electron, $m_e = 9.1 \times 10^{-31}$ kg,
Charge of electron, e= 1.602×10^{-19} C, Boltzmann constant, K = 1.38×10^{-23} J/K

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. Mention the applications of shock waves. **(CO1 04 Marks)**

PTO

H.O.D
Dept. of Physics
S.I.E.T., TUMKUR -6.

PRINCIPAL
SIET., TUMAKURU.

3 a. Discuss the success of quantum free electron theory.

(CO4 08 Marks)

b. Derive the expression for electrical conductivity of semiconductors.

(CO4 08 Marks)

c. Calculate the probability of an electron occupying an energy level 0.02eV above the Fermi level at 200K and 400K. **(CO4 04 Marks)**

OR

4 a. What is polarization? Explain various types of polarizations Mechanisms.

(CO4 08 Marks)

b. What is Hall Effect? Obtain the expression for Hall voltage in terms of Hall co-efficient. **(CO4 08 Marks)**

c. The conductivity and hall coefficient of an n – type silicon specimen are $112\Omega m^{-1}$ and $1.25 \times 10^{-3} m^{3} c^{-1}$ respectively, calculate charge carrier concentration and electron mobility. **(CO4 04 Marks)**

Question number	II Semester CIE - I internal assessment test 21PHY22 Engineering Physics [15/07/22]	Marks

1. a) Free oscillation :-

Under the action of a restoring force an oscillating body oscillates with undiminished amplitude at it's own natural frequency so long as no other External force intervenes in it's motion Such oscillations are called free oscillations. —— ②

Damped oscillations :-

It is type of motion executed by a body Subjected to the combined action of both the restoring and the motion always get terminated with the body coming to a rest at the equilibrium position in a finite interval of time. —— ②

Restoring force $= -kx$

Resultant force $= m\frac{d^2x}{dt^2}$

$$m\frac{d^2x}{dt^2} + r\frac{dx}{dt} + kx = 0.$$ —— ①

$$\frac{d^2x}{dt^2} = A\alpha e^{\alpha t}$$ —— ①

$$\alpha^2 + 2b\alpha + \omega^2 = 0.$$

$$\alpha = -b \pm \sqrt{b^2 - \omega^2}$$ —— ①

08

$$b^2 = \omega^2$$

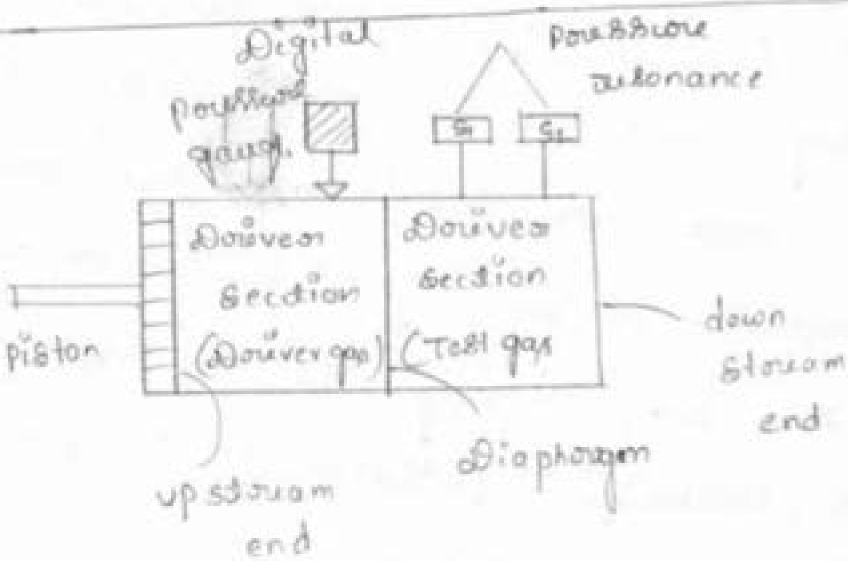
$$x = e^{-bt}\left[c(1+\varepsilon t - - + - - -) + D(1+\varepsilon + \cdots + - - -)\right].$$

$$x = e^{-bt}\left[(C+D) + (C-D)\varepsilon t\right]$$

—— ①

---

1. b)



08

Explination of constraction of ruddy shock tube.

—— (08)

1. c) Given data :-

$x = -0.03$ m. $m = 0.5$kg.

To find out :- K, ω & T.

Solution :-

force acting $F = mg = 0.5 \times 9.8N$

Restoring force $F_x = -4.9 N$

$$k = \frac{-F_x}{x} = \frac{-4.9}{-0.03} = 163.3 N/m$$

$$\omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{163.3}{0.5}} = 18.1 \text{ rad/s}$$

$$f = \frac{\omega}{2\pi} = \frac{18.1}{2\pi} = 2.877 \text{ Hz}$$

$$T = \frac{1}{f} = 0.35 s.$$

---

2. a) SHM is a motion in which the accelaration of the body is directly proportional to it's displacement of the from a fixed point and is always directly towards the fixed point. — ③

$$F = -ky.$$

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

$$\frac{d^2y}{dt^2} + \frac{k}{m}y = 0$$

$y = a \sin\omega t$ ——— ②

08

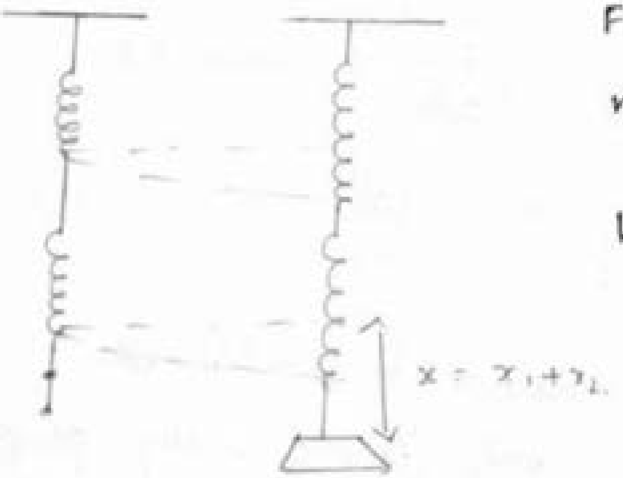
Characteristics of SHM ——— ②

Examples of SHM ——— ②

---

2. b) Force constant is defined as it is the magnitude of the applied force that. Produced with extension (or compoussion) in the sporing which it. is loaded with in the elastic limit.

Series combination :-



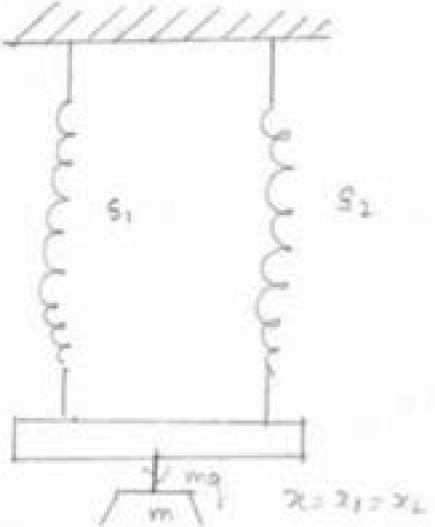
$x_1 = \frac{-mg}{k_1}$

$F = mg$

$mg = -k_1 x$

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

Parallel combination :-



$F_p = F_1 + F_2$

$F_p = -k_1 x_1 - k_2 x_2$

$k_p = -(k_1 + k_2)$

$k_p = k_1 + k_2$

2.c) Application of shock waves.

- They are used to break up kidney stones
- using a technique with the impressive name Extracorporeal shock-wave lithotripsy
- For used to break hard materials. —— ④

04

3.a) The success of quantum free electron theory.

* specific heat —— ②

* Temperature depends on electrical conductivity. —— ④

* Electrical conductivity on electron concentration —— ②

08

3b) Consider a semiconductor of area of cross section A, in which current I is flowing let v be the velocity of electrons whose flow constitute the electric current —— ②

08

$$I = N_e e A v \quad — ①$$

$$J = (N_e e \mu_e E) \quad — ①$$

$$J = \sigma E \quad — ① \qquad \sigma = e(N_e\mu_e + N_h\mu_h) \quad — ①$$

$$\sigma_e = N_e e \mu_e \quad — ①$$

$$\sigma_h = N_h e \mu_h \quad — ①$$

3.c) Given data :-

$(E - E_F) = 0.02\,ev$

$T_1 = 200k$ and $T_2 = 400k$.

Solution :-

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

for $T = 200k$

$$f(E) = \frac{1}{e^{\frac{0.02 \times 1.6 \times 10^{-18}}{1.38 \times 10^{-23} \times 200}}} = 0.24$$

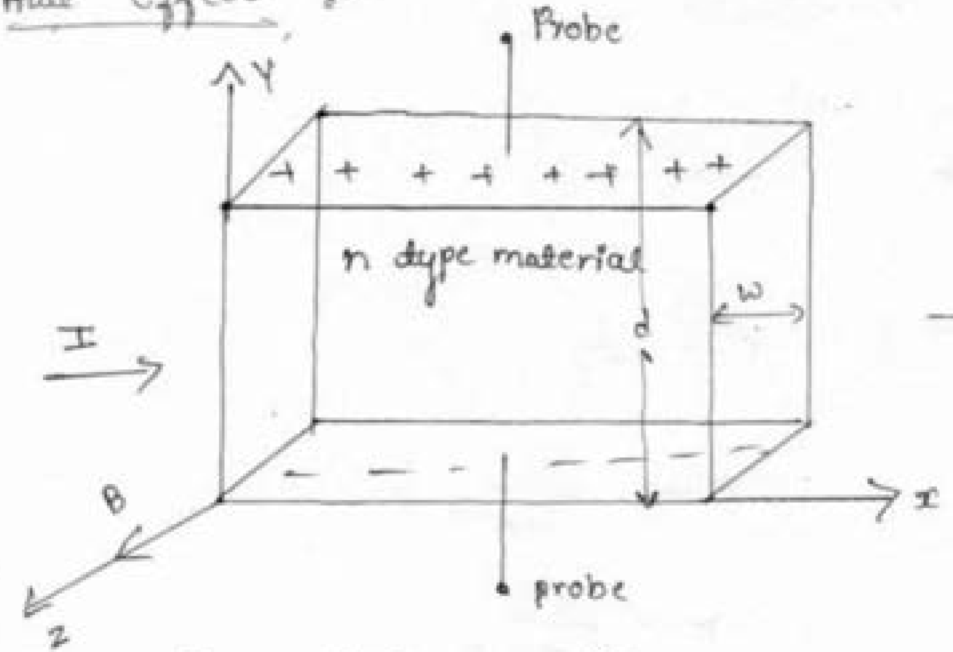
for, $T = 400k$ $f(E) = 0.36$

4.a) Polarization :-

The displacement of centous of (+)ve and (-)ve charges in the atoms (molecules) in a dielectric by applying an eletric field leading to be dipole moment is called polarization.

- Electronic polarization
- Ionic polarization
- Orientational polarization.

4.b) <u>Hall effect</u> :-



— ②

$F_L = -Bev$ — ①

$F_H = -eE_H$ — ①

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

$V_H = Bvd$

$I = nevA$

$v = \frac{I}{\rho w d}$ — ①

$\rho = \frac{BI}{V_H w}$ — ①

08

Hall co-efficient R_H :-

$E_H \propto JB$ — ①

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

$R_H = \frac{Bv}{\rho v B}$

$R_H = \frac{1}{\rho}$ — ①

4.c) Given data :-

$\sigma = 112\ \Omega m^{-1}$

$R_H = 1.25 \times 10^{-3}\ m^3 c^{-1}$

Solution :- $R_H = \frac{1}{\rho}$

$R_H = \frac{1}{ne}$

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

$n = \frac{1}{(1.25 \times 10^{-3})(1.602 \times 10^{-19})}$

$= 5 \times 10^{21}/m^3$

H.O.D
Dept. of Physics
S.I.E.T., TUMKUR -6.

PRINCIPAL
SIET., TUMAKURU.

Shridevi Institute of Engineering and Technology, Tumkur-06

II Semester: CIE II Internal Assessment Test:16/08/2022

21PHY22-Engineering Physics

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, $m_e = 9.1 \times 10^{-31}$ kg,
Charge of electron, $e = 1.602 \times 10^{-19}$ C, Boltzmann constant, $K = 1.38 \times 10^{-23}$ J/K

1 a. What is blackbody? Explain energy spectrum of a Blackbody. **(CO2 08 Marks)**
b. State Heisenberg's Uncertainty Principle. Show that electron cannot exist inside the nucleus. **(CO2 08 Marks)**
c. Mention the properties of the wave function. **(CO2 04 Marks)**

OR

2 a. Write the assumption of Planck's law of radiation. Deduce wein's law and Rayleigh-Jeans law from Planck's law of radiation. **(CO2 08 Marks)**
b. What is wave function? Set up time independent one dimensional schrodinger wave equation. **(CO2 08 Marks)**
c. Derive the expression for the de-Broglie wavelength of accelerated electron. **(CO2 04 Marks)**

Shridevi Institute of Engineering and Technology, Tumkur-06

II Semester: CIE II Internal Assessment Test:16/08/2022

21PHY22-Engineering Physics

Time: 90 Min **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, $m_e = 9.1 \times 10^{-31}$ kg,
Charge of electron, $e = 1.602 \times 10^{-19}$ C, Boltzmann constant, $K = 1.38 \times 10^{-23}$ J/K

1 a. What is blackbody? Explain energy spectrum of a Blackbody. **(CO2 08 Marks)**
b. State Heisenberg's Uncertainty Principle. Show that electron cannot exist inside the nucleus. **(CO2 08 Marks)**
c. Mention the properties of the wave function. **(CO2 04 Marks)**

OR

2 a. Write the assumption of Planck's law of radiation. Deduce wein's law and Rayleigh-Jeans law from Planck's law of radiation. **(CO2 08 Marks)**
b. What is wave function? Set up time independent one dimensional schrodinger wave equation. **(CO2 08 Marks)**
c. Derive the expression for the de-Broglie wavelength of accelerated electron. **(CO2 04 Marks)**

H.O.D
Dept. of Physics
S.I.E.T., TUMKUR -6.

PRINCIPAL
SIET., TUMAKURU

3 a. Describe different types of optical fiber with neat diagram. **(CO3 08 Marks)**

b. With the help of block diagram, explain the basics of point to point communication system .mention any two advantage of optical communication system **(CO3 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. **(CO3 04 Marks)**

OR

4 a. Define fractional Index change (Δ). Derive the expression for Numerical aperture and acceptance angle of an optical fiber. **(CO3 08 Marks)**

b. What is optical fiber sensors and explain intensity based displacement sensor **(CO3 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. **(CO3 04 Marks)**

3 a. Describe different types of optical fiber with neat diagram **(CO3 08 Marks)**

b. With the help of block diagram , explain the basics of point to point communication system .mention any two advantage of optical communication system **(CO3 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. **(CO3 04 Marks)**

OR

4 a. Define fractional Index change (Δ). Derive the expression for Numerical aperture and acceptance angle of an optical fiber. **(CO3 08 Marks)**

b. What is optical fiber sensors and explain intensity based displacement sensor **(CO3 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. **(CO3 04 Marks)**

Question Number

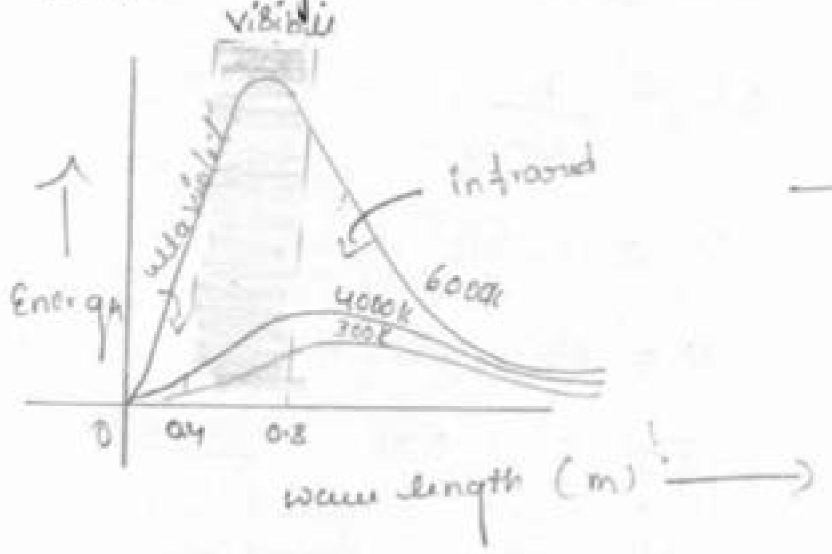
II Semester, CIE III internal Assessment test

21PHY22 - Engineering Physics [16/08/22]

1] a] A body which completely absorbs radiation of all wavelengths incident on it is called blackbody and the radiation emitted by such a body is called blackbody radiation. —— ②

Explination of Energy Spectrum of a Black body —— ④

08



—— ②

b] Statement :- if any determination of the position and momentum of a particle the product of the corresponding uncertainities inherently present in the measurement is greater than or equal to $\frac{h}{4\pi}$ —— ②

Non Existance of electron in the atomic Nucleys

$E = mc^2$ —— ①

$$E = \frac{m_0c^2}{\sqrt{1-\frac{v^2}{c^2}}}$$ —— ①

$$p^2c^2 = \frac{m_0^2v^2c^4}{c^2-v^2}$$ —— ①

08

$E^2 = p^2c^2 + m_0^2c^4$ —— ①

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

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

$$\Delta p \geq 1.1\times10^{-20}\ kgms^{-1}$$

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

$E \geq 20.6$ Mev. —— ①

Properties of wave function

1.c.

* The wave function should be single value everywhere —— ①

* The wave function and it's slope should be continuous everywhere —— ①

* Allow energy calculation —— ①

* To avoid infinite probability the wave must be infinite everywhere —— ①

04

2. a) **Assumptions :-**

* Each oscillator has an energy given by integral multiple of hν where h is plancks constant and ν is frequency of radiation $E = h\nu$

* An oscillator may lose or gain energy by emitting or absorving respectively a radiation of frequency ν where $\nu = \frac{\Delta E}{h}$ ΔE is differend in energy of the the oscillation before and after the emission or obserbing take place.

$$U_\lambda d_\lambda = \frac{8\pi hc}{\lambda^5}\left[\frac{1}{e^{\frac{h\nu}{KT}}-1}\right] d\lambda$$

Reduce of Plancks law to weins law and rayleigh jeans law. 08.

$$U_\lambda d_\lambda = \frac{8\pi hc}{\lambda^5}\left[\frac{1}{e^{h\nu/KT}-1}\right] d\lambda \quad \text{—④}$$

case (i) for shorter wavelength

$\nu = c/\lambda$ is large

when $\nu = \frac{c}{\lambda}$ is large $e^{\frac{h\nu}{KT}}$ also large.

$$U_\lambda d_\lambda = \frac{8\pi hc}{\lambda^5}\left[\frac{1}{e^{hc/KT}}\right] d\lambda \quad \text{—②}$$

$$U_\lambda d_\lambda = C_1\lambda^{-5} e^{\left(\frac{-C_2}{\lambda T}\right)} d\lambda$$

case (ii) for longer wavelength $\nu = \frac{c}{\lambda}$ is small

$$U_\lambda d_\lambda = \left[\frac{8\pi KT}{\lambda^4}\right] d\lambda \quad \text{— ②}$$

2.b] <u>Wave function</u> :- in quantum mechanics it is postulated that there exists a function determined by the physical situation (x, t etc) Such function called wave function.

— ②

Time independent Schrodinger's wave Equation. in one dimensional.

$$\psi = A e^{ikx} \quad \text{— ①}$$

$$\frac{d^2\psi}{dx^2} = e^{-iax} \frac{d^2\psi}{dx^2} \quad \text{— ①}$$

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

08

$$K.E = \frac{h^2}{2m} \frac{1}{\lambda^2} \quad \text{— ①}$$

$$P.E = V.$$

$$E = KE + PE \quad \text{— ①}$$

$$\frac{d^2\psi}{dx^2} + \frac{8\pi^2 m}{h^2} [E V] \psi = 0$$

— ①

2. c) de - Broglie wavelength of accelarated electron.

Energy Equation for non-relativistic case $ev = \frac{1}{2} mv^2$ —— ①

$p = mv \qquad p^2 = m^2v^2$

$P = \sqrt{2mv}$

$\lambda = \frac{h}{p}$

$\lambda = \frac{h}{2mev}$ —— ①

04

$\lambda = \frac{1}{\sqrt{V}} \left[\frac{h}{\sqrt{2me}} \right]$

$\lambda = \frac{1}{\sqrt{V}} \left[\frac{6.626 \times 10^{-34}}{\sqrt{2(9.11 \times 10^{-31})(1.602 \times 10^{-19})}} \right]$

$= \frac{1.226 \times 10^{-9}}{\sqrt{V}}$ m —— ①

$\boxed{\lambda = \frac{1.226}{\sqrt{V}} \text{ nm}}$ —— ①

3. a) 3 types of optical fiber.

with Explination.

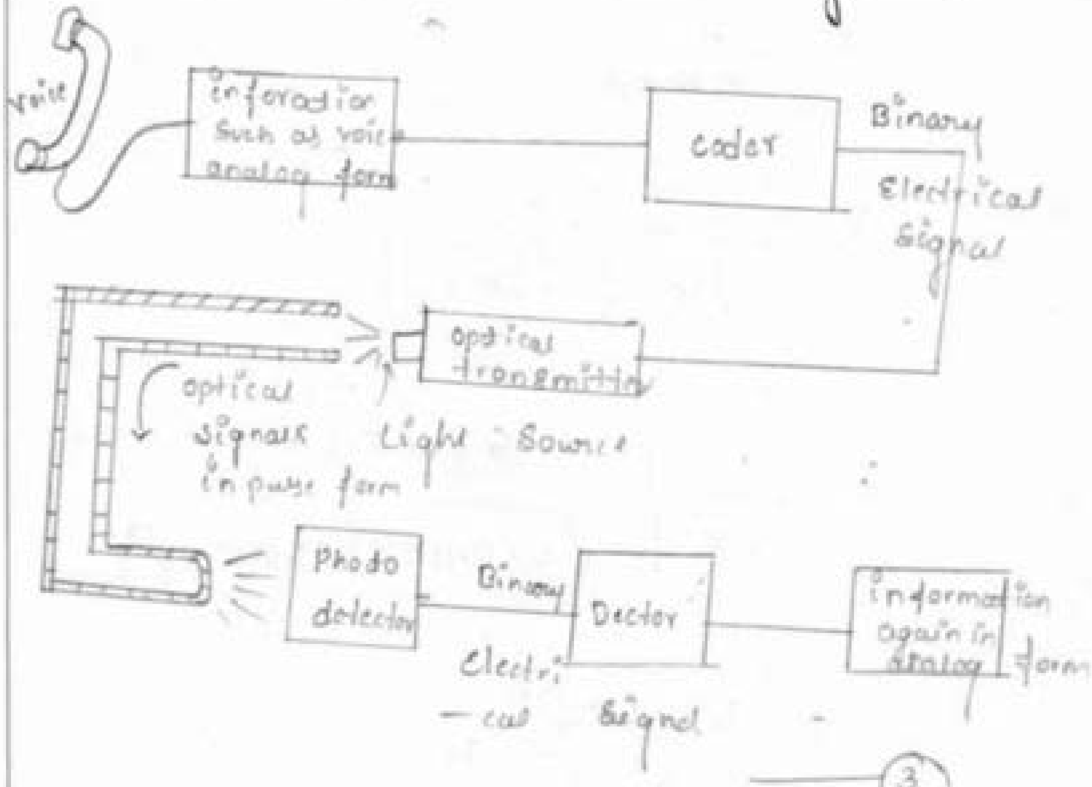
1] Single mode step index optical fiber.

2] Multimode step index optical fiber. 08

3] Multimode graded index optical fiber.

—— (08)

Point to Point communication System.



08

—— ③

Explination about point to poind.

communication System.

—— ⑤

3. c) Given data :-

$n_1 = 1.50$, $n_2 = 1.48$

To find out :- NA = ?

θ = Angle of acceptance = ?

Solution :-

$$NA = \sqrt{n_1^2 - n_2^2}$$

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

$$= 0.2441$$

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

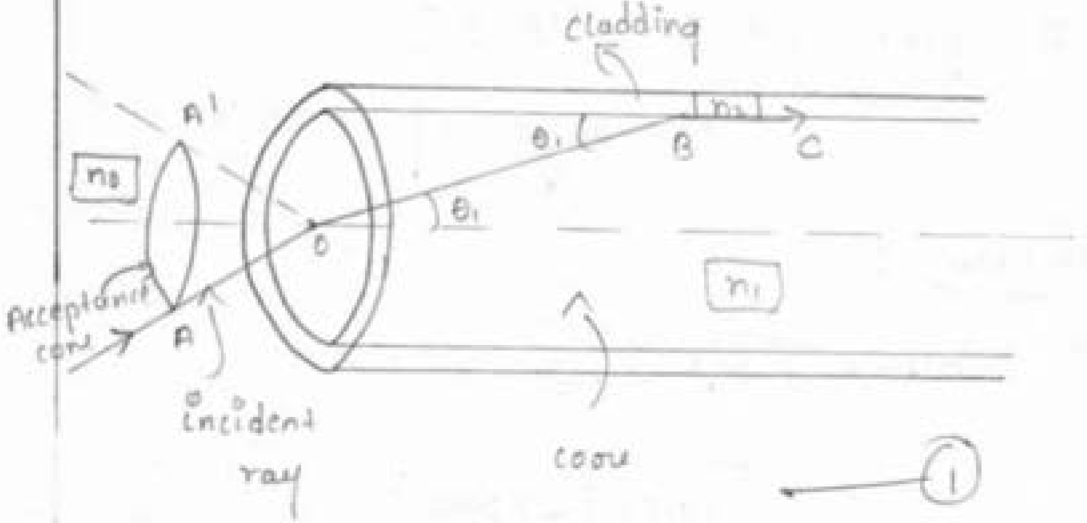
$$\theta = \sin^{-1}(0.2441)$$

$$\boxed{\theta = 14.130}$$

---

4. a) fractional index change : the ratio of refractive index of difference of core and cladding to the refractive index of core

$$\Delta = \frac{n_1 - n_2}{n_1} \quad \text{——} ②$$



← ①

Snell's law

$n_0 \sin\theta_0 = n_1 \sin\theta_1$ ← ①

08

$\cos\theta_1 = \frac{n_2}{n_1}$ ← ①

$\sin\theta_0 = \sqrt{n_1^2 - n_2^2}$ ← ①

$NA = \sqrt{n_1^2 - n_2^2}$ ← ①

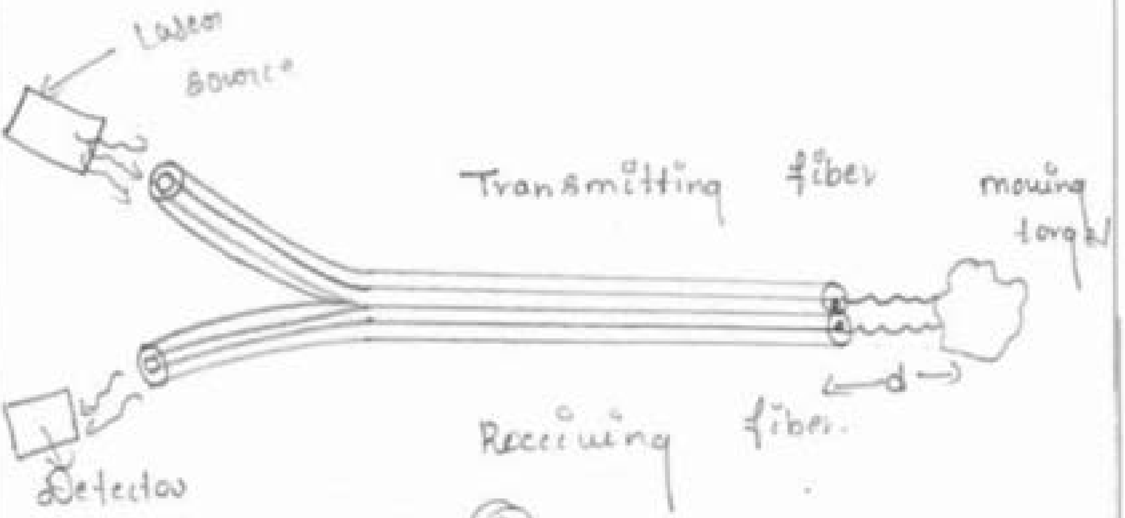
$\theta_i < \theta_0$

$\sin\theta_i < \sqrt{n_1^2 - n_2^2}$ ← ①

$\sin\theta_i < NA$

4.b) Optical sensor is a transducer, which converts any form of signal into optical signal in the measurable form.

Displacement Sensor :-



← ③

08

Explanation of displacement sensor.

← ⑤

---

4. c) Given data :-

$L = 500m = 0.5 km$

$P_{in} = 100 mW$

$P_{out} = 90 mW$

To find : fiber attenuation $\alpha = ?$

$$\alpha = \frac{-10}{L} \log_{10}\left(\frac{P_{out}}{P_{in}}\right) \text{ dB/km}$$

$$\alpha = \frac{-10}{0.5} \log_{10}\left(\frac{90}{100}\right)$$

$$= 0.915 \text{ dB/km.}$$

Shridevi Institute of Engineering and Technology, Tumkur-06
II Semester: CIE III Internal Assessment Test:30/08/2022
21PHY22-Engineering Physics

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

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

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 08 Marks)**

b. With a neat diagram explain the construction and working of Reddy shock tube. **(CO1 08 Marks)**

c. Calculate the peak amplitude of vibration of a system whose natural frequency is 1000 Hz when it oscillates in a resistive medium of damping / unit mass of 0.008 rad/s under the action of an external periodic force/unit mass of 5 N/m with tunable frequency. **(CO1 04 Marks)**

OR

2 a. What are forced oscillations? Derive the expression for steady state amplitude and phase angle in case of forced oscillation. **(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 100mm. calculate the mach number. Assume speed of sound as 340 m/s. **(CO1 04 Marks)**

Module - 2

3 a. Write the assumption of Planck's law of radiation. Deduce wein's law and Rayleigh-Jeans law from Planck's law of radiation. **(CO2 08 Marks)**

b. What is wave function? Set up time independent one dimensional Schrodinger wave equation. **(CO2 08 Marks)**

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. **(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)**

PTO

H.O.D
Dept. of Physics
S.I.E.T., TUMKUR -6.

PRINCIPAL
SIET., TUMAKURU

Module-3

5 a. Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein's co-efficient. **(CO3 08 Marks)**

b. With a neat diagram derive the expression for numerical aperture and arrive, condition for propagation in an optical fiber. **(CO3 08 Marks)**

c. A pulse from laser with power 1mW lasts fort 10 ns, if the number of photons emitted per pulse is 3.491×10^7. Calculate the wavelength of laser. **(CO3 04 Marks)**

OR

6 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. **(CO3 08 Marks)**

b. Describe different types of optical fiber with neat diagram. **(CO3 08 Marks)**

c. Calculate the NA, Relative RI, V number and the number of modes in an optical fiber of core diameter 50 μm and the core and cladding RI are 1.41 and 1.40 respectively. Given wavelength of source 820nm. **(CO3 08 Marks)**

Module- 4

7 a. Mention the four assumption of QFET and hence discuss the success. **(CO4 08 Marks)**

b. What is Hall Effect? Obtain the expression for Hall voltage in terms of Hall co-efficient. **(CO4 08 Marks)**

c. Calculate the probability that an energy level at 0.2eV below Fermi level is occupied at temperature 500K. **(CO4 04 Marks)**

OR

8 a. Define Fermi factor & Discuss the variation of Fermi factor with Temperature and effect on occupancy of energy levels. **(CO4 08 Marks)**

b. Define Internal field. Derive Clausius-Mossotti equation. Describe in brief the various types of polarization mechanisms. **(CO4 08 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. **(CO4 04 Marks)**

Module-5

9 a. With neat diagram describe the principle, construction and working of X-ray Photoelectron Spectroscopy (XPS) **(CO5 08 Marks)**

b. With neat diagram describe the principle, construction and working of Scanning Electron Microscope (SEM). **(CO5 08 Marks)**

c. X-rays are diffracted in the first order from crystal with d spacing 2.8×10^{-10} m at a glancing angle 60^0. Calculate the wavelength of X-rays. **(CO5 04 Marks)**

OR

10 a. With neat diagram describe the principle, construction and working of Atomic Force Microscopy (AFM). **(CO5 08 Marks)**

b. With neat diagram describe the principle, construction and working of X-ray difractometer (XRD). **(CO5 08 Marks)**

c. Determine the wavelength of x-rays for crystal size of 1.188×10^{-6}m, peak width is 0.5^0 and peak position 30^0 for a cubic crystal. Given Scherrer's constant K=0.92. **(CO5 04 Marks)**

****

Question Number

II Sem : CIE III internal Assessment test 30/08/21

21PHY22 - Engineering Physics

Marks

1. a)

It is defined as a motion in which the accelaration of the body is directly proportional it's displacement of the from a fixed point and is always directly towards the fixed point. — ②

characteristics of SHM

* It is a particular type of periodic motion.
* The oscillating system must have inertia — ②

Examples of SHM.

* Pendulum set for oscillation
* Excited tuning fork — ②

08

$$F = -ky$$

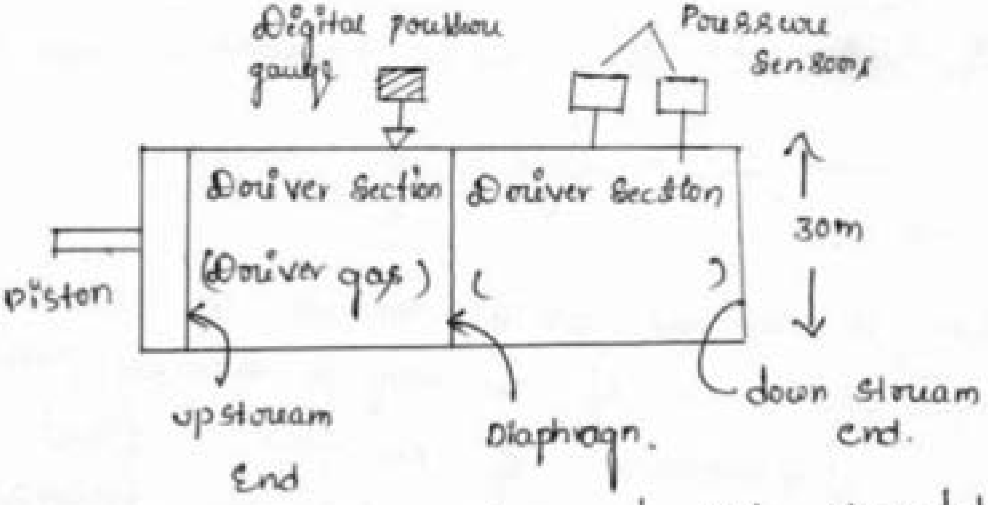
$$F = \frac{md^2y}{dt^2}$$

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

$$\frac{d^2y}{dt^2} + \frac{k}{m}y = 0$$

$$y = a \sin\omega t$$ — ②

1.b)



construction and working of Redy shock tube

1.c) Given data :-

$v = 1000 Hz$

$r/m = 0.008 rad/s.$

$F/m = 5 N/kg$

To find : $a_{max} = ?$

$$b = \frac{r}{2m} = \frac{1}{2}\left(\frac{r}{m}\right) = \frac{1}{2} \times 0.008 = 0.004$$

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

$p = 2\pi v = 2\pi \times 1000 =$. $b = 0.004$

then $$a_{max} = \frac{5}{2 \times 0.004 \times 2\pi \times 1000}$$

$$= \frac{5}{50}$$

$$= 0.1 m.$$

2. a) The vibration in which the body vibrations with fovquency other than it's natural fovquency under the action of an External periodic force it is called forced oscillation. —— ②

External periodic force = F sin (pt) —— ①

Resistive force = $-r \frac{dx}{dt}$

Resultant force = $-r \frac{dx}{dt} - kx + F \sin(pt)$

resultant force = $m \frac{d^2x}{dt^2}$ —— ①

$$m \frac{d^2x}{dt^2} + r \frac{dx}{dt} + kx = F \sin(pt)$$

08

$$x = a \sin(pt - \alpha)$$ —— ①

$$-ap^2 + a\omega^2 = \frac{F}{m} \cos \alpha$$

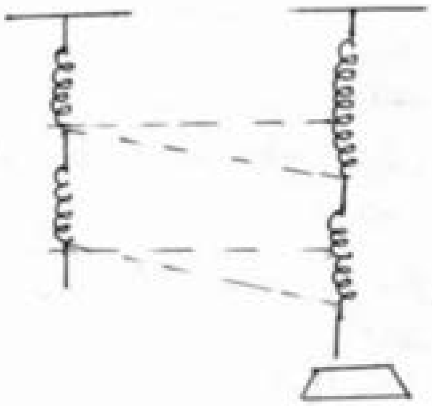
$$a^2 = \frac{\left(\frac{F}{m}\right)^2}{(\omega^2 - p^2)^2 + 4b^2p^2}$$ —— ①

$$a = \frac{\left(\frac{F}{m}\right)}{\sqrt{4b^2p^2 + (\omega^2 - p^2)^2}}$$ —— ①

$$\alpha = \tan^{-1}\left(\frac{2bp}{\omega^2 - p^2}\right)$$ —— ①

2.b) Force constant is defined as it is the magnitude of the applied force that. Produces whit Extension ((or compoussion) in the Spring which is. loaded within the Elastic limit. —②

Series combination :-



$F = -k_1 x_1$

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

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

$x = x_1 + x_2$

$x_1 + x_2 = \frac{-mg}{k_s}$

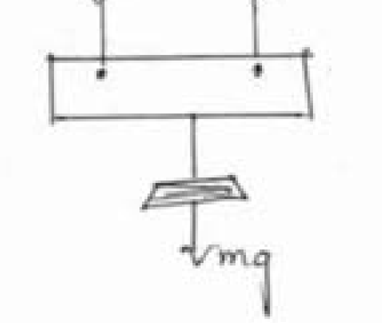
—①

08

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

—②

Parallel combination :-



$F_p = F_1 + F_2$

$F_p = F_1 + F_2$

$F_p = -k_1 x_1 - k_2 x_2$

$F_p = -k_p x.$

$\cancel{-}k_p\cancel{x} = \cancel{-}(k_1 + k_2)\cancel{x}$

$k_p = k_1 + k_2$

$x = x_1 + x_2$

—②

—①

Reduction of plancks law to wein's law and rayligh Jeans law :-

$$u_\lambda d_\lambda = \frac{8\pi hc}{\lambda^5}\left[\frac{1}{e^{\frac{h\nu}{kT}}-1}\right] d\lambda \left[\text{since } \nu = c/\lambda\right]$$ ①

$$e^{\frac{h\nu}{kT}} >> 1$$ ①

$$u_\lambda d_\lambda = \frac{8\pi hc}{\lambda^5}\left[\frac{1}{e^{\frac{hc}{\lambda kT}}}\right] d\lambda$$ ①

$$u_\lambda d_\lambda = C_1 \lambda^{-5} e^{-\left(\frac{C_2}{\lambda T}\right)} d\lambda$$ 08

$$e^{h\nu/kT} \approx 1 + h\nu/kT$$ ①

∴ If $h\nu/kT$ is small

$$e^{\frac{h\nu}{kT}} - 1 = \frac{h\nu}{kT} = \frac{hc}{\lambda kT}$$ ①

$$u_\lambda d_\lambda = \left[\frac{8\pi hc}{\lambda^5\left(\frac{hc}{\lambda kT}\right)}\right] d\lambda$$

$$u_\lambda d_\lambda = \left[\frac{8\pi kT}{\lambda^4}\right]$$ ①

2. c) Given data:-

~~distance d = 195 x10~~

$t = 195 \times 10^{-9}$ s

$d = 100 \times 10^{-3}$ m

$\alpha = 340$ ms^{-1}

To find:- M = ?

$$m = \frac{U_s}{\alpha}$$

$$U_s = \frac{d}{t} = \frac{100 \times 10^{-3}}{195 \times 10^{-6}}$$

$$U_s = 0.51 \times 10^{6}$$

$$M = \frac{U_s}{\alpha}$$

$$= \frac{0.51 \times 10^{3}}{340}$$

$$= 1.51$$

04

---

3. a Assumption of plank's law of radiation.

* Each oscillator has an Energy given by integral multiple of hγ where h is plank's constant γ is the frequency of radiation.

* An oscillator may lose (or) gain Energy by emitting respectively a radiation of frequency γ where γ = ΔE/h —②

5.b It quantum mechanics it is postulated. that there exists a function is called wave function. —— ②

Time independend Schrodinger's wave equation.

According to de-Broglie wave length associated with particle.

$$\lambda = \frac{h}{mv} \quad —— ①$$

$$\psi = A e^{i(kx - \omega t)} \quad —— ①$$

$$\psi = \omega e^{iox}$$

$$\frac{d^2\psi}{dt^2} = -\omega^2 e^{-iox} \psi$$

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

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

08

$$K.E = \frac{h^2}{2m} \frac{1}{\lambda^2} \quad —— ①$$

$$P.E = V \quad —— ①$$

$$E = K.E + PE \quad —— ①$$

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

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

3, c) Given data :-

$\alpha = 1A^\circ = 10^{-10} m$

To find :- $E_1 = ?$, $E_2 = ?$, $E_3 = ?$

Solution :-

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

$$E_1 = \frac{h^2}{8ma^2} = \frac{(6.63\times10^{-34})^2}{8(9.11\times10^{-31})(10^{-10})^2} = 37.64\ eV$$

$$E_0 = E_1$$

$$E_2 = \frac{2^2h^2}{8ma^2} = 2^2\left(\frac{h^2}{8ma^2}\right) = 4E_0$$

$$E_3 = \frac{3^2h^2}{8ma^2} = 9E_0.$$

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/π)

According to theory of relativity the Energy E of a body is expressed as

$$E = mc^2$$

$$E = \frac{m_0c^2}{\sqrt{1-\frac{V^2}{c^2}}} \qquad m = \frac{m_0}{\sqrt{1-\frac{V^2}{c^2}}}$$

4. b. Energy values and normalized wave function with respect to a partical in a one dimensional potential well of infinite height.

$$\int_0^a |\psi_n|^2 \, dx = 1 \quad \text{———} ①$$

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

Substitute ψ_n ——①

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

But $\sin^2\theta = \frac{1}{2}(1-\cos 2\theta)$ ——①

$$\therefore \int_0^a D^2 \frac{1}{2}\left(1-\cos \frac{2\pi n}{a} x\right) dx = 1$$

$$\frac{D^2}{2}\left[a - \frac{a}{2n\pi} \sin(2n\pi)\right] = 1 \quad \text{———} ①$$

←——①

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

$$\frac{D^2 a}{2} = 1$$

$$D = \sqrt{\frac{2}{a}} \quad \text{———} ①$$

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

——①

08

moment (p) of electron

$$p = mv$$

$$p = \frac{m_0 v}{\sqrt{1-\frac{v^2}{c^2}}}$$

$$p^2c^2 = \frac{m_0^2 v^2 c^2}{c^2 - v^2}$$

$$E^2 = p^2c^2 + m_0^2 c^4$$

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

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

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

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

$$\Delta p \geq 1.1 \times 10^{-2} \text{ kg m s}^{-1}$$

The momentum of the Electron must at least be equal to uncertainty in the momentum. $P \geq 1.1 \times 10^{-20}$ kgms^{-1}

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

$$E^2 \geq 1.09 \times 10^{-23}$$

$$E \geq 3.3 \times 10^{-12} \text{ J}$$

$$\underline{E \geq 20.6 \text{ Mev}}$$

4.c) Given data :-

$m = 0.5\ Mev/c^2$

kindic Energy $E = 100ev = 100 \times 1.60 \times 10^{-19} J$

To find :-

De Broglie wavelength $\lambda = ?$

<u>Solution:-</u> $m = 0.5\ Mev/c^2$

$$m = 8.9 \times 10^{-31} kg$$

$$\lambda = \frac{h}{\sqrt{2mE}} = \frac{6.63 \times 10^{-34}}{\sqrt{2 \times 8.9 \times 10^{-31} \times 100 \times 1.602 \times 10^{-19}}}$$

$$\lambda = 1.24 \times 10^{-10} m$$

04

5.a) Energy density of radition under equilibrim condition in terms of Einstein's co-efficient.

(i) case of Induced Absorption

Rate of absorption $= B_{12} N_1 U_y$ — ①

(ii) case of Spontaneous emission

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

(iii) case of Stimulated emission

Rate of Stimulated emission $=$

$B_{21} N_2 U_y$ — ①

Rate of absorption = Rate of Spontaneous emission + Rate of Stimulated emission.

— ①

$$B_{12} N_1 U_v = A_{21} N_2 + B_{21} N_2 U_v$$

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

By Boltzmann's law

$$\frac{N_2}{N_1} = e^{-\frac{(E_2 - E_1)}{kT}} = e^{-\frac{hv}{kT}}$$

According to Planck's law

$$U_v = \frac{8\pi h v^3}{c^3} \left[\frac{1}{e^{\frac{h\nu}{kT}} - 1} \right] \quad \text{——} ①$$

$$\frac{A_{21}}{B_{21}} = \frac{8\pi h v^3}{c^3}$$

08

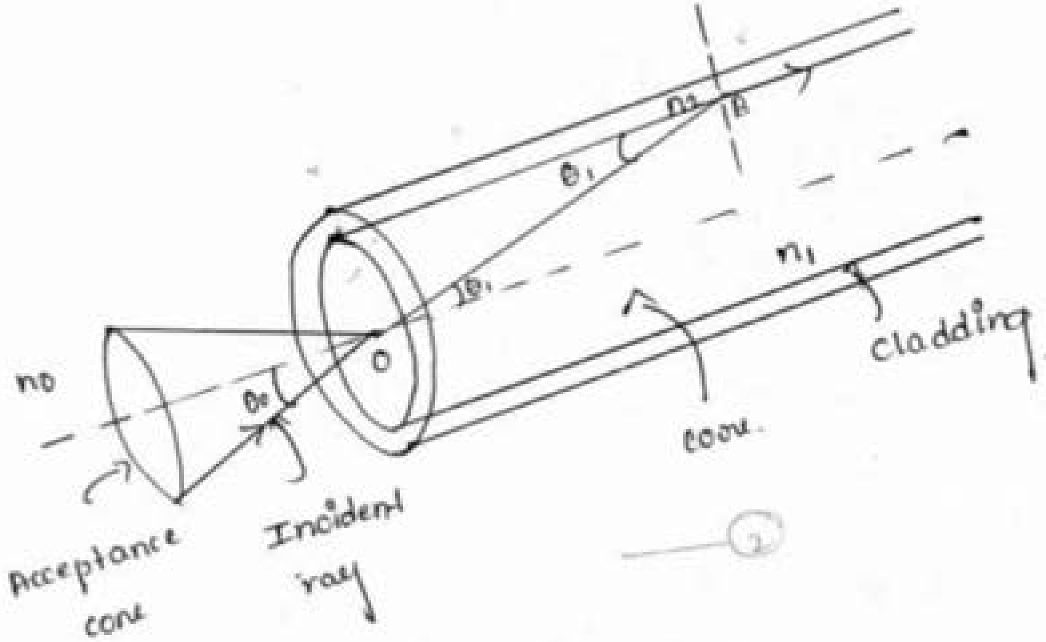
$$\frac{B_{12}}{B_{21}} = 1 \quad \text{——} ①$$

$$B_{12} = B_{21}$$

At thermal Equilebrim the equation for Energy density is

$$U_v = \frac{A}{B\left[e^{\frac{h\nu}{kT}} - 1\right]} \quad \text{——} ①$$

5.b)



②

Applying Snell's law at O

①

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

Snell's law at point B

$$n_1 \sin(90 - \theta_1) = n_2 \sin 90^0$$ ①

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

08

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

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

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

$$\sin\theta_0 = \frac{\sqrt{n_1^2 - n_2^2}}{n_0} \qquad n_0 = 1$$

$$\sin\theta_0 = \sqrt{n_1^2 - n_2^2}$$ ①

$$NA = \sqrt{n_1^2 - n_2^2}$$ ①

i.e $\sin\theta_c^o \angle NA$

①

5.c) Given data:-

$W = 1\,mW = 10 \times 10^{-3}\,W$

$t = 10 \times 10^{-9}\,s$

$N = 3.491 \times 10^{7}$

To find $\lambda = ?$

Solution:-

$N \times \Delta E = E$

E = power x duration pulse.

$\Delta E = \frac{hc}{\lambda}$

$N \times \frac{hc}{\lambda}$ = power x duration pulse

$$\frac{(3.49 \times 10^{7})(6.63 \times 10^{-34})(3 \times 10^{8})}{\lambda} = (10 \times 10^{-3})(10 \times 10^{-9})$$

$$= \underline{69399 \times 10^{-9}\,m}$$

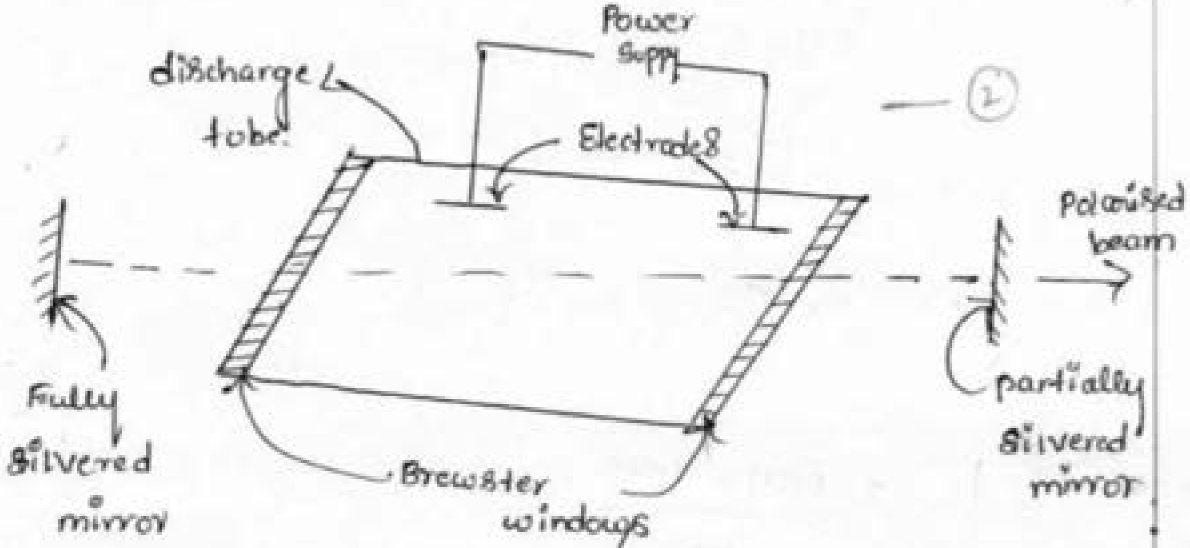
6.a) CO_2 laser

Vibration Energy levels of a carbon dioxide molecules.

* Symmetoric stoutching

* A symmetric stoutching. —— ②

* Bending mode



—— ② 08

↑ Explination of constouction and working of CO_2 laser. —— ④

6.b) Explination of types of optical fiber 08.

* single mode step index optical fiber

* Multi mode step index optical fiber

* Multi mode graded index optical fiber

—— ⑧

6.c) **Given data :-**

$d = 50 \times 10^{-6} m$

$n_1 = 1.41$

$n_2 = 1.40$

$\lambda = 820 \times 10^{-9} m$

To find . NA , R.I profile . V-Number

Solution :-

$$NA = \sqrt{n_1^2 - n_2^2}$$

$$= \sqrt{(1.41)^2 - (1.40)^2}$$

$$= 0.16$$

Refractive index profile

$$\Delta = \frac{n_1 - n_2}{n_1}$$

$$= \frac{1.41 - 1.40}{1.41}$$

$$= 7.092 \times 10^{-3}$$

V- Number

$$V = \frac{\pi d}{\lambda} \frac{\sqrt{n_1^2 - n_2^2}}{n_0}$$

$$= \frac{(3.14)(50 \times 10^{-6})}{820 \times 10^{-9}} \sqrt{1.41^2 - 1.40^2}$$

$$= 30.63 \qquad V \geq 1$$

The No of V^2 Nomber $= \frac{V^2}{2} = 469.2$.

7.a) Assumption of QFET

* The Energy values of the conduction electrons are quandized.

* The distoribution of electrons in the various allowed Energy levels occur as per Pauli's Exclusion principle

* The electrons travel with a constant potential inside the metal but confined within it's boundaries

* The attraction between the electrons and the lattice ions and the repulsion between the electrons themselves are ignored. ④

08.

success (or) merits

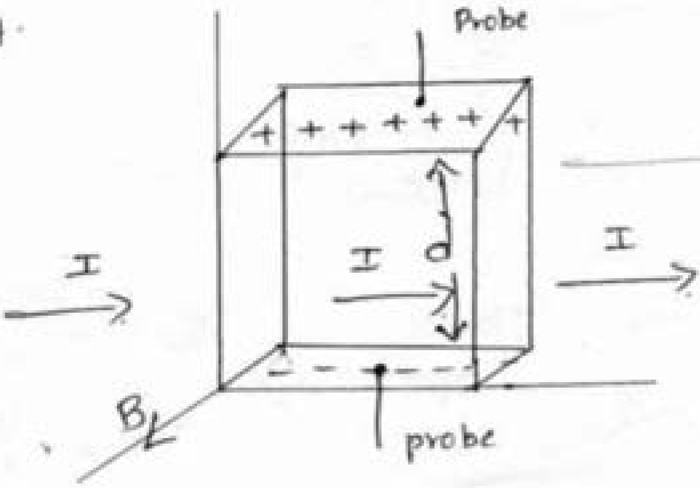
* Specific heat

* Temperature depends on electrical conductivity.

* Electrical conducdivity on electron concentration.

④

Hall effect.



②

consider a rectangular slab of a n-type Semiconductor. in which a current I is flowing in the positive z direction

$F_L = -Bev$ —— ①

$F_H = -eE_H$ —— ①

$F_L = F_H$ —— ①

$\cancel{-}B\cancel{e}v = \cancel{-}\cancel{e}E_H$

$E_H = Bv$

if d is the distance between the upper and lower surfaces of the slab then

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

$V_H = E_H d$ —— ① 08

$V_H = Bvd$

The current density.

$J = I/A$

$J = \rho v$

$v = \frac{I}{\rho w d}$ $V_H = \frac{BI}{\rho w}$

$\rho = \frac{BI}{V_H w}$ —— ①

Hall co-efficient :-

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

$E_H = R_H J B$ $R_H = 1/\rho$ —— ①

7.c) Given data:-

$E-E_f = 0.2ev$

$T = 500k.$

To find $f(E) = ?$

Solution:- $$f(E) = \frac{1}{e^{\left(\frac{E-E_f}{kT}\right)}+1}$$ 04

$$f(E) = \frac{1}{e^{\frac{0.2\times1.6\times10^{-19}}{(1.38\times10^{-23}\times500)}}}$$

$$f(E) = 0.99$$

8.a) fermi factor is the probability of occupation of a given Energy state for a material in thermal equilibrium. ②

$$f(E) = \frac{1}{e^{\frac{E-E_F}{kT}}+1}$$ ②

The dependence of fermi factor on temperature and effect on occupancy of Energy levels 08

(i) Probability of occupation for $E<E_F$ at $T=0k$.
$f(E) = 1$ ④

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

(iii) if $E = E_F$ $f(E) = 1/2$ (or) 0.5

8.b The internal field, or the local field is the electric field that acts at the site of any given atom of a solid or liquid dielectric subjected to an external electric field, and is the resultant of the applied field and the field due to all the surrounding dipoles. — ②

Clasius Mosotti - Equation.

conside a solid dielectric material of dielectric constant ε_r.

if N is the No of atoms / unit volume of the material. μ is the atomic dipole then we have

08

Dipole moment / unit volume $= N\mu$ — ①

$$\mu = \alpha_e E_i$$ — ①

$$P = N\alpha_e E_i$$

$$P = \varepsilon_0(\varepsilon_r - 1)E$$ — ①

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

$$E_i = E + \gamma\frac{P}{\varepsilon} \Rightarrow \frac{P}{N\alpha_e} = \frac{P}{\varepsilon_0(\varepsilon_r-1)} + \gamma\frac{P}{\varepsilon_0}$$ — ①

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

8.c) Given data :-

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

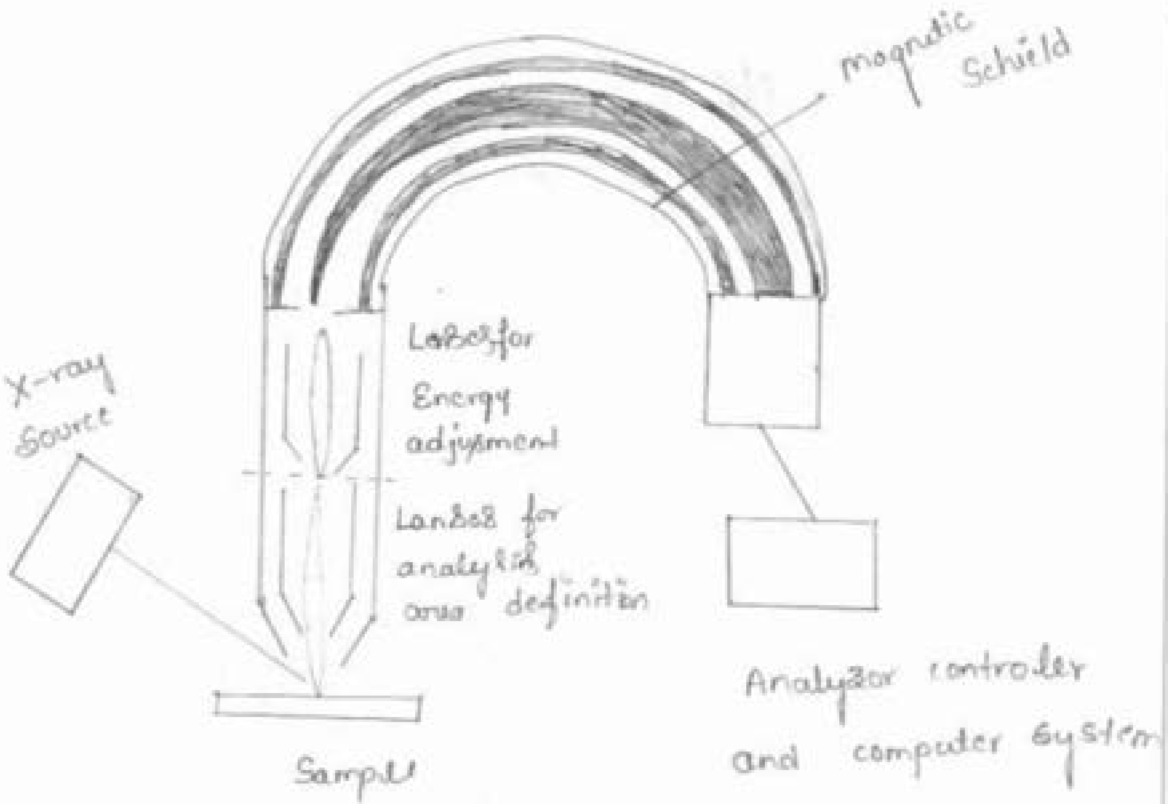
$(E - E_f) = 0.5ev$

To find :- $T = ?$

<u>Solution</u> :- $f(E) = \frac{1}{e^{\left(\frac{E-E_f}{KT}\right)} + 1}$

$$\boxed{T = 1261.1k}$$

9.a) X-ray photoelectric spectroscopy



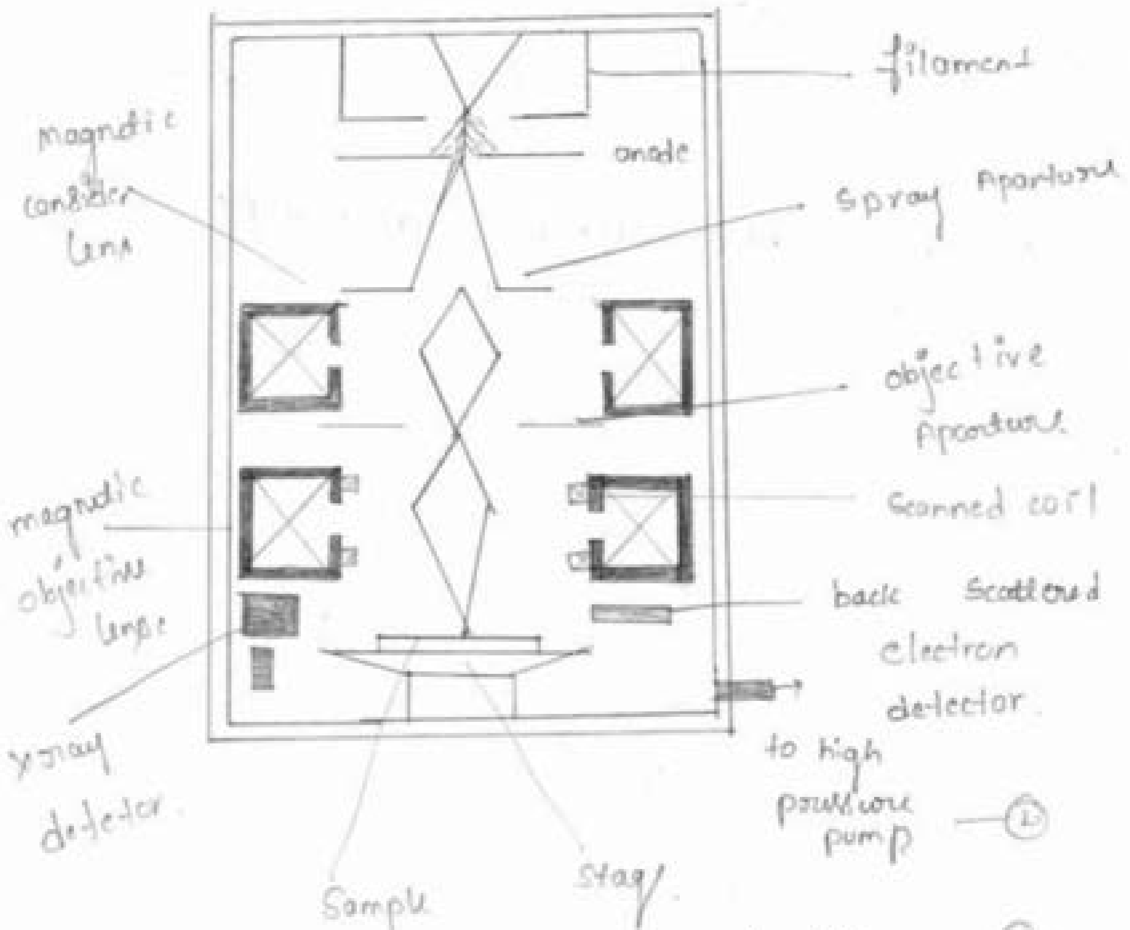
08

construction and working of XPS

9.b) Scanning Electron microgcope (SEM)

Principle :- The basic principle involved in the working of all kinds of electron microscope is the wave nature of electrons. An electron accelerated under a potential difference of V volts behave like a wave of wavelength

②



②

construction and working of SEM — ④

08

9.C. Solution :-

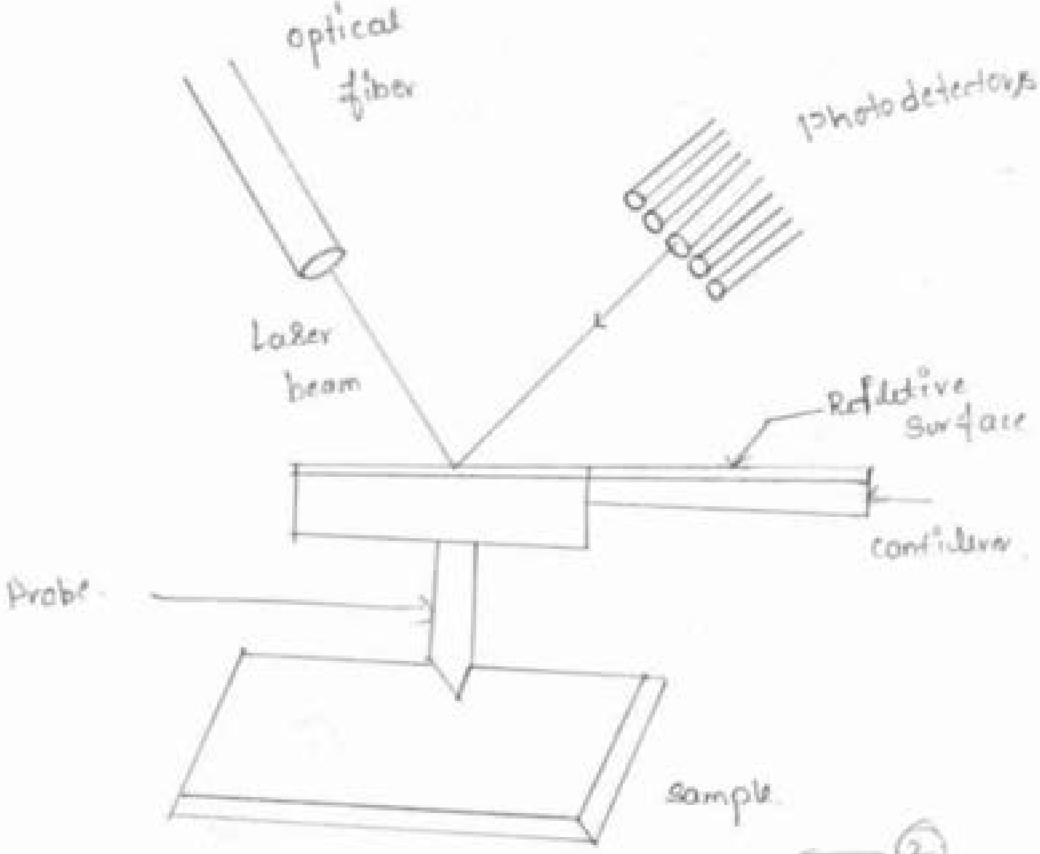
$$\frac{2d\sin\theta}{n} = 4.8\times10^{-10}\,m$$

04

Atomic force microscope AFM

1(a) Principle :-

AFM produces image by physically pushing. a cantilever probe against the Sampel. the probe movement is analysed and converted into a three dimensinal image of the sample surface. — ②



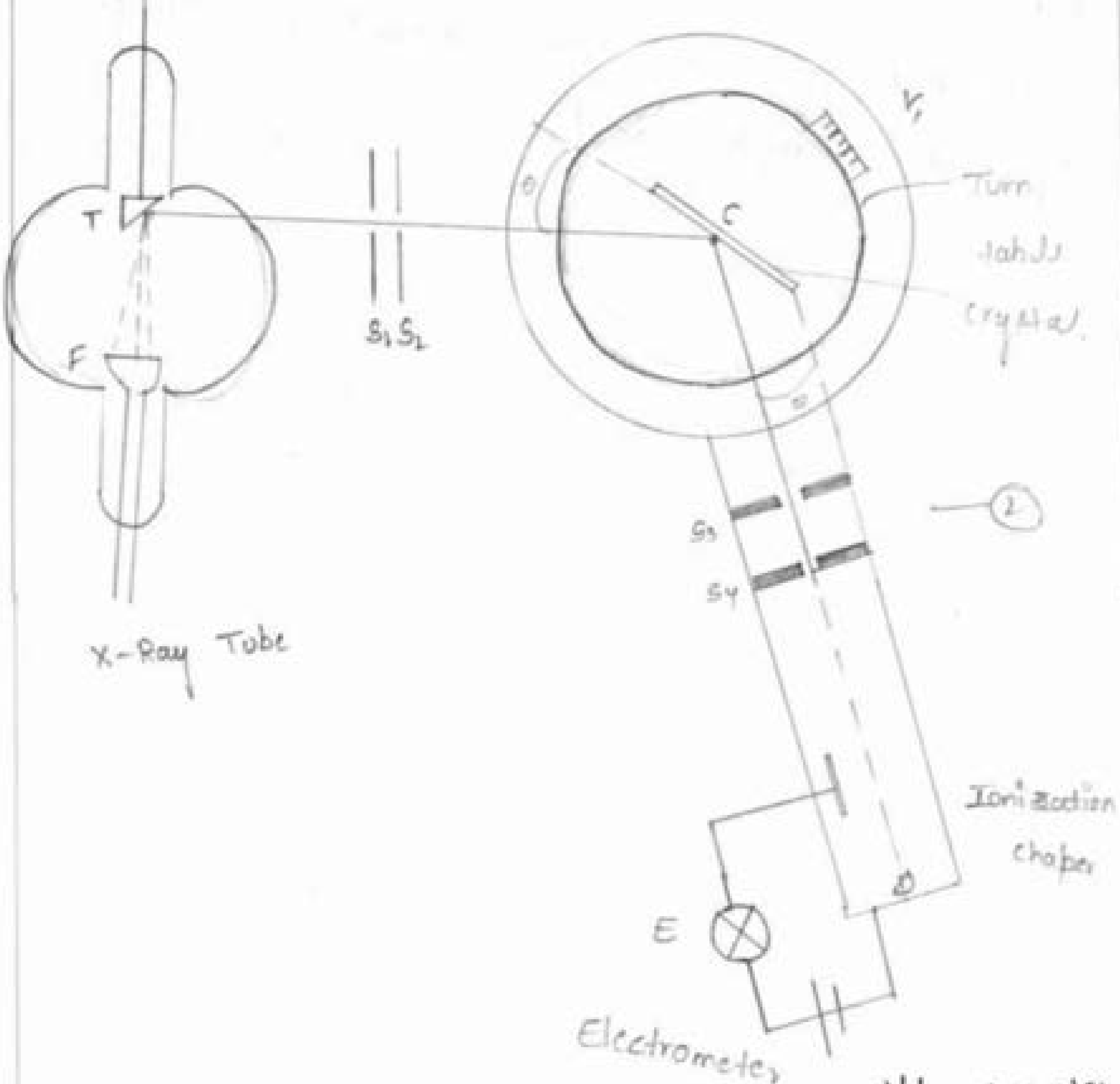
— ②

08

Explination of construction and working — ④

10.b) X-ray diffractometer

The Bragg's X-ray diffractometer works on the principle of Bragg's law of diffraction $2d \sin\theta = n\lambda$ —①



—②

08

construction and working of X-ray diffractometer —④

10.c Given data :-

$\theta = 0.5^\circ$ and 30°

$K = 0.92$ $D = 1.188 \times 10^{-6}$

04

Solution :-

$\lambda = 1.5 \times 10^{-7}\ m$

$$D = \frac{K\lambda}{\beta \cos\theta}$$

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

(An ISO 9001-2008 Certified Institution)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

ACADEMIC YEAR 2021-22

Internal Assessment Test I

Course: Computer Organization & Architecture

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

Course Code: 18EC35 **Semester: III**

1) A) With a neat diagram explain the functional units of a digital computer. **8M**

B) Explain the single bus structure with a block diagram. **4M**

C) Describe the basic operational concepts between processor and memory. **8M**

OR

2) A) Explain Big-Endian and Little-Endian byte addressing modes. **6M**

B) How we can improve the performance of a computer using basic performance equation. **4M**

C) Explain IEEE standard for a floating point number with example. **10M**

3) A) Explain the following with examples

i) One –Address Instruction ii) Two –Address Instruction iii) Three–Address Instruction **6M**

B) Perform the following

i) (-3) + (-7) ii) (+7) + (-3) iii) (+4) + (-6) iv) (+6) - (+3)

v) (-7) - (+1) vi) (+2) –(-3) **6M**

C) Illustrate Instruction and Instruction sequencing with an example. **8M**

OR

4) A) What are addressing modes? Explain any 5 addressing modes with examples. **10M**

B) Write short note on i) Assembly language ii) Assembler iii) Assembler directives iv) Subroutines v) Stacks & queues **10M**

PRINCIPAL

[illegible]

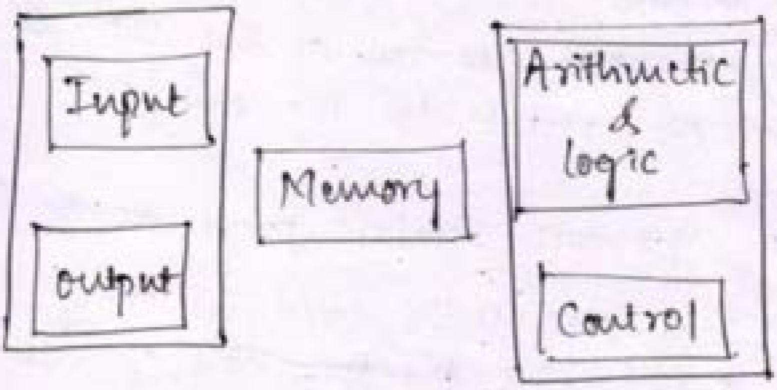
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2021-22(odd semester)

FIRST INTERNAL ASSESSMENT

SCHEME & SOLUTION

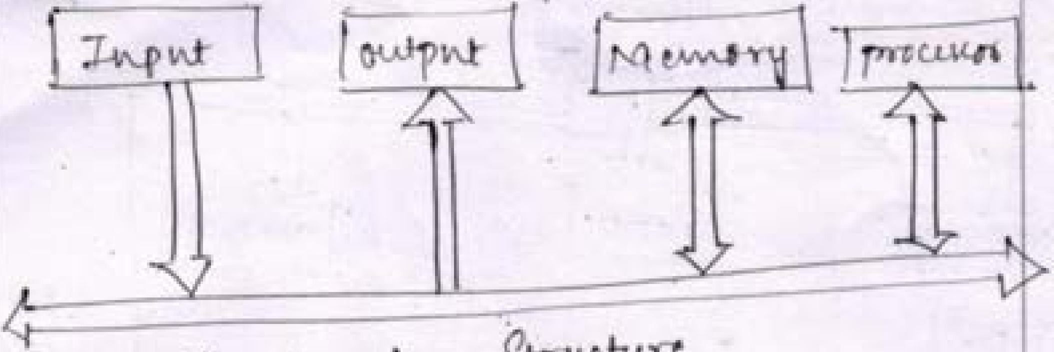
NAME OF COURSE INSTRUCTOR:	Nayana . M.S.
PROGRAMME:	B.E
COURSE TITLE:	Computer Organization & Architecture
COURSE CODE:	18EC35
SIGNATURE:	Nay

Q.NO	SOLUTION	MARKS
(1) A.	A Computer Consists of 5 functional units: Input, Memory, Arithmatic & logic, output & Control units as shown below	Total (8M)
		Fig: 1M
	(a) Input unit : Compr accepts Coded infn from human operators (or) audio inputs from microphones (or) input from far places through Sensors, through input devices. Eg:- keybard, joysticks, trackballs, mouses etc	Definition: (1/2M) Eg: (1/2M)

PRINCIPAL
SIET. TUMAKURU

Q.NO	SOLUTION	MARKS
(6)	(b) <u>Memory unit</u> : The function of memory unit is to Store programs & data 2 types of memory (1) primary storage : This memory is used for temporary storage of programs & data while executing Eg:- RAM (2) Seconary storage :- This memory is used for permanent Storage of large amount of data & programs which are accessed infrequently Eg:- CD-ROMS, Magnetic discs (or) taps <u>etc</u>	(1M)
	(c) <u>ALU</u> : Most <u>Compr</u> operations are executed in ALU present in processor. Any kind of Arithmetic (or) logic operations like multiplication, division, Comparisions of operands is performed in ALU	(1M)
	(d) <u>Output units</u> :- The function of this unit is to Send processed result to the outside world.	Defn (½M)
	Eg:- printers, monitors, Speakers, projectors <u>etc</u>	Eg (½M)
	(e) <u>Control unit</u> :- This is the nerve Center of Compr which Co-ordinates the operation of all other units. The data transfers b/w processor, memory & I/O devices are also Controlled by Control unit <u>through</u> Control & timing Signals	(1M)
	Summery of operation of all functional units	(2M)

PRINCIPAL
SIET, TUMAKURU

Q.NO	SOLUTION	MARKS
1(B)		Total: (3M) fig: (1M)
	Fig: Single - bus Structure	
	Defn: A group of lines that Serves as a Connecting path for Several devices is Called Bus.	Defn (1M)
	Advge:- low-Cost & its flexibility over peripheral devices Disadvge:- Only 1 ~~single~~ data transfer Can be Carried at a time.	(1M)
1(C)	>Defn: The most important measure of the performance of a Compr is how quickly it Can execute programs.	Total: (4M) (1M)
	>write about processor time and its dependence on hardware units and how the Changes are made in processor hardware to improve performance.	(1M)
	>Basic performance eqn: $T = \frac{N \times S}{R}$ Explain each term and also mention how to improve the performance by varying these terms.	(2M)

PRINCIPAL
SIT, TUMAKURU.

Q.NO | SOLUTION | MARKS

(2) a. Total : (8 M)

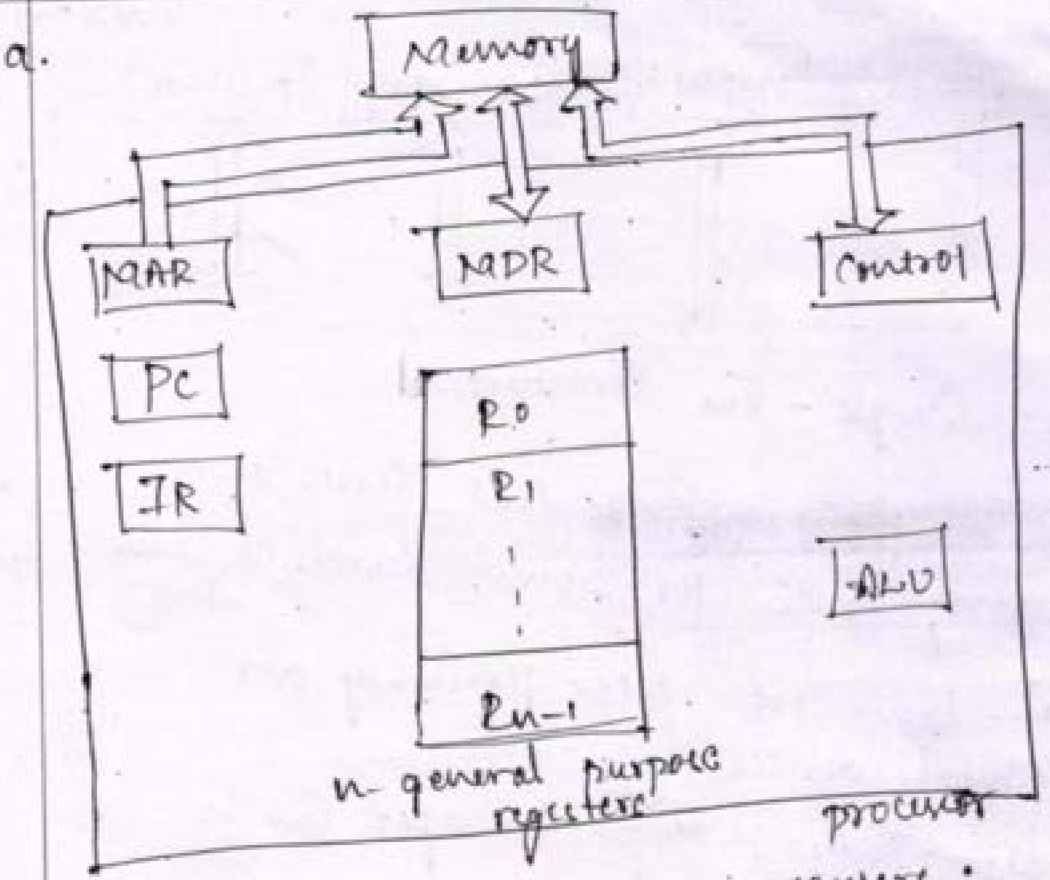


Fig: (2M)

> Explain all special-purpose registers : MAR, PC, IR, MDR & general purpose registers (2M)

> Mention the steps to perform data flow b/w memory & processor by taking one eg instruction. $\boxed{\text{ADD LOA, R0}}$

① PC $\xrightarrow{\text{loads}}$ 1st inst^{n}

② PC $\xrightarrow{\text{transferred}}$ MAR

③ Read Command & Data $\xrightarrow{\text{moved}}$ MDR

④ Instruction $\xrightarrow{\text{moved}}$ IR

⑤ Address of 1st operand in LOC $\xrightarrow{\text{loaded}}$ MAR (4M)

⑥ Read Signal & MDR $\xrightarrow{\text{moved}}$ ALU

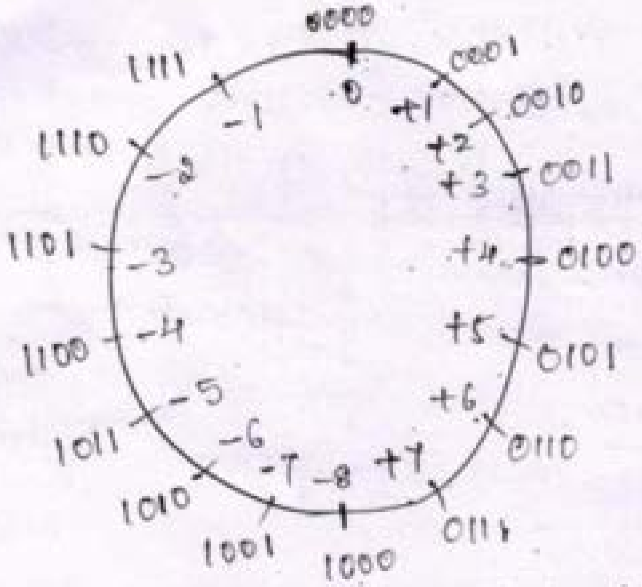
⑦ R0 $\xrightarrow{\text{transferred}}$ ALU : operation (ADD) is performed

⑧ Result $\xrightarrow{\text{moved}}$ R0 & Content of PC is incremented

PRINCIPAL
SIET, TUMAKURU

Q.NO **SOLUTION** **MARKS**

(2)(B) Total : (7M)



(1M)

Mod 16 System for 2's-Complement System

(i) -3 + (-7) : 2's Complement of -3 is 1101 pointout this in System (1M)

Take 2's Complement of -7 → 1001 → 9
Move 9 times from 1101 which is 0110 → 6
Take 2's Complement of 6 which is 1010 → 10
No overflow occured.

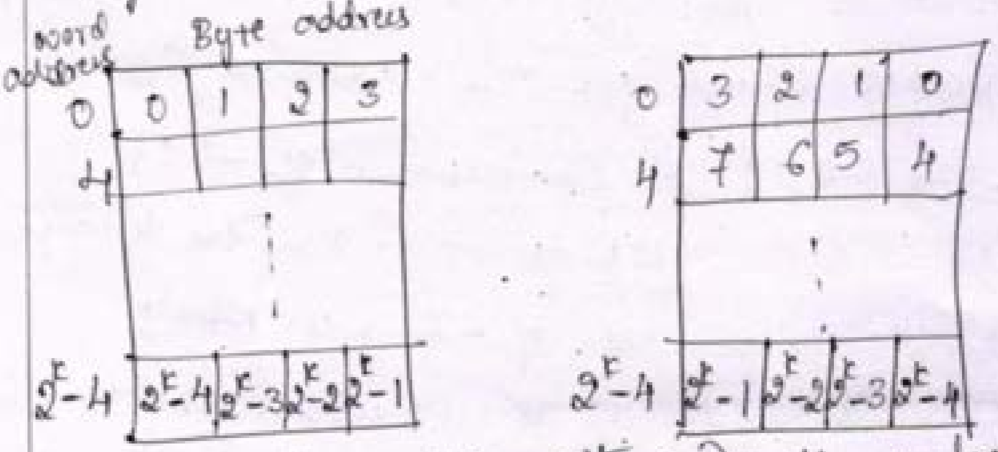
(2) (+7) + (-3) = 4 Follow Same procedure for all Sums (1M)
(3) (+4) + (-6) = -2 (1M)
(4) (+6) - (+3) = 3 (1M)
(5) (-7) - (+1) = -8 (1M)
(6) (+2) - (-3) = 5 (1M)

(3)(B) Byte addressability :- The assignment of Successive addresses to Successive byte in memory Total (6M) Defn:(1M)

Eg:- If the word length is 32 bits, Byte locations have addresses 0, 1, 2 . . . , Successive words are located at addresses 0, 4, 8, ... (1M.)
write for word length of 16 bits & 64 bits

> Big-Endian: lower byte addresses are assigned for more significant bytes (2M)

> Little-Endian: lower byte addresses are assigned for least significant bytes (2M)



(a) Big-endian assignment (b) Little-endian assignment

Total (6M)

4(A) Subroutine :- Subroutines are the subtasks which are oftenly necessary for a program. write about Calling program & Called program Defn: (2M)

> Eg program : Calling progam

```
Move  N, R1
Move  #NUM1, R2
Call  LIST ADD
Move  R0, SUM
```

(4M)

Subroutine :

```
LISTADD   Clear R0
  LOOP    Add (R2)+, R0
Decrement   R1
Branch >0  loop
  Return
```

> Mention all the parameters passed in program

1SU20EC004

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

(An ISO 9001-2015 Certified Institution)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

ACADEMIC YEAR 2021-22

Internal Assessment Test I

Course: Microcontroller

Time: 120 min. **Max Marks: 40**

Course Code: 18EC46 **Semester: IV**

Note: Note: Answer any to full questions

3) **A)** Diffrentiate between Microprocessor and Microcontroller.**[CO1]** **8M**

B) With neat diagram explain architecture of 8051 microcontroller. **[CO1]** **12M**

OR

4) A) With neat diagram explain memory organaisation of 8051 microcontroller **[CO1]** **8M**

B) Diffrentiate between RISC and CISC Machine. **[CO1]** **7M**

C) Briefly explain program status word (PSW) of 8051 microcontroller. **[CO1]** **5M**

3) A) With neat pin diagram explain 8051 microcontroller [CO1] **8M**

B) With neat diagram explain interfacing of 16 k byte of ram and 32 k byte of eprom to 8051.[CO2] **12M**

OR

4) A) Explain the Stack memory operation with example. [CO1] **8M**

B) What is an addressing modes? Explain different 8051 addressing modes with examples.**[CO2]12M**

Prof. Raghavendra.D
(Asst. Professor)

Prof. A A Sharief
(H O D)

Dr. Narendra Vishwanath
(Principal)

HOD
Dept of E&C
SIET, Tumkur-6

PRINCIPAL
SIET., TUMAKURU

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2021-22(Even semester)

II - INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	***RAGHAVENDRA D***
PROGRAMME:	***BE***
COURSE TITLE:	**Microcontroller**
COURSE CODE:	**18ec46**
SIGNATURE:	

Q.NO	**SOLUTION**	**MARKS**
1 a)	Explaining Arithmetic instructions. Explaining Logical instructions.	3.5M 3.5M
1 b)	8051 addressing modes are classified as follows. 1.Immediate addressing. 2.Register addressing. 3.Direct addressing. 4.Indirect addressing. 5.Relative addressing. 6.Absolute addressing. 7.Long addressing. 8.Indexed addressing. 9.Bit inherent addressing. 10.Bit direct addressing. explaining any 4 addressing modes each carries equal marks	8M
1c)	explaining 3 types of jump instructions. 1.Relative Jump 2.Short Absolute Jump 3.Long Absolute Jump	 2M 1.5M 1.5M

PRINCIPAL
SIET., TUMAKURU

2 a)	Explaining 1. Bit manipulation instructions. 2.Bit level jump instructions 3. Subroutine CALL And RETURN Instructions Explaining all 3, each carries equal marks	12M
2 b)	Defining Assembler directives.	2M
	ORG (origin) **EQU and SET** **DB (DEFINE BYTE)**	6M
	Explaining all above Assembler directives, each carries equal marks	4M
3 a)	**Explaining Conditional Jump instructions.** JBC Jump if bit = 1 and clear bit JNB Jump if bit = 0 JB Jump if bit = 1 JNC Jump if CY = 0 JC Jump if CY = 1 CJNE reg,#data Jump if byte ≠ #data CJNE A,byte Jump if A ≠ byte DJNZ Decrement and Jump if A ≠ 0 JNZ Jump if A ≠ 0 JZ Jump if A = 0	12M

3 b) 4M

```
ORG 0000H ; Set program counter 0000H
MOV A, #0FFH ; Load FFH into A
MOV 50H, A ; Store contents of A in location 50H
MOV 51H, A ; Store contents of A in location 5IH
MOV 52H, A ; Store contents of A in location 52H
MOV 53H, A ; Store contents of A in location 53H
MOV 54H, A ; Store contents of A in location 54H
MOV 55H, A ; Store contents of A in location 55H
MOV 56H, A ; Store contents of A in location 56H
MOV 57H, A ; Store contents of A in location 57H
MOV 58H, A ; Store contents of A in location 58H
END
```

3 c) 7M

```
ORG 0000H ; Set program counter 0000H
MOV A, #0FFH ; Load FFH into A
MOV R0, #50H ; Load pointer, R0-50H
MOV R5, #08H ; Load counter, R5-08H
Start:MOV @R0, A ; Copy contents of A to RAM pointed by R0
INC R0 ; Increment pointer
DJNZ R5, start ; Repeat until R5 is zero
END
```

PRINCIPAL
SIET., TUMAKURU

4 a)	The various C data types for the 8051 are: 1. Unsigned Char 2. Signed char 3. Unsigned int 4. Signed int 5. Sbit (Single bit) 6. Bit and sfr explaining any 4 C data types each carries equal marks	8M
4 b)	Explaining the following	
	• Delay program	3M
	• Timers of 8051	3M
4c)	Briefly Explaining the following. 1.128 bytes of internal data memory 2.64 KB of program memory 3. 64 KB of exienal data memory explaining all above 3, each carries equal marks	6M

PRINCIPAL
SIET., TUMAKURU.

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
Sira Road, Tumakuru - 572 106, Karnataka

Department of Electronics & Communication Engineering
Academic Year: 2021-22
Second Internal Assessment Test

Subject: Digital Communication (18EC61) **Year/Sem: III/VI**

1	a)	With a neat block diagram explain the CDMA system based on IS-95.	8 M	CO5
	b)	With a neat block diagram, explain the frequency hopping spread spectrum (FHSS) system.	8M	CO5
	c)	Explain the applications of direct sequence spread sequence signals.	4M	CO5
		OR		
2	a)	Explain the generation and demodulation of direct sequence spread spectrum (DSSS) signals with neat block diagram.	8M	CO5
	b)	With a neat diagram explain the generation of PN sequences and state its properties.	8M	CO5
	c)	A slow frequency hopped/MFSK system has the following parameters. i) The number of bits/MFSK symbol=4 ii) The number of MFSK symbols per hop=5 Calculate the processing gain of the system in decibels.	4M	CO5
		OR		
3	a)	Explain geometric representation of signals and express the energy of the signal interms of Signal vector	8M	CO2
	b)	Explain Gram-Schmidt orthogonalization procedure	8M	CO2
	c)	Explain the effect of despreading on narrowband interference.	4M	CO5
		OR		
4)	a)	Explain the correlation receiver with neat diagram.	8M	CO2
	b)	Explain the matched filter receiver with relevant mathematical theory.	8M	CO2
	c)	Write a short note on jamming margin. Probability of error of BPSK system.	4M	CO5

FACULTY INCHARGE

PRINCIPAL
SIET., TUMAKURU.

HOD-ECE

HOD
Dept of E&C
SIET, Tumkur-6

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2021-22(Even semester)

II - INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Dr. Pradeep K.G.M
PROGRAMME:	UG/B.E
COURSE TITLE:	Digital Communication
COURSE CODE:	18EC61
SIGNATURE:	

Q.NO	SOLUTION	MARKS
① ⓐ	with a neat block diagram explain the CDMA based on IS-95	
Soln:	Forward link - 3 marks Reverse link - 3 mark Explaination - 2 mark } 8 marks	8M
① ⓑ	With a neat block diagram. explain the frequency hopping spread spectrum (FHSS) system	
Soln.	Transmitter block diagram - 2 marks Receiver block diagram - 2 marks Waveform - 2 mark Description - 2 mark	8M

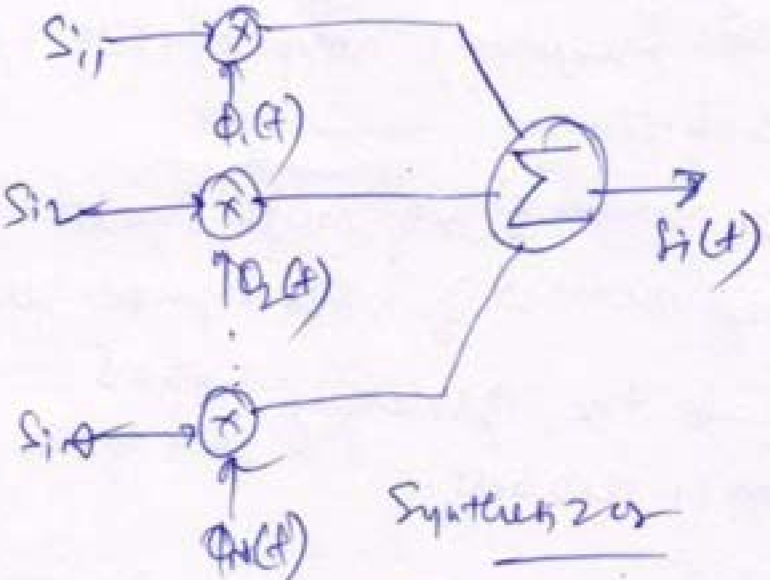
PRINCIPAL
SIET., TUMAKURU

①ⓒ	Explain the applications of direct sequence spread sequence signals.	
Soln:	① each application - 2 marks ② each application - 2 marks	2M
	OR	
②ⓐ	Explain the generation and demodulation of direct sequence spread spectrum (DSSS) signals with block diagram.	
Soln:	Transmitter - 3 marks Receiver block diagram - 3 marks Description - 2 marks	8M
②ⓑ	With a neat diagram, explain the generation of PN sequences and state its properties	
Soln:	Generation of PN sequences = 4 marks Properties of PN sequences - 4 marks	8M

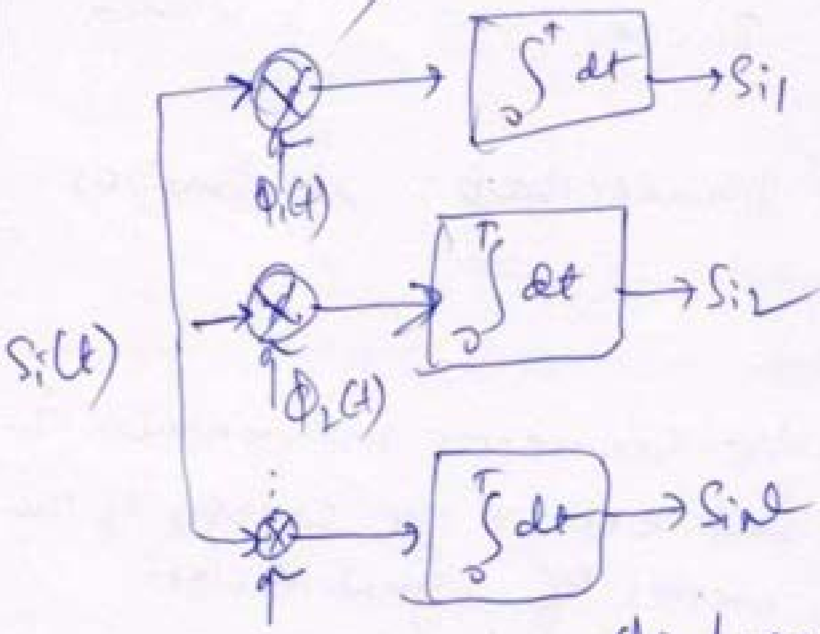
PRINCIPAL
SIET., TUMAKURU.

Q.NO	SOLUTION	MARKS
2(c)	A slow frequency hopped/MFSK system has the following parameters. i) The number of bits/MFSK symbol = 4 ii) The number of MFSK symbols per hop = 5 Calculate the processing gain of the system in decibels. Soln: i) PG = 20 } 2 marks ii) PGin dB = 13dB } 2 marks	4M
3(a)	Explain the geometric representation of signals and express the energy of the signal in terms of signal vector Mathematical equations - 4 marks Explaination — 4 marks $s_i(t) = \sum_{j=1}^{N} s_{ij}\phi_j(t)$ where $\left.\begin{array}{l} 0 \le t \le T \\ i = 1,2 \ldots M \end{array}\right\} \rightarrow ①$	8M

Q.NO **SOLUTION** **MARKS**



Synthesizer



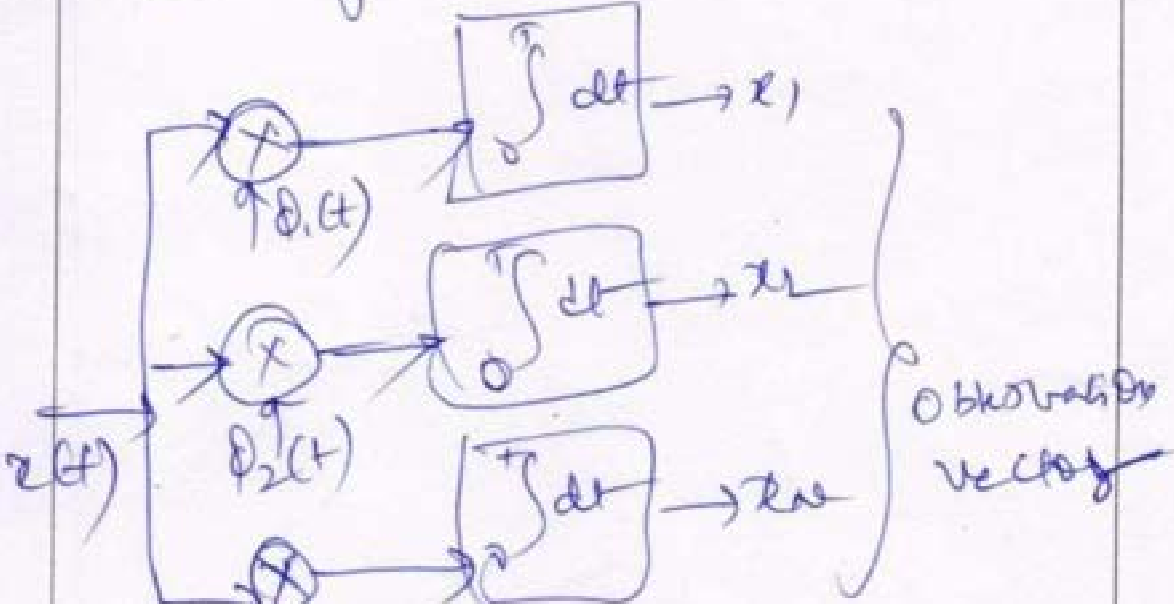
Analyser

(3)(b) Explain Gram-Schmidth Orthogonalisation Procedure (8M)

$\phi_1(t) = \frac{s_1(t)}{\sqrt{E_1}}$, $s_{21} = \int_0^T s_2(t)\,\phi_1(t)\,dt$

$g_2(t) = s_2(t) - s_{21}\,\phi_1(t)$ $\int_0^T \phi_2^2(t)\,dt = 1$

$$\phi_2(t) = \frac{g_2(t)}{\sqrt{\int_0^T g_2^2(t)\,dt}}$$

Q.NO	SOLUTION	MARKS
	$\phi_i(t) = \frac{g_i(t)}{\sqrt{\int_0^T g_i^2(t)dt}}$	
3 (c)	Explain the Effect of de spreading on narrow band interference. block diagram - 2 marks Description - 2 marks	4M
4 (a)	Explain the Correlator receiver with neat diagram 	
	PRINCIPAL SIET., TUMAKURU.	

Detector / Demodulator

Q.NO	SOLUTION	MARKS
④ⓑ	Explain the matched filter receives with relevant mathematical Theory.	8M
	Block diagram	— 4M
	Explaination	— 4M
④ⓒ	Write a short note on Jamming margin. Probability of error of BPSK System	4M
	Jamming Margin	— 2M
	Probability of error of BPSK System	— 2M

PRINCIPAL
SIET., TUMAKURU

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
Sira Road, Tumakuru - 572 106, Karnataka.

Department of Electronics & Communication Engineering
Academic Year: 2021-22
Third Internal Assessment Test

Subject: Digital Communication (18EC-63) **Year/Sem: III/VI**

Note: Answer any one full question from Part-A & answer any one full question from Part-B

		PART -A		
1	a)	State and prove Radio-Communication link with relavent diagrams & equations	6 M	CO3
	b)	Derive the expression for maximum effective aperture of short dipole antanna and compute its directivity.	8M	CO3
	c)	Define (i) Beam Area (ii) Radiation Resistance (iii) Radiation Intensity.	6M	CO3
		OR		
2	a)	Define & Derive Power Theorem.	6M	CO3
	b)	Obtain the field pattern for linear array of isotropic antennas satisify the following parameters. N=5, d= $\lambda/2$, $\delta = -d_r$.	6M	CO4
	c)	Compute peak angles, null angles, side lobe angles , Half power beam width(HPBW) and beam width between first nulls(FNBW)and draw the field pattern for N=5, d= $\lambda/2$, $\delta = 0$.	8M	CO4
		PART-B		
3	a)	Obtain the relation between Directivity & effective aperture.	6M	CO3
	b)	Obtain the expression for radiation resistance (R_r) of short dipole.	6M	CO3
	c)	Explain parabolic reflector antenna with relavent diagrams and equations.	8M	CO3
		OR		
4)	a)	Explain Yagi-Uda array with the help of neat diagram.	6M	CO3
	b)	Explain helical antenna with the help of neat diagram. Explain two modes of operation with relavent equations.	8M	CO3
	c)	Derive the expression for radiation resistance of small loop antenna.	6M	CO4

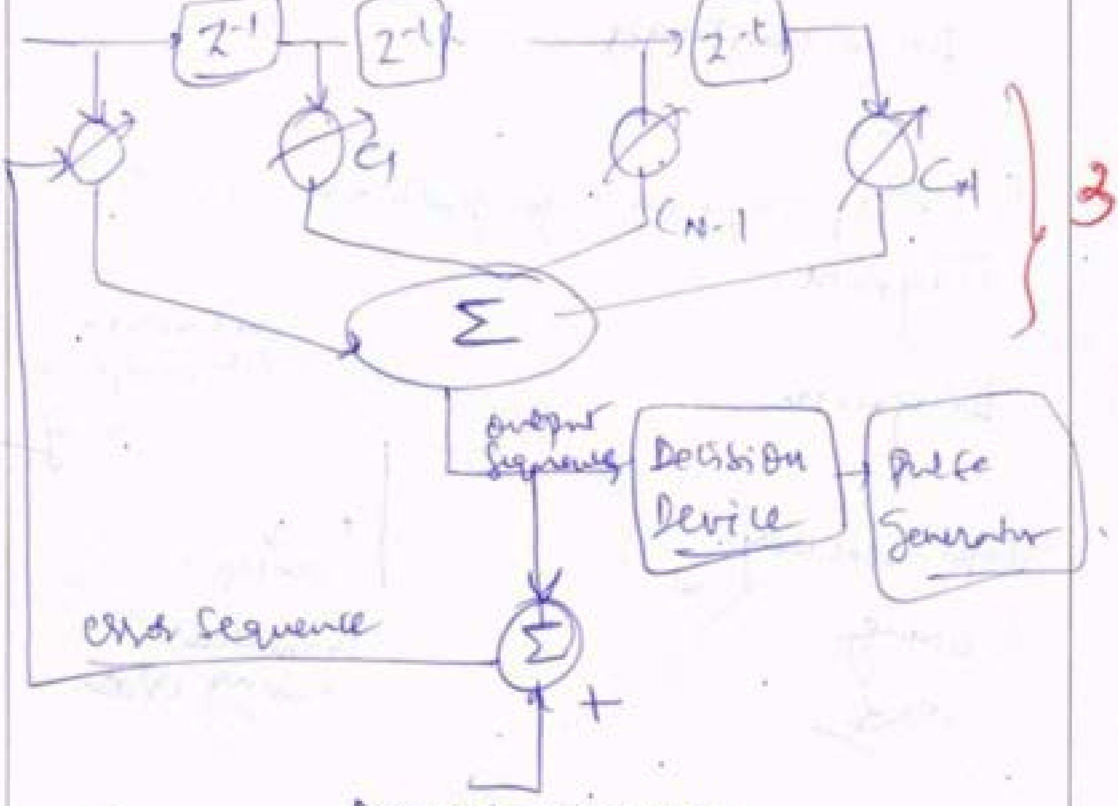
PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
ACADEMIC YEAR 2021-22(Even semester)
III - INTERNAL ASSESSMENT
SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Dr. Pradeep K.G.M
PROGRAMME:	B.E III Years / VI Sem
COURSE TITLE:	Digital Communication.
COURSE CODE:	18EC61
SIGNATURE:	

Q.NO | **SOLUTION** | **MARKS**

1) a) Explain the block diagram of adaptive equalizer and also list out the advantages & applications.



3 Mark

PRINCIPAL
SIET, TUMAKURU.

- Description —3 Mark
- Advantages —1 Mark
- Application —1 Mark

(b) Explain zero forcing equalizer with neat block diagram. Mention its advantages and disadvantages

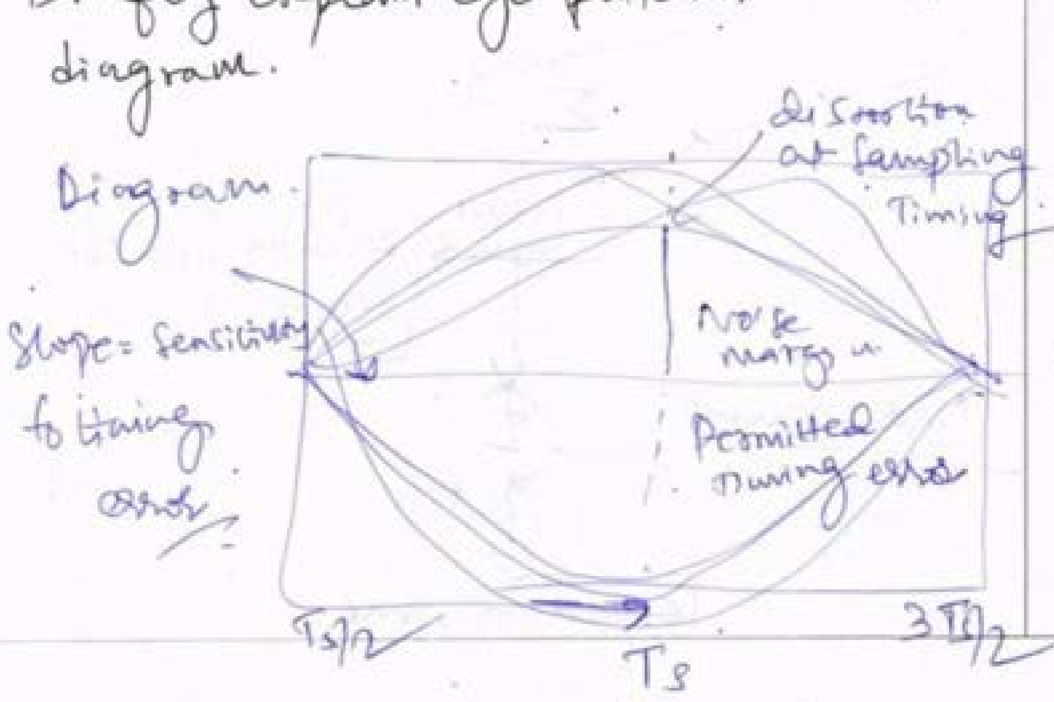
Block diagram
Explaination.
} 5 Marks

Advantages
Disadvantages
} 3 marks

(c) Briefly explain eye pattern with its diagram.

Soln:

Diagram.



2 marks

PRINCIPAL
SIET., TUMAKURU

Q.NO	SOLUTION	MARKS
	Description of Eye Diagram —	2 Marks
②ⓐ	Derive an expression for probability of error of binary FSK (BFSK) technique and also draw the block diagram of BFSK transmitter & Coherent Receiver.	8M
	Derivation	→ 3M
	Explaination	→ 3M
	Blockdiagram	→ 2M
②ⓑ	State and prove Nyquist Condition for Zero ISI	8M
	Statement	→ 2 Mark
	Block diagram	→ 2 Mark
	Mathematical proof	→ 2 Mark
	Explaination	→ 2 mark
②ⓒ	Obtain the Constellation of QAM for M=16 and draw Signal Space diagram	4M
	Constellation description	→ 2 Mark
	Signal Space diagram	→ 2 Mark

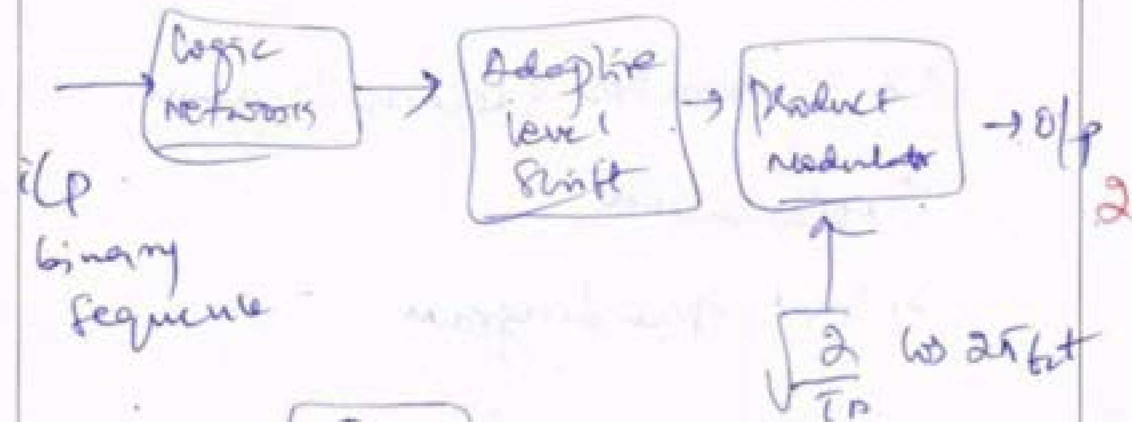
PRINCIPAL
S.S.I.T. TUMAKURU

Q.NO	SOLUTION	MARKS
3(a)	Explain Coherent QPSK transmitter and receiver with neat block diagram and waveform.	
	Transmitter block diagram/description —	3mark
	Receiver block diagram description —	3mark
	waveform —	2mark
3(b)	Explain Signal space diagram of BPSK with its waveform.	
	$S_{11} = \int_0^{T_b} \sqrt{\frac{2}{T_n}} \cos 2\pi f_c t \Rightarrow \sqrt{E_b} \cos 2\pi f_c t$	
	$S_{11} = \sqrt{E_b}$	4marks
	$S_{21} = \int_0^{T_b} \sqrt{\frac{2}{T_b}} \cos 3\pi f_c t = S - \sqrt{E_b} - \cos 2\pi f_c t$	
	$S_{21} = -\sqrt{E_b}$	
	Signal space diagram —	2mark
	Waveform —	2mark

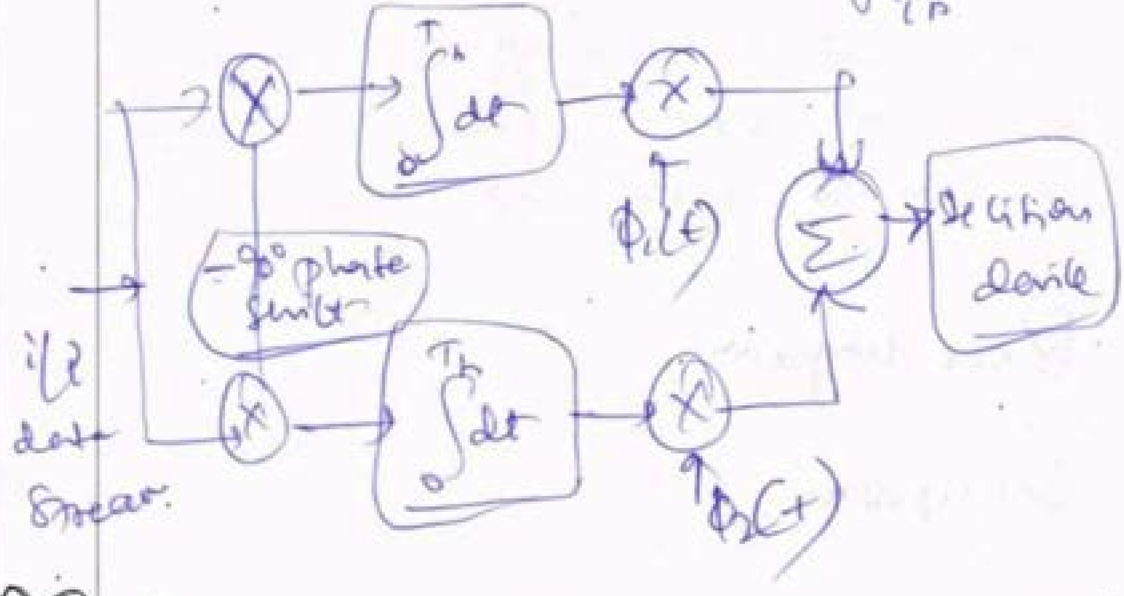
PRINCIPAL
SIET., TUMAKURU

Q.NO **SOLUTION** **MARKS**

③ⓒ Draw the block diagram of DPSK generation and detection.



2mark



2mark

④ⓐ Explain the signal space representation of BPSK modulation. Derive an expression for the probability of error for the BPSK

Signal space diagram → 3mark

Derivation of probability of error — 5mark

PRINCIPAL
SIET., TUMAKURU

Q.NO	SOLUTION	MARKS
④ ⓑ	Describe the QPSK Signal with its Signal space Characterisation.	
	QPSK transmitter &Receiver diagram	—3 mark
	Explaination	—3 mark
	Signal Space diagram	—2 mark
④ ⓒ	with a neat block diagram explain the digital PAM transmission through bandlimited base band Channels.	
	Block diagram	—2 mark
	Description	—2 mark

PRINCIPAL
SIET., TUMAKURU

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING			
AY:2021-2022	SEM : VI	TITLE: Internal Assessment Test-1	DATE:21-05-2022
SUB NAME /CODE: Microwave & Antennas /18EC63			

Note: 1.Answer any two full questions choosing ONE full question from each module.

2. All questions carry eqaul marks.

Max.marks: 40

1. a) Explain the Operation of Reflex klystron with the help of neat Diagam[CO2]. 08M

b) Define standing wave & standing Wave Ratio. [CO3]. 04M

c) Derive Microwave Transmission line equations [CO2]. 08M

OR

2. a) Define Reflection Coefficint.Derive the expression for reflection coefficient at load end at a distance 'd' from the load[CO4]. 06M

b) Describe the Mechanism of oscillations in reflex klystron. 08M

c) Certain Transmission line has a charecterstic impedence of 75+j0.01 ohm and it is terminated in a load impedence of 70+j50 ohm.

Compute (i) Refletion co-efficint (ii) Transmission co-efficient [CO4]. 06M

3. a) Explain Microwave Sysetm with the help of neat diagram. [CO1] 10M

b) Explain the different Microwave frequency bands. [CO3] 10M

OR

4. a) Briefly explain Z & Y parameters related microwave networks. [CO2] 08M

b) A Transmission line has a charecterstic impedence of 50+j0.01 ohm & terminated in a load impedence of 73-j42.5 ohm. Compute (i) Reflection co-eficient (ii) SWR [CO4] 06M

c) Briefly explain H & ABCD parameters related Microwave networks. [CO3] 06M

Faculty Incharge

HOD

PRINCIPAL

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
ACADEMIC YEAR 2021-22(Even semester)

I - INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Pradeepkumar S.S
PROGRAMME:	B.E
COURSE TITLE:	Microwave & Antenna
COURSE CODE:	18EC63
SIGNATURE:	

Q.NO	SOLUTION	MARKS
1.a)	Construction details of Reflex klystron	04M
	Working procedure of reflex klystron to produce microwave oscillations →	04M
b)	Definition of standing wave	01M
	Generation of standing wave	01M
	Standing wave ratio Definition	01M
	$\rho = \left\| \frac{V_{max}}{V_{min}} \right\| = \left\| \frac{I_{max}}{I_{min}} \right\|$	01M

PRINCIPAL

SIET.

1.c)	Derivation of transmission line equations like $\frac{dV}{dz} = -j\omega LI$ $\quad \frac{dI}{dz} = -j\omega CV$ $\frac{d^2V}{dz^2} = -\omega^2 LCV$ $\quad \frac{d^2I}{dz^2} = -\omega^2 LCI$	08M
2 a)	Reflection Coefficient Definition	01M
	$\Gamma = \frac{V_{ref}}{V_{in}} = \frac{I_{ref}}{I_{inc}}$	01M
	Derivation of expression $\Gamma = \frac{Z_L - Z_0}{Z_L + Z_0}$	04M
b)	Mechanism of Reflex klystron oscillator Oscillation diagram →	04M
	Explaination of Mechanism →	04M
c)	$\Gamma = \frac{Z_L - Z_0}{Z_L + Z_0} = 0.08 + j0.32$ →	03M
	$T = \frac{2Z_L}{Z_L + Z_0} = 1.08 + j0.32$ →	03M

PRINCIPAL
SIET., TUMAKURU.

3. a)	Microwave System Diagram →	04M
	Explaination of each block like i) Source ii) Wavemeter iii) Attenuator iv) Antenna v) Oscilloscope vi) Termination	06x01 = 06M
b)	Explaination of different Microwave frequency bands like HF, VHF, UHF, L, S, C, X, Ku, Ka, Millimeter, sub Millimeter bands	10M
4 a)	Z-parameter like $Z_{11}, Z_{12}, Z_{21}, Z_{22}$	04x02 = 08M
	Y-parameters like $Y_{11}, Y_{12}, Y_{21}, Y_{22}$	04x01 = 04M

CIPAL
KURU

b) Reflection Co-efficient (Γ)

$$\Gamma = \frac{Z_L - Z_0}{Z_L + Z_0}$$

03M

Standing wave ratio (S)

$$\rho = \frac{1+|\Gamma|}{1-|\Gamma|}$$

03M

c) H-parameters like

$h_{11}, h_{12}, h_{21}, h_{22}$ → 03M

Definition of ABCD parameters like

A
B
C
D

→ 03M

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

(An ISO 9001-2015 Certified Institution)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

ACADEMIC YEAR 2021-22

Internal Assessment Test II

Course: Microwave & Antenna (18EC63) Time: 90 Minutes

Note: Answer all the questions

1) A) With a neat diagram explain co-planar strip lines. 6M
   B) Briefly Explain the different types of loses in Micro strip Lines. 8M
   C) With a neat diagram briefly explain Shielded strip line. 6M

OR

2) A) Write a short note on Microwave Attenuator. 6M
   B) State & explain the different Properties of S-Parameters. 6M
   C) Explain Precision Type Phase shifter with a neat diagram. 8M

3) A) Write a short note on Coaxial Connectors. 6M
   B) Write the characteristics of Magic Tee. Also obtain the Scattering Matrix for Magic Tee 8M
   C) 20 MW is fed into one of the collinear ports of a lossless T junction. Calculate the power delivered through each port when other ports are terminated in matched load. 6M

OR

4) A) Write a note on Microwave Adapters. 6M
   B) Explain the distributed parameters of Parallel strip line with equations. 6M
   C) What is a strip line? Briefly explain Micro strip lines with a neat diagram. 8M

Signature of the staff

Signature of HOD

PRINCIPAL
SIET., TUMAKURU

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2021-22(Even semester)

II - INTERNAL ASSESSMENT

SCHEME & SOLUTION

NAME OF COURSE INSTRUCTOR:	Pradeepkumar.s.s
PROGRAMME:	B.E
COURSE TITLE:	Microwave and Antenna
COURSE CODE:	18EC63
SIGNATURE:	Pradeep

Q.NO	SOLUTION	MARKS
1.A)	Co-planar strip lines	
	Diagram →	02M
	Explanation →	04M
B)	Losses in Micro strip lines	
	1) Conductor losses	04×2=08M
	2) ohmic losses	
C)	Shielded strip lines	
	Diagram →	02M
	Explanation →	06M

PRINCIPAL
SIET TUMKUR

2. A)	Microwave Attenuator	
	Diagram →	02M
	Explaination →	04M
B)	Four different properties of S-parameter.	1.5×4=6M
c)	Precision phase shifter	
	Diagram →	04M
	Explaination →	04M
3. A)	Co-axial Connectors	
	Different types of Connectors →	03M
	Explaination →	03M
B)	Characterstics of Magic tee →	04M
	Scattering Matrix of Magic tee →	04M

PRINCIPAL
SIET., TUMAKURU

3. c)	power Delievered through each port of Magic tee	06M
4. A)	Different Microwave Adaptors →	06M
B)	Distributed parameters of parallel strip line →	03M
	Equation →	03M
c)	Strip line →	01M
	Microstrip line Diagram →	02M
	Explaination →	05M

PRINCIPAL
SIET., TUMAKURU

Shridevi Institute of Engineering and Technology
Department of Electronics & Communication Engineering
First Internal Test, Academic year 2021-2022
OPERATING SYSTEM

Time: 1:30 Min.
Sub Code: 18EC-641

Max. Marks: 40
Semester: VI

Note: Answer any two full questions

Q1.(a) Define an OS? Explain the uses of abstract view of an OS & discuss the designer's view of an OS.[CO1][10M]
(b) Discuss logical & Physical organization of an OS & Discuss the goals of an OS.. [CO1] [10M

OR

Q2.(a) Explain the common tasks performed by an OS & Explain the Program management function of OS.[CO1][10
(b) Explain Resource allocation techniques in an operating system. [CO1] [10M

Q3.(a) Explain the batch processing system in detail. [CO1] [10M
(b) Explain the operation of a multiprogramming system & discuss the features required in order to support Multiprogramming. [CO1] [10M

OR

Q4. (a) Explain the Time sharing operating system in detail. [CO1] [10M
(b) Explain the Real time operating system in detail and its essential features. [CO1] [10M

Staff Incharge

HOD

HOD
Dept of E&C
SIET, Tumkur-6

Shridevi Institute of Engineering and Technology
Department of Electronics & Communication Engineering
First Internal Test, Academic year 2021-2022
OPERATING SYSTEM

Time: 1:30 Min.
Sub Code: 18EC-641

Max. Marks: 40
Semester: VI

Note: Answer any two full questions

Q1.(a) Define an OS? Explain the uses of abstract view of an OS & discuss the designer's view of an OS.[CO1][10M]
(b) Discuss logical & Physical organization of an OS & Discuss the goals of an OS.. [CO1] [10M

OR

Q2.(a) Explain the common tasks performed by an OS & Explain the Program management function of OS.[CO1][10
(b) Explain Resource allocation techniques in an operating system. [CO1] [10M

Q3.(a) Explain the batch processing system in detail. [CO1] [10M
(b) Explain the operation of a multiprogramming system & discuss the features required in order to support Multiprogramming. [CO1] [10M

OR

Q4. (a) Explain the Time sharing operating system in detail. [CO1] [10M
(b) Explain the Real time operating system in detail and its essential features. [CO1] [10M

PRINCIPAL
TUMAKURU.

Staff Incharge

HOD 18/5/2022

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2021-22

INTERNAL ASSESSMENT TEST-1,2,3 SCHEME & SOLUTIONS

NAME OF THE FACULTY:	**PROF.AIJAZ AHAMED SHARIEF**
DEPARTMENT.	***Electronics & Communication Engineering***
SUBJECT TITLE:	***Operating System***
SUBJECT CODE:	***18EC641***
SIGNATURE:	

Q.NO	SOLUTION	MARKS
Q1 (a)	Definition: Operating system is an intermediary between the user & the computer system or Operating system is a collection of software that manages computer hardware resources & provides common services for computer system. —2 marks— Use of Abstract View → Gathering system requirements → Design of a system → Implementation of a system. & Explanation of the points —4 marks—	10

PRINCIPAL
SIET., TUMAKURU

	Designer's abstract view of an OS Diagram → 2 marks — Explanation of Kernel, Non Kernel programs, & user interface – 3 marks —	
(b)	Logical & physical organization Logical view diagram – 1/2 marks explanation – 2 marks physical view diagram – 1/2 marks explanation – 2 marks. Goals of an OS → Efficient use → User convenience → Non-interference Explanation of the above – 5 marks.	10
Q2		
(a)	Common Tasks performed by OS → construct a list of resources → maintain information for security → Verify identity of a user	10

→ Initiate execution of programs

→ maintain authorization info

→ perform resource allocation.

→ maintain current status of resources.

→ current status of programs & perform scheduling — 2 marks —

Explanation of above — 3 marks —

program management:-

→ single program

→ sequence of single programs

→ co-executing programs

& explanation — (2 marks)

Block diagram of scheduling — (1 marks)

Explanation of scheduling (2 marks).

(b)	Resource management Resource allocation → Resource partitioning diagram — 1 mark Explanation — 1 mark (2 marks) → Pool based approach → diagram — 1 mark → Explanation — 1 mark (2 marks) Resource Allocation Table → (1 mark) ex → (1 mark) (2 m) ⇒ Resource Sharing → Sequential Sharing → Concurrent Sharing } 1 mark ⇒ CPU Sharing → Memory Sharing ⇒ Partitioned Allocation Diagram — Explanation — } 1 mark	10

PRINCIPAL
SIET, TUMAKURU

pool - based Allocation:-

Diagram —
Explanation — } 1 marks.

→ Disk sharing
→ virtual networks
ex
→ virtual memory — } 1 mark.

Q3
(a) Batch processing System | 10

Conceptual diagram - 1m
Operational diagram - 1m
Diagram showing the turn around time - 1m
Example program - 1m
} marks 1 mark each

Explanation shall focus on explaining batch processing of definition, its operation, turn around time, & how batch processing system manages the program interference by example (6 marks)

PRINCIPAL
SIET., TUMAKURU.

(b)	Multiprogramming Operational diagram (2marks) Explanation — (3marks) Listing of features — 1mark Explanation of each (4mark) features	10
Q4 (a)	Time Sharing O.S Schematic diagram of Round-Robin — (1marks) scheduling Explanation — (2marks) Example showing operation of time sharing system — along with a table & diagram (charts). (7marks)	10

(b)	Real time operating system → Real time applications → Response requirements Example of Real time system. ⇒ Hard & soft Real time systems & explanations Features 1. concurrency within an application 2. Process priorities 3. Scheduling 4. Domain-specific events & Interrupts 5. Predictability	10

6. Reliability.

→ Fault tolerance

→ Graceful degradation

Listing of above —(3marks)

explanation of all above (7marks)

End

18/05/2012

PRINCIPAL
SIET., TUMAKURU.

Shridevi Institute of Engineering and Technology
Department of Electronics & Communication Engineering
Second Internal Test, Academic year 2021-2022
OPERATING SYSTEM

Time: 1:30 Min. **Max. Marks: 40**
Sub Code: 18EC-641 **Semester: VI**

Note: Answer any two full questions

Q1.(a) Discuss the fundamental functions of the Kernel for controlling processes with a neat diagram.[CO2][10M]
(b) Discuss fundamental process states & state transitions for a process with help of a state diagram [CO2] [10M]

OR

Q2. (a) Discuss contiguous memory allocation & non-contiguous memory allocation. [CO2] [10M]

(b) Write short notes on paging and segmentation. [CO2] [10M]

Q3. (a) Define Virtual memory and Discuss overview of virtual memory [CO3] [10M]
(b) Discuss the page replacement policies in detail [CO3] [10M]

OR

Q4. (a) List and Explain the functions performed by the virtual memory handler [CO3] [10M]
(b) Write a note on UNIX virtual memory & LINUX virtual memory [CO3] [10M]

Staff Incharge HOD

Shridevi Institute of Engineering and Technology
Department of Electronics & Communication Engineering
Second Internal Test, Academic year 2021-2022
OPERATING SYSTEM

Time: 1:30 Min. **Max. Marks: 40**
Sub Code: 18EC-641 **Semester: VI**

Note: Answer any two full questions

Q1.(a) Discuss the fundamental functions of the Kernel for controlling processes with a neat diagram.[CO2][10M]
(b) Discuss fundamental process states & state transitions for a process with help of a state diagram [CO2] [10M]

OR

Q2. (a) Discuss contiguous memory allocation & non-contiguous memory allocation. [CO2] [10M]

(b) Write short notes on paging and segmentation. [CO2] [10M]

Q3. (a) Define Virtual memory and Discuss overview of virtual memory [CO3] [10M]
(b) Discuss the page replacement policies in detail [CO3] [10M]

OR

Q4. (a) List and Explain the functions performed by the virtual memory handler [CO3] [10M]
(b) Write a note on UNIX virtual memory & LINUX virtual memory [CO3] [10M]

Staff Incharge HOD

PRINCIPAL
SIET., TUMAKURU

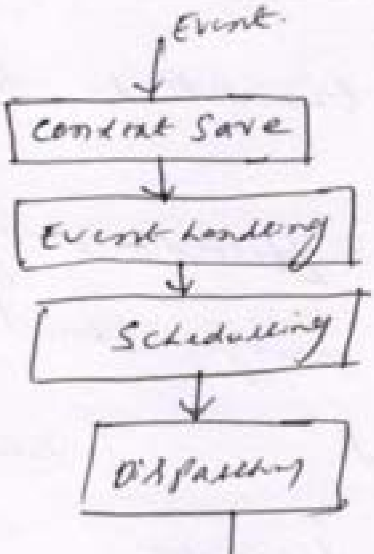
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2021-22

INTERNAL ASSESSMENT TEST -1,2,3 SCHEME & SOLUTIONS

NAME OF THE FACULTY:	**PROF.AIJAZ AHAMED SHARIEF**
DEPARTMENT:	***Electronics & Communication Engineering***
SUBJECT TITLE:	***Operating System***
SUBJECT CODE:	***18EC641***
SIGNATURE:	

Q.NO	SOLUTION	MARKS
Q1 (a)	 (2 marks) General explanation of Implementing process. —(2 marks) Explanation of the following in detail * context save — 1½ * Event handling — 1½ * Scheduling — 1½ * Dispatching — 1½ } 6 marks.	10

PRINCIPAL
SIET., TUMAKURU.

Q1 (b)

Tabulation or listing the fundamental states & their description such as

State	Description
Running	—
Blocked	—
Ready	—
Terminated	—

(4m)

10

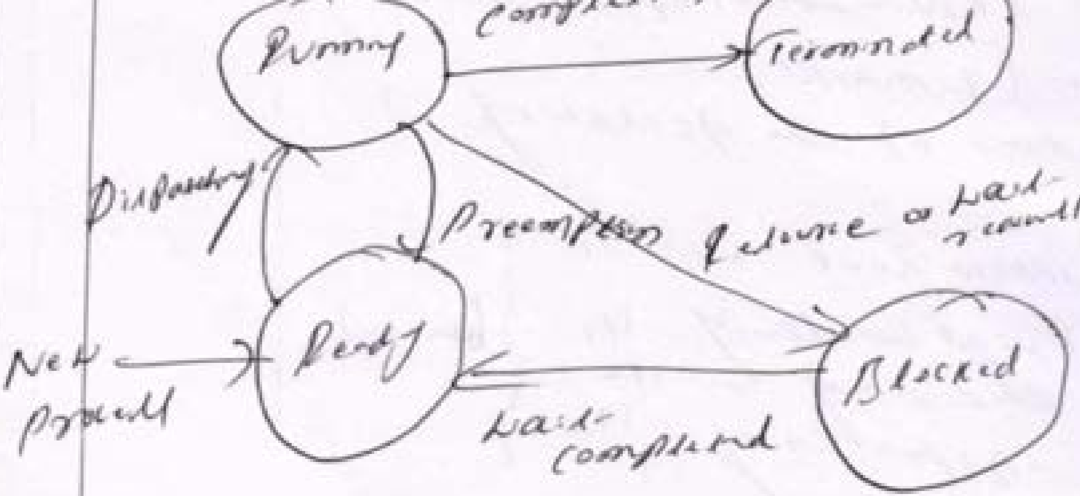
Listing of state transition & their description.

ready → running, blocked - ready

running → ready, running - blocked.

running → Terminated. (4marks)

State transition diagram:-



(2marks)

PRINCIPAL
SIET., TUMAKURU.

Q2 (a)	Explanation of contiguous memory allocation — (5 marks) Explanation of non contiguous memory allocation - (5 marks)	10
(b)	Short note on paging (5 marks) Short note on segmentation (5 marks)	10
Q3 (a)	Definition of the virtual memory — (2 marks) Explanation of the overview of virtual memory along with the the fundamental approaches. — (8 marks)	10
(b)	Explanation of page replacement policies such as	10

	x optional page replacement policy - 3mars) x First-in-First out (FIFO) page replacement policy (-3mars)) x Least Recently used (LRU) page replacement policy. along with an example. (4mm)	
Q4. (a)	Explanation of virtual memory handler such as x management of the physical memory — (2mars) x protection — (2mars) x collection of information for page replacement -(2mars) diagram - operation of VM handler -(4mark).	10
(b)	explanation unix VM —5marks explanation of LinuxVM —5marks.	10

PRINCIPAL
SIET., TUMAKURU.

Shridevi Institute of Engineering and Technology
Department of Electronics & Communication Engineering
Second Internal Test, Academic year 2021-2022
SATELLITE COMMUNICATION

Time: 1:30 Min.
Sub Code: 18EC-732/17EC755

Max. Marks: 40
Semester: VII

Note: Answer any two full questions

Q1.(a) Discuss power supply subsystem & their types? Explain the regulated bus power supply system & series- Parallel arrangement of solar cells with the help of neat block diagram.[CO2] [14M]

(b) An antenna has a directivity of 20 and a radiation efficiency of 90% .Compute the gain in dBs. .[CO2] [06M]

OR

Q2.(a) Explain with a neat diagram the arrangement of the basic TT&C subsystem. [CO4] [12M]

(b) What is the maximum power received at a distance of 0.5 km over a free space for 1GHz frequency. System Consisting of a transmitting antenna with a 2.5dB gain and a receiving antenna with a 20dB gain? The transmitting antenna is fed with 150 watts power.[CO4] [08M]

Q3.(a) Discuss TDMA & Explain the TDMA frame structure with neat diagram [CO4] [08M]

(b) Explain SCPC systems. [CO4] [07M]

(c) A TDMA frame and burst structure has the following parameters :(a) TDMA frame lengh=20ms ;(b)length and clock recovery sequence=352bits ;(c)length of unique word=48bits;(d)length of order wire channel = 510bits ;(e)Length of management channel=256bits;(f)length of transmit timing channel=320bits; (g) Length of service channel=24bits ;(h)guard time=64bits.Also each of the 10 stations in the network transmits two traffic bursts in each frame and each frame contains two reference bursts in addition. Determine the following.(a)Length of reference burst preamble in bits(b)length of traffic burst preamble in bits(c)Total number of overhead bits. [CO4] [05M]

OR

Q4. (a) Explain DS-CDMA transmission and reception. [CO4] [10M]

(b) Explain FH-CDMA system. [CO4] [10M]

Staff In charge

[HOD]

HOD
Dept of E&C
SIET, Tumkur-6

Shridevi Institute of Engineering and Technology
Department of Electronics & Communication Engineering
Second Internal Test, Academic year 2021-2022
SATELLITE COMMUNICATION

Time: 1:30 Min.
Sub Code: 18EC-732/17EC755

Max. Marks: 40
Semester: VII

Note: Answer any two full questions

Q1.(a) Discuss power supply subsystem & their types? Explain the regulated bus power supply system & series- Parallel arrangement of solar cells with the help of neat block diagram.[CO2] [14M]

(b) An antenna has a directivity of 20 and a radiation efficiency of 90% .Compute the gain in dBs. .[CO2] [06M]

OR

Q2.(a) Explain with a neat diagram the arrangement of the basic TT&C subsystem. [CO4] [12M]

(b) What is the maximum power received at a distance of 0.5 km over a free space for 1GHz frequency. System Consisting of a transmitting antenna with a 2.5dB gain and a receiving antenna with a 20dB gain? The transmitting antenna is fed with 150 watts power.[CO4] [08M]

Q3.(a) Discuss TDMA & Explain the TDMA frame structure with neat diagram [CO4] [08M]

(b) Explain SCPC systems. [CO4] [07M]

(c) A TDMA frame and burst structure has the following parameters :(a) TDMA frame length=20ms ;(b)length and clock recovery sequence=352bits ;(c)length of unique word=48bits;(d)length of order wire channel = 510bits ;(e)Length of management channel=256bits;(f)length of transmit timing channel=320bits; (g) Length of service channel=24bits ;(h)guard time=64bits.Also each of the 10 stations in the network transmits two traffic bursts in each frame and each frame contains two reference bursts in addition. Determine the following.(a)Length of reference burst preamble in bits(b)length of traffic burst preamble in bits(c)Total number of overhead bits. [CO4] [05M]

OR

Q4. (a) Explain DS-CDMA transmission and reception. [CO4] [10M]

(b) Explain FH-CDMA system. [CO4] [10M]

Staff In charge

PRINCIPAL
SIET, TUMAKURU

HOD

HOD
Dept of E&C
SIET, Tumkur-6

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06

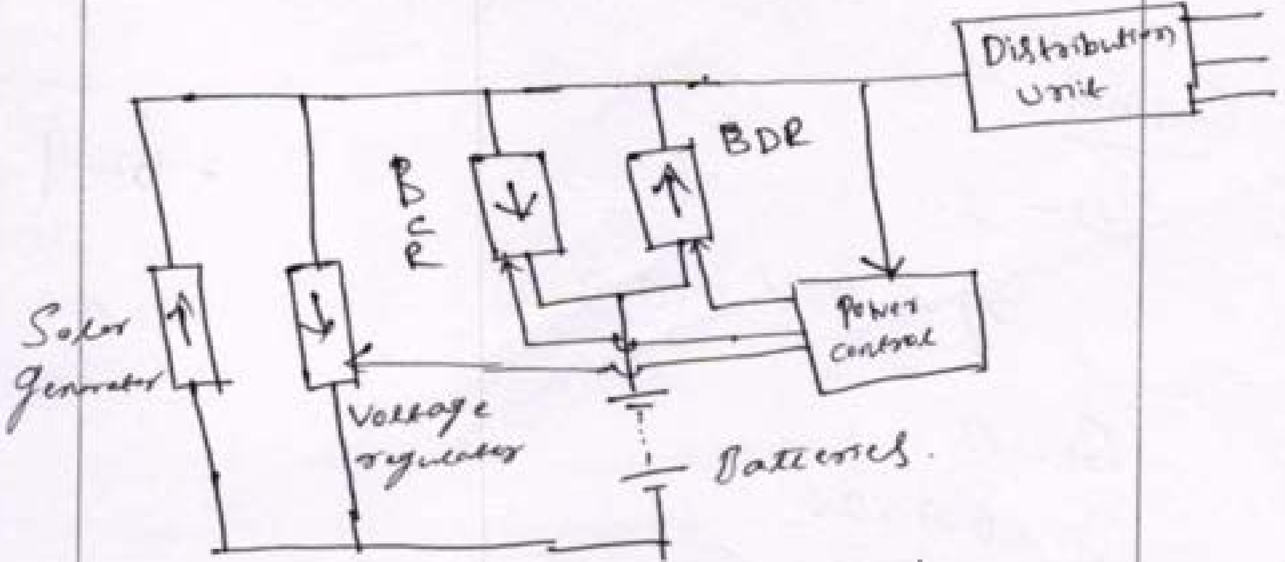
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

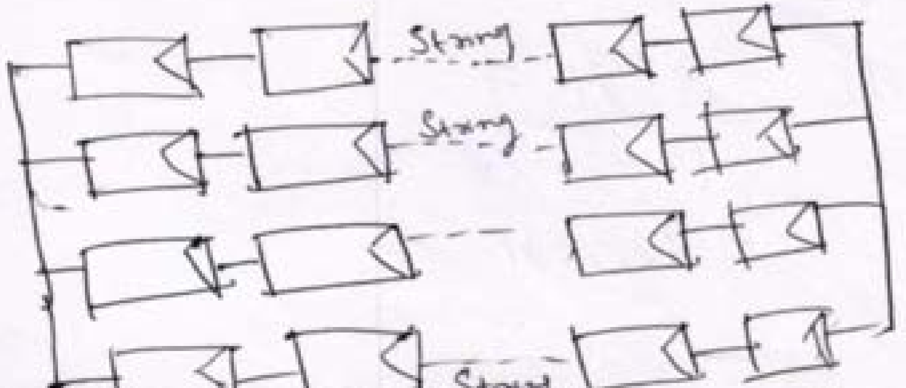
ACADEMIC YEAR 2021-22

INTERNAL ASSESSMENT TEST -1,2,3 SCHEME & SOLUTIONS

NAME OF THE FACULTY:	**PROF.AIJAZ AHAMED SHARIEF**
DEPARTMENT:	***Electronics & Communication Engineering***
SUBJECT TITLE:	***Satellite Communication***
SUBJECT CODE:	***18EC732/17EC755***
SIGNATURE:	

Q.NO	**SOLUTION**	**MARKS**
Q1 (a)		(14)





(3 marks)

PRINCIPAL
SIET, TUMAKURU

Explanation of solar energy driven power systems. & types — (2marks)

Explanation of regulated bus power supply system explaining the operation of DCR & BDR — (3marks)

Explanation of solar panels, — (2marks)

Explanation of principle of working of solar cell & diagram — (4marks)

(b) Given — 6m

$D = 20$

$\eta = 90\% = 0.9$

$G = D$

$G = 0.9 \times 20$

$G = 18$

$\text{Gain in dBs} = 10 \log_{10} G$

$= 10 \log_{10} 18$

$= 12.55 \text{ db}$

Q2. (a) 12

Block diagram → 4m

Explanation of Telemetry subsystem 2m

Explanation of Tracking subsystem — 2m

Explanation of Command subsystem — 2m

(b) 8

Given

$P_t = 150$ watts

$G_t = 25dB = 1.77$

$f = 1 GHz$, $\therefore \lambda = \frac{c}{f} = \frac{3\times10^8}{1\times10^9} = 0.3m$

$d = 0.5km = 500$ meters.

$G_r = 20dB = 100$

Received power is given by

$$P_r = \frac{P_t \cdot G_t \cdot G_r \lambda^2}{16\pi^2 d^2}$$

$P_r = 60.52$ watts

Q3	(a) Discussion on TDMA — 1 marks Frame structure — 4 marks. Explanation of each field in the frame structure — 3 marks.	(8)
	(b) SCPC systems SCPC/FM/FDMA system — 4 m SCPC/PSK/FDMA system — 3 m	(7)
	(c) (a) $= 352+48+510+256+320 = 1486$ bits (b) $= =352+48+510+24 = 934$ bits (c) Guard time $\rightarrow 22\times64 = 1408$ bits. Overhead bits $= 1486\times2+934\times20+1408$ $= 2972+18680+1408$ $= \underline{\underline{23060}}$ bits	(5)

Q4.	(a) DS-CDMA Tx & Rx. Diagram & Explanation of DS-CDMA Tx - (5 marks) Diagram & Explanation of DS-CDMA Rx - (5 marks)	(10)
	(b) FH-CDMA System Diagram - 4 marks Explanation of FH-CDMA System. - 4 marks ex diagram - 2 marks -	10.

PRINCIPAL
SIET., TUMAKURU.

Shridevi Institute of Engineering and Technology
Department of Electronics & Communication Engineering
Third Internal Test, Academic year 2021-2022
SATELLITE COMMUNICATION

Time: 1:30 Min.
Sub Code: 18EC-732/17EC755

Max. Marks: 40
Semester: VII

Note: Answer any two full questions

Q1.(a) Discuss the transparent & regenerative transponders with a neat block diagram [CO4] [10M]
(b) Discuss satellite telephony with a neat block diagram [CO4] [10M]

OR

Q2.(a) Explain a typical satellite TV network with the help of a neat diagram [CO4] [10M]
(b) Explain a typical VSAT network with the help of a neat diagram.[CO4] [10M]

Q3.(a) Discuss the classification of satellite remote sensing systems [CO5] [10M]
(b) Discuss remote sensing satellites payloads. [CO5] [10M]

OR

Q4. (a) Discuss the applications of weather forecasting satellites. [CO5] [10M]
(c) Discuss the GPS system.[CO5] [10M]

Staff In charge

HOD

HOD
Dept of E&C
SIET, Tumkur-6

Shridevi Institute of Engineering and Technology
Department of Electronics & Communication Engineering
Third Internal Test, Academic year 2021-2022
SATELLITE COMMUNICATION

Time: 1:30 Min.
Sub Code: 18EC-732/17EC755

Max. Marks: 40
Semester: VII

Note: Answer any two full questions

Q1.(a) Discuss the transparent & regenerative transponders with a neat block diagram [CO4] [10M]
(b) Discuss satellite telephony with a neat block diagram [CO4j [10M]

OR

Q2.(a) Explain a typical satellite TV network with the help of a neat diagram [CO4] [10M]
(b) Explain a typical VSAT network with the help of a neat diagram.[CO4] [10M]

Q3.(a) Discuss the classification of satellite remote sensing systems [CO5] [10M]
(b) Discuss remote sensing satellites payloads. [CO5] [10M]

OR

Q4. (a) Discuss the applications of weather forecasting satellites. [CO5] [10M]
(b) Discuss the GPS system.[CO5] [10M]

Staff In charge

HOD

HOD
Dept of E&C
SIET, Tumkur-6

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR -06

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ACADEMIC YEAR 2020-21

3rd INTERNAL ASSESSMENT TEST SCHEME & SOLUTIONS

NAME OF THE FACULTY:	**PROF.AIJAZ AHAMED SHARIEF**
DEPARTMENT:	***Electronics & Communication Engineering***
SUBJECT TITLE:	***Principles of Communication systems***
SUBJECT CODE:	***18EC53***
SIGNATURE:	

Q.NO	SOLUTION	MARKS
Q1.	(a) Block diagram of Transparent transponder — 2 marks. Explanation of Transparent transponder — 4 marks. Explanation of regenerative transponder — 4 marks	— 10 —
	(b) Block diagram — 3 Explanation focusing on the various steps in making a call through a Satellite n/w. — 4 Explanation on point to point trunk telephone network & mobile satellite telephony - 3	— 10 —

PRINCIPAL
SIET., TUMAKURU

Q2. (a) Diagram of SatelliteTV — 4 — 10 —

Explanation focusing on the uplink & downlink sections, components of uplink section like programming source the broadcast center, & broadcasting Satellite.

Explanation focusing on downlink Components. — 6

(b) Diagram VSat n/w — 3 — 10 —

Explanation on service provided like one way or two broadcast services, point to point voice services. — 2 marks.

Examples like used for small & medium business with a central office, Banking Institutions, Reservation system, airline ticketing system, etc — 2 marks

Explanation on advantages & disadvantages

Explanation w.r.t to diagram.

Explanation on the frequency bands used. — 3 marks.

PRINCIPAL
SIET., TUMAKURU.

Q3. (a) Block diagrams: — 10 —

* optical remote sensing
* Thermal remote sensing
* Active microwave remote sensing.

— 4 marks

Explanation — 6 marks

(b) Remote sensing payloads — 10 —

Explanation of Passive & active sensing & Scanning sensors & Non-scanning sensors -

Q4 (a) Discussion on weather forecasting satellite applications.

* Measurement of cloud parameters
* Rainfall
* Wind speed & direction
* Ground level Temperature measurements
* Air pollution & Haze
* Fog
* oceanography
* Severe storm support
* Fisheries
* Snow & Ice studies

PRINCIPAL
SIET., TUMAKURU

(b)	GPS: System. Diagram - working principle GPS — 2 Diagram of operation of the control Segment of GPS systems. — 2 Explanation of the GPS system its space segment, control segment user segment & working principles — 6 marks —	10 —

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
IV Semester Internal Assessment Test II –28th July 2022
20MBAHR401: ORGANISATIONAL LEADERSHIP

Duration: 1½ Hrs **Max. Marks: 50**

Answer the following questions.

1. a. Define Transformational Leadership. **(03 Marks)**
   b. Explain the Clinical Paradigm of Psychodynamic Approach. **(07 Marks)**
   c. Discuss in detail the early studies and later studies of LMX Theory. Explain its strengths and weakness. **(10 Marks)**
2. a. What is Leadership in Making.. **(03 Marks)**
   b. Explain how the Task and Follower characteristics influence the leadership effectiveness according to Path Goal Theory.. **(07 Marks)**
   c. Define Authentic Leadership. Explain different approaches to it. **(10 Marks)**
3. a. Define Ethnocentrism and Prejudice. **(03 Marks)**
   b. Explain the key Concepts and Dynamics of Psychodynamic Approach. **(07 Marks)**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
IV Semester Internal Assessment Test II –28th July 2022
20MBAHR401: ORGANISATIONAL LEADERSHIP

Duration: 1½ Hrs **Max. Marks: 50**

Answer the following questions.

1. a. Define Transformational Leadership. **(03 Marks)**
   b. Explain the Clinical Paradigm of Psychodynamic Approach. **(07 Marks)**
   c. Discuss in detail the early studies and later studies of LMX Theory. Explain its strengths and weakness. **(10 Marks)**
2. a. What is Leadership in Making.. **(03 Marks)**
   b. Explain how the Task and Follower characteristics influence the leadership effectiveness according to Path Goal Theory.. **(07 Marks)**
   c. Define Authentic Leadership. Explain different approaches to it. **(10 Marks)**
3. a. Define Ethnocentrism and Prejudice. **(03 Marks)**
   b. Explain the key Concepts and Dynamics of Psychodynamic Approach. **(07 Marks)**

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

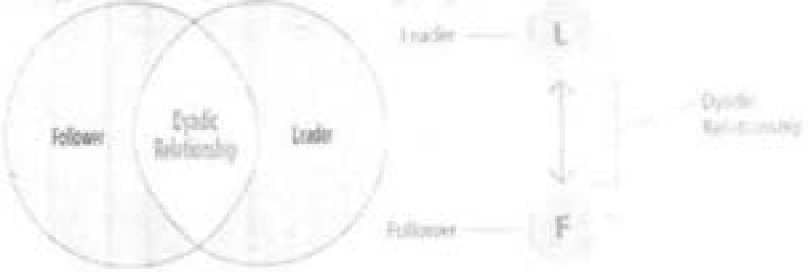
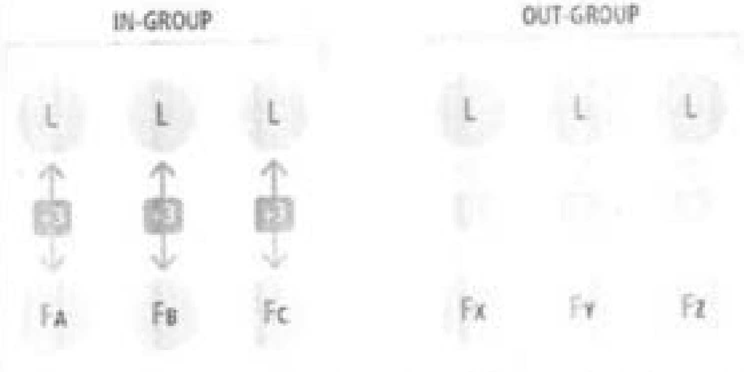
Department of MBA

Scheme of Evaluation – Internal Assessment II

Subject : ORGANISATIONAL LEADERSHIP	**Code: 20MBAHR401**
Max marks: 50	**No Choice**

Sl. No	Answer Script	Marks 50
1.a	**Transformational Leadership :** One of the current and most popular approaches to leadership that has been the focus of much research since the early 1980s is the transformational approach. Transformational leadership is part of the "New Leadership" paradigm, which gives more attention to the charismatic and affective elements of leadership. As its name implies, transformational leadership is a process that changes and transforms people. It is concerned with emotions, values, ethics, standards, and long-term goals. It includes assessing followers' motives, satisfying their needs, and treating them as full human beings. Transformational leadership involves an exceptional form of influence that moves followers to accomplish more than what is usually expected of them. It is a process that often incorporates charismatic and visionary leadership.	**03 Marks**
b.	**The Clinical Paradigm:** The Clinical Paradigm consists of four basic premises 1. **First**, it argues that there is a *rationale behind every human act*—a logical explanation—even for actions that seem irrational. This point of view stipulates that all behaviour has an explanation. 2. **The second premise** is that a great deal of *mental life—feelings, fears, motives—lies outside of conscious awareness*, but still affects conscious reality and even physical well-being. We all have blind spots. People aren't always aware of what they are doing—much less *why* they are doing it 3. **The third premise** states that nothing is more central to who a person is than the way he or she *regulates and expresses emotions*. Emotions colour experiences with positive and negative connotations, creating preference in the choices we make, and the way we deal with the world. Emotions also form the basis for the internalization of mental representations of the self and others that guide relationships throughout one's life. 4. **The fourth premise** underlying the clinical paradigm is that human development is an inter- and intrapersonal process; we are all *products of our past experiences*, and those experiences, including the developmental experiences provided by our early caregivers, continue to influence us throughout life	**07 marks** **02 Marks for listing and 05 Marks for explanation**

PRINCIPAL
SIET., TUMAKURU.

c.	**Early Studies: Leader–Member Exchange Theory** In the first studies of exchange theory, which was then called vertical dyad linkage (VDL) theory, researchers focused on the nature of the *vertical linkages* leaders formed with each of their followers. A leader's relationship to the work unit as a whole was viewed as a series of vertical dyads In assessing the characteristics of these vertical dyads, researchers found two general types of linkages (or relationships): those that were based on expanded and negotiated role responsibilities (extra-roles), which were called the *in-group*, and those that were based on the formal employment contract (defined roles), which were called the *out-group*.  **Later Studies:** After the first set of studies, there was a shift in the focus of LMX theory. Whereas the initial studies of this theory addressed primarily the nature of the differences between in-groups and out-groups, a subsequent line of research addressed how LMX theory was related to organizational effectiveness. Specifically, these studies focus on How the quality of leader–member exchanges was related to positive outcomes for leaders, followers, groups, and the organization in general.  Note: A leader (L) and his or her followers (F) form unique relationships. Relationships within the in-group are marked by mutual trust, respect, liking, and reciprocal influence. Relationships within the out-group are marked by formal communication based on job descriptions. Plus 3 is a high-quality relationship, and zero is a stranger.	**10 Marks** **03 Marks for listing and 07 marks for explanation**
2.a	**Leadership Making:** Leadership making is a prescriptive approach to leadership emphasizing that	**03 Marks**

	leaders should develop high - quality exchanges with all of their followers rather than just a few. It attempts to make every follower feel as if he or she is a part of the in-group and, by so doing, avoids the inequities and negative implications of being in an out-group. In general, leadership making promotes partnerships in which the leader tries to build effective dyads with all followers in the work unit.	
b.	**Follower Characteristics:** Follower characteristics determine how a leader's behavior is interpreted by followers in a given work context. Researchers have focused on followers' *needs for affiliation, preferences for structure, desires for control*, and *self-perceived level of task ability*. ➢ Path–goal theory predicts that followers who have strong *needs for affiliation* prefer supportive leadership because friendly and concerned leadership is a source of satisfaction. ➢ For followers who are dogmatic and authoritarian and have to work in uncertain situations, path–goal theory suggests directive leadership because that provides psychological *structure* and task clarity. **Task Characteristics:** In addition to follower characteristics, task characteristics have a major impact on the way a leader's behavior influences followers' motivation. Task characteristics include the design of the *followers' task*, the *formal authority system* of the organization, and the *primary work group* of followers. ➢ When a situation provides a clearly structured task, strong group norms, and an established authority system, followers will find the paths to desired goals and will not need a leader to clarify goals or coach them in how to reach these goals. ➢ In some situations, however, the *task characteristics* may call for leadership involvement. Tasks that are unclear and ambiguous call for leadership input that provides structure. In addition, highly repetitive tasks call for leadership that gives support in order to maintain followers' motivation.	**07 Marks 02 marks for listing and 04 marks for explanation**
c.	**Authentic leadership:** Authentic leadership represents one of the newer areas of leadership research. It focuses on whether leadership is genuine and "real." As the title of this approach implies, authentic leadership is about the *authenticity* of leaders and their leadership. Unlike many of the theories that we have discussed in this book, authentic leadership is still in the formative phase of development. As a result, authentic leadership needs to be considered more tentatively: It is likely to change as new research about the theory is published. **Approaches to Authentic Leadership:** **Practical Approach:** **Bill George's Authentic Leadership Approach**	**10 Marks** **03 marks for listing and 07 marks for explanation**

PRINCIPAL
SIET., TUMAKURU.

	The authentic leadership approach developed by George (2003; George & Sims, 2007) focuses on the characteristics of authentic leaders. George describes, in a practical way, the essential qualities of authentic leadership and how individuals can develop these qualities if they want to become authentic leaders. Based on his experience as a corporate executive and through interviews with a diverse sample of 125 successful leaders: ✓ George found that authentic leaders have a genuine desire to serve others, ✓ they know themselves, and they feel free to lead from their core values ✓ Specifically, authentic leaders demonstrate five basic characteristics: **Theoretical Approach:** Although still in its initial stages of development, a theory of authentic leadership is emerging in social science literature In this section, we identify the basic components of authentic leadership and describe how these components are related to one another. Background to the Theoretical Approach. Although people's interest in "authenticity" is probably timeless, research on authentic leadership is rather recent. Luthans and Avolio (2003) published one of the first articles on the topic, focusing on authentic leadership development and positive organizational scholarship. Initial writing on authentic leadership gave rise to a leadership summit at the University of Nebraska. This summit was sponsored by the Gallup Leadership Institute, and focused on the nature of authentic leadership and its development. From the summit, two sets of publications emerged: (1) a special issue of The Leadership Quarterly in the summer of 2005, and (2) Monographs in Leadership and Management, titled	
3a.	**Ethnocentrism** As the word suggests, ethnocentrism is the tendency for individuals to place their own group (ethnic, racial, or cultural) at the center of their observations of others and the world. People tend to give priority and value to their own beliefs, attitudes, and values, over and above those of other groups. Ethnocentrism is the perception that one's own culture is better or more natural than the culture of others. It may include the failure to recognize the unique perspectives of others. Ethnocentrism is a universal tendency, and each of us is ethnocentric to some degree. **Prejudice** Closely related to ethnocentrism is prejudice. Prejudice is a largely fixed attitude, belief, or emotion held by an individual about another individual or group that is based on faulty or unsubstantiated data. It refers to judgments	**03 Marks**

	about others based on previous decisions or experiences.	
b.	**Key Concepts and Dynamics within the Psychodynamic Approach:** 1. **Focus on the inner theatre:** One of the core concepts of the psychodynamic paradigm is the "inner theatre" (McDougall, 1985). It is the stage filled with people who have influenced, for better or worse, our experiences in life. Early experiences with key individuals (such as early caregivers) contribute to the creation of response patterns that have a tendency to repeat themselves in other contexts, with different people. 2. **Focus on the Leader-Follower Relationships:** A study of leader-follower relationships necessarily addresses the psychology of groups. The psychiatrist Wilfred Bion (1959) identified three basic assumptions in groups—dependency, fight-flight, and pairing—that may result in pathological regressive processes, deflecting people from the principal tasks to be performed. 3. **Focus on the Shadow Side of Leadership:** ***Narcissism*** At the heart of leadership lies narcissism. Narcissism—which Freud (1914) summarized as behaviors that range from a normal self-interest to a pathological self-absorption—offers leaders the conviction about the righteousness of their cause, which in turn inspires loyalty and group identification. Narcissism can be either constructive or reactive. Constructive, or healthy narcissistshave been fortunate enough to have caretakers who provided a supportive environment that led to basic trust and to a sense of control over one's actions. In leadership roles, constructive narcissists tend to be relatively well balanced, have vitality and sense of self-esteem, capacity for introspection, and empathy. Reactive, or excessive narcissistic leaders, on the other hand, were not as fortunate in childhood. Instead, they were the recipients of over- or under-stimulation, or inconsistent stimulation. Typically, such leaders are fixated on issues of power, status, prestige, and superiority.	**07 marks** **02 marks for listing and 05 marks for explanation**

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA

Fourth Semester Internal Assessment Test-II, 30th July 2022

Time-1 ½ Hrs **20MBAHR403–International Human Resource Management** **Max. Marks: 50**

Answer all the questions.

1. a. Define Global Performance Management.	**03 Marks**
b. Explain the factors affecting Performance Management System..	**07 Marks**
c. Explain Performance Management for expatriates.	**10 Marks**
2. a. Define international compensation.	**03 Marks**
b. Explain different varieties of host country environments.	**07 Marks**
c. Describe approaches to international compensation.	**10 Marks**
3. a. Explain Performance Management System of any 3 countries.	**10 Marks**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA

Scheme of Evaluation – II Internals

IV sem20MBAHR403 :International Human Resource Management Max.Marks:50

Q.No	Question and Answers	Marks
1a	In global terms, performance management can be described as a process which allows an international company or multinational enterprise (MNE) to evaluate and constantly improve individual and corporate performance in relation to pre-set goals and targets.	
b.	**Constraints in goal attainment** 1. **Unsatisfactory performance improvement:** 2. **Incorrect decisions being made:** 3. **Legal compliance not being met**: 4. **Inadequate job satisfaction:** 5. **Increased turnover of employees:** 6. **In consistency between organizational strategy and behaviour:** 7. **Inconsistency between organizational strategy and performance appraisal:**	
c	Planning Monitoring Rating Developing Rewarding	
2a	A universally accepted & fair compensation program requires an in-depth knowledge about the employment & taxation laws ,social security systems ,customs & cost of living indices of the host countries.	
b	 Varieties of Host Country Environment Whilst the internal employment contract is a social institution shaped both by legal and customs the external labour market can be marked by so many different factors: ➢ *Price of labour (wages)* ➢ *Non-wage labour costs* ➢ *Competition* ➢ *Local laws* ➢ *Social/cultural factors*	
c	**Going Rate Approach** • Expatriate paid according to the standards in the host country. • This prevents the situation where junior staff is paid substantially higher salaries than the expatriates ,who are compensated in conformity with the standards of income in his parent country • Employees would not like the prospect of being assigned to a less prosperous country under this system ,as it will result in profoundly lower salaries.	

PRINCIPAL
SIET., TUMAKURU.

	- Thus it is used for assignments to countries with clearly higher compensation levels. **The Balance Sheet Approach or Home Net System** - The main objective behind this system is to provide the same net sum of salary in both, home & host countries. - In this context "net" does not mean net salary after taxes & social security contributions . - It means the freely disposable income. - The idea is that spending power must be identical in both the countries. - Consequently allowances will be adjusted for cost of living ,housing. - The original gross income in the country is reduces step by step, by all premiums& costs. - The premium & costs should be carefully considered before inclusion in comparison.	
3a	U.S. A The objective of performance appraisal is to evaluate pre-established goals, which have been agreed upon by the appraiser and appraisee • The employee is expected to take accountability and responsibility for achieving those goals • Given the situational factors, the employees' performance is evaluated on the basis of the goals • The performance appraisal is formal and regularly conducted, usually once or twice in a year. Russia The objective of appraisal can be both evaluating the performance and individual personality factors • It is a formal process • The performance targets are set against the organizational or department performance target or by the individual appraiser • Some companies encourage the reciprocal process of performance review i.e.,	

	• Appraisal takes place once a year **Japan** The objective of the performance review is to ensure that the employee is effectively functioning in a group • It is a semi-formal process and the manager is expected to act as a senior family member • Performance review can be frequent and informal, depending on the nature of requirement (for example, counseling) • Individual performance is measured by the contribution to the group performance. Semi-annual bonus is a form of reward, which an employee may get on the basis of his/her performance • Feedback about an individual employee is sent to the personnel department on a continuous basis and based on that, the bonus and increase in salary is calculated.	

PRINCIPAL
SIET., TUMAKURU

Department of MBA

Scheme of Evaluation – II Internals

IV Sem 20MBAHR402 : Personal Growth and Interpersonal Effectiveness Max.Marks:50

Q.No	*Question and Answers*	*Marks*
1 a.	• Define Emotional Intellegence. It is the ability to understand & manage one's own moods and emotions & the moods and emotions of other people. It helps managers carry out their interpersonal roles of figurehead, leader & liaison	3 marks
b.	Explain J.P Guilford's Structure of Intellect Theory. • Spearman emphasised a single ability in his theory. Joy .p. Guilford proposed as many as 120 factors. In the structure of intelligent(SOI) model. • Intelligent is understood as a cube that represents the intersection of 3 distinct dimensions like Operations, contents, and Products. He became interested in the dissimilarities of children's abilities in different areas. He believed there were many relatively independent mental abilities factors. • According to Guilford. a) **Operations :** are mental process that comes in 6 ways • **Cognition:** It is the ability to understand, comprehend, discover, and become aware of the information gathered. • **Memory recording:** It is the ability to memorize information. • **Memory retention:** It is the ability to recollect information. • **Evaluation:** It is the ability to know if the information is accurate and valid or not. • **Divergent production:** It is the ability to come up with several solutions to a problem. • **Convergent production:** It is the ability to end up with a single solution to a problem.	7marks Listing: 2m Explana tion" 5m
C	Explain the tools/methods and uses of NLP. • 1. IMAGERY TRAINING Imagery training, sometimes called mental rehearsal, is one of the classic neuro-linguistic programming techniques based on visualization. It's an excellent exercise for beginners because it's straightforward and linear. The key is to create a highly detailed scene of yourself performing an action successfully – whether that action is nailing a presentation or perfecting your golf putt. • 2. NLP SWISH When you're ready for more advanced NLP techniques, use the NLP swish. First, create a vivid picture in your mind of something you *don't* want. Make it big and bright. Then create a vivid picture of what you want to replace it with, making it small and dull. Now reverse them: Bring the image of what you want into the foreground, making it brighter and brighter. • 3. MODELING Modeling is one of the NLP training techniques that has gained the most attention from successful entrepreneurs, athletes and more. It's based on the law of attraction – the idea that, as Tony says, "Whatever you consistently think about and focus upon you move toward." • 4. MIRRORING	Listing 3m Explana tion 7m

PRINCIPAL
SIET., TUMAKURU

	Mirroring is an NLP technique that leverages body language to make instant connections and build rapport with anyone. When you're talking to someone, mirror your body language to theirs. If they are high energy, match that energy level. If their body language is relaxed, reflect that. • 5. INCANTATIONS Incantations are a more powerful version of affirmations, which are one of the more mainstream neuro-linguistic programming techniques. An affirmation is a phrase you repeat to yourself about your beliefs and goals.	
2 a	What is social adjustments Social Adjustment means the success with which people adjust to her people in general and to the group with which people adjust to other people in genera and to the group with which they are identified in particular.	3 marks
B	Explain 6 thinking hat to creavity. **Blue Hat: "the Conductor's Hat"** When you or your team are in blue hat mode, you focus on controlling your thinking and managing the decision-making process. You have an agenda, ask for summaries, and reach conclusions. **Green Hat: "the Creative Hat"** The green hat represents creative thinking. When you're "wearing" this hat, you explore a range of ideas and possible ways forward. **Red Hat: "the Hat for the Heart"** This hat represents feelings and instincts. When you're engaged in this type of thinking, you can express your feelings without having to justify them logically. • Yellow Hat: "the Optimist's Hat" With yellow hat thinking, you look at issues in the most positive light possible. You accentuate the benefits and the added value that could come from your ideas. Black Hat: "the Judge's Hat" This hat is about being cautious and assessing risks. You employ critical judgment and explain exactly why you have concerns.White Hat: "the Factual Hat"	7marks Listing: 2m Explanation" 5m
C	What is locus of control? Explain its type. It refers to the extent to which individuals believe that they can control events that affect them A person's locus is derived from Latin word that means place or location is conceptualised as either internal or external. **Types of Locus of Control** **Internal Locus of control** **External Locus of control** 1The person believes they can control their life. Individuals with a high locus of control believe that events in their life derive primarily from their own actions. These individuals attribute outcomes of their actions are results of their own control. They believe that the outcomes of their actions are results of their own abilities, their hard work would lead them to obtain positive outcomes. They exhibit 2 essential characteristics – high achievement motivation & low outer directedness. 2.Individual believe that their decisions and life are controlled by environmental factors that they cannot influence. People with an external LOC would tend to praise or blame an external factor such as the teacher or the test. People that have external LOC believe that many things that happen in their lives are out of their control. They tend to blame others for the outcomes rather than themselves.	Listing 3m Explanation 7m
3a	You are given occupational choices for each occupation. Identify the personality types i) Designers INTJ vi) Editors INTJ ii) Aeronautical Engineers ENPJ vii) Repoters ENPJ iii) Actors ISTP viii) Writers ISTJ iv) Company Executive ISTJ ix) Dectectives ENTP v) Doctors ENTP x) Suoervisor INTJ	3 marks

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

SHRIDEVI
EDUCATION

Department of MBA

Fourth Semester Internal Assessment Test-III, August 2022

20MBAHRM402 Personal Growth and Interpersonal Effectiveness

Time-1 ½ Hrs **Max. Marks: 50**

Answer all the questions.

1.	a. What is organizational commitment?	**03 Marks**
	b. What are the sources of conflicts? Explain the process of conflict.	**07 Marks**
	c. Discuss the importance of T- group and sensitivity training in.	**10 Marks**
2.	a. What do you mean by interpersonal needs?	**03 Marks**
	b. Explain different life positions.	**07 Marks**
	c. Define different learning styles. How does it help in personality development.	**10 Marks**
3.	a. Explain the FIRO- B scale in detail with examples	**10 Marks**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA

Scheme of Evaluation – III Internals

IV Sem 20MBAHR402 : Personal Growth and Interpersonal Effectiveness Max.Marks:50

Q.No	*Question and Answers*	*Marks*
1 a.	What is organisational commitment Organizational commitment describes how much team members care about their place of work. High levels of commitment can increase workplace productivity, bolster team morale and enhance a company's ability to reach its objectives.	3 marks
b.	What are the source of conflict? Explain the processs of conflict. Conflict has many causes, including **organizational structures, limitations on resources, task interdependence, goal incompatibility, personality differences, and communication challenges**. Conflict Process • Stage 1: Potential Opposition or Incompatibility: Presence of conditions that create opportunities for conflict to arise. • Stage 2: Cognition &personalization: Perceived by parties whether conflict exists is a perception issues • Stage 3 : Intentions: Decisions to act in a given way, general guidelines for parties in a conflict situation • Stage 4 : Behaviour : Conflict becomes visible includes statement, actions & reactions needs • Stage 5: Outcomes: Action reaction results in consequences	7marks Listing: 2m Explanation" 5m
c	Each group has its own goal and progress speed. The members who are attending the group will all benefit from self expression and interaction with others. The goal of T-group is to initiate social interaction, individuality and confidence in expression. The leader does not decide upon the topic of conversation. Since the members choose what is going to be talked about they will participate more and express feelings that pertain to the therapy matter. As sessions go on each member of the group will gain self awareness. They will learn from the other members who also express their feelings toward the subject matter. If controversy is present within the group this will only increase the social interaction and allow members to gain more self awareness. Sensitivity training helps employees to be more sensitive and accepting of the existing diversity in the workplace. It enhances understanding between members of the organization and enables building good interpersonal relationships with other team members. Sensitivity training educates members about constructive behavior which will benefit everybody working in the organization through developing acceptable and correct behavioral and emotional actions.	
2a	The three basic interpersonal needs are **inclusion, control and affection**. Inclusion refers to people's need to be recognized as participants in human interaction. If a feeling of inclusion is a baseline condition for healthy human	

PRINCIPAL
SIET, TUMAKURU

	existence, then the need to make a difference through control is the next logical level.	
b	classification of life positions, Berne introduced the concept of being "OK", which consisted of being fair with oneself and others, as well as seeing oneself and others as having equal rights.[1] According to Berne, the subjects of all positions focus on "I" versus "Others" and their predicates focus on being "OK" versus "not OK." Thus, the basic predicates are: 1. I am OK 2. I am not OK 3. You are OK 4. You are not OK These predicates then form the four possible life positions:[1] 1. I am OK, you are OK (I+ U+) 2. I am OK, you are not OK (I+ U-) 3. I am not OK, you are OK (I- U+) 4. I am not OK, you are not OK (I- U-)	
c	The 7 Learning styles are: • visual • kinaesthetic • aural • social • solitary • verbal • logical In other words, attempting to put learners into boxes and trying to only give them material that matches their "style" isn't going to make them retain information any better. Most people benefit from a range of teaching techniques, and utilising different learning methods can actually improve learners' adaptability.	
3a	**The FIRO (Fundamental Interpersonal Relations Orientation) instrument helps repair broken relationships and takes good, functional relationships to a higher level. It is the key that unlocks the potential in workplace interactions.** FIRO's accessible and universally applicable framework reveals how individuals can shape and adapt their individual behaviours, influence others effectively and build trust among colleagues. It is an excellent resource for coaching individuals and teams about the underlying drivers behind their interactions with others. Relationships are important. They are an inevitable part of life, and yet can be a potential source of tension in organisations. In the workplace, performance, delivery and efficiency are required, often from a team of mere acquaintances. To achieve high performance, teams need to operate on trust and a solid foundation of good working relationships. The FIRO instrument targets this need, identifying the drivers underlying the behaviours that shape relationships for individuals and teams within an organisation.	

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution

Department of MBA

Fourth Semester Internal Assessment Test-III, August 2022

Time-1 ½ Hrs 20MBAHR403–International Human Resource Management Max. Marks: 50

Answer all the questions.

1. a. What is de-regulation in a global context. **03 Marks**
   b. Explain why there is a changing Context of Global Employment relations. **07 Marks**
   c. Explain how MNC's manage cross border integration. **10 Marks**

2. a. What do you mean by work-life balance. **03 Marks**
   b. Explain 7 steps in effective diversity management host country environments. **07 Marks**
   c. Explain Globe's Nine Cultural Dimensions. **10 Marks**

3. a. Explain the problems in de-regulation. **10 Marks**

An Internship provides Real Life Experience and Exposure. Enables to gain first-hand exposure of working in the real world. Real working environment that was very much different from course of study.

Internship useful because

a. Application of Education and Career Exploration.
b. Gain experience and increase Marketability
c. Networking
d. National Data
e. Method of data collection
f. Lear about Organization Environment
g. Professionalism
h. Learn how a Professional Workplace Operates
i. Build our Resume

Department of MBA

Scheme of Evaluation – III Internals

IV sem20MBAHR403 :International Human Resource Management Max.Marks:50

Q.No	Question and Answers	Marks
1a	• Failure to win the argument for complete de-regulation: current modes of thinking favour some de-regulation of HRM practices within MNCs by establishing codes of practice and ethical agendas in the light of a greater interest in worker rights and CSR • 'Shift' in thinking towards a new form of soft regulation developed by a new set of political actors and social movements	
b	**Standardisation and labour market knowledge** • MNCs continue to develop towards the potential of global systems of employment. At the same time, migration continues to be a vital part of international labour markets and at virtually all skills and educational levels. This prompts the need to create structures and frameworks that assist in sharing the content of work and the skills of workers. Creates greater coordination on aspects of labour management and IHRM • These systems are complemented by international networks in specific sectors with a high level of inter-state activity ◆ In the airlines industry, international regulatory agencies collaborate to influence approaches in safety-related problems and assist in the pooling of knowledge and practice in IHRM **Labour standards and codes of practice** • Increasing interest in labour standards and the behaviour of employers from a range of bodies concerned with issues of malpractice, corruption and 'bad' employment practices. International dialogue on employment and HRM between governments.	
c	The term "cross-border integration" has multiple definitions, particularly in the context of studies on European integration (Anderson and Wever 2003; De Boe, Grasland and Healy 1999; Hansen and Serin 2007; Sohn, Reitel and Walther 2009). For cross-border regions, the integration process is fundamentally based on the existence of interactions between areas separated by an international boundary. These interactions are not limited to the economic sphere, but also concern other flows or transactions (migration, political relations, cultural exchanges, etc). The existence of interactions across a border does not necessarily mean that the territories converge. Some relationships can be highly asymmetric and can be fed by strong differentials. It is therefore necessary to complete an analysis of interactions taking into account the possible convergence of the territories concerned. The need or the desire of actors to cooperate is also to be taken into consideration, as cross-border relations are not necessarily based on shared motivations. As a consequence, cross-border integration is considered in this study as a process of convergence between separate territories resulting from the intensification of the interaction between actors located in different geographical units. This definition allows us to consider the two main dimensions of cross-border integration: first, this process refers to the existence of interactions between territories and is based on flow analysis and barrier effects; second, cross-border integration also refers to the convergence of territorial characteristics and is based on an analysis of homogeneity and discontinuities.	

PRINCIPAL
SIET., TUMAKURU

2a	Work-life balance is the state of equilibrium where a person equally prioritizes the demands of one's career and the demands of one's personal life. Some of the common reasons that lead to a poor work-life balance include:	
b	1. Effective Communication. 2. Equality 3. Encourage Diverse Teams 4. Maintain Transparent Policies 5. Sensitivity Training 6. Leadership 7. Hiring	
c	**1. Assertiveness:** The degree to which individuals are courageous forceful, dominant, confrontational, or demanding in relationships with others. **2. Collectivism–group:** The degree to which individuals express and show pride, loyalty, and cohesiveness to their organizations or families. **3. Collectivism–societal:** The degree to which organizational and societal institutional (such as government) practices encourage and reward collective (joint) distribution of resources (such as under socialism) and collective action. **4. Future orientation:** The degree to which a society encourages and rewards behaviors such as planning, investing in the future, and delaying gratification. **5. Gender egalitarianism:** The degree to which a society minimizes differential treatment between men and women, such as through equal opportunity based on ability and performance. **6. Humane orientation:** The degree to which a society or organization encourages and rewards individuals for being fair, altruistic, generous, caring, and kind to others. **7. Performance orientation:** The degree to which a society encourages and rewards group members for performance improvement, excellence, high standards, and innovation. **8. Power distance:** The degree to which members of a society accept and endorse the equal (lower power distance) or unequal (higher power distance) distribution of authority, control, and status privileges (such as a class structure). **9. Uncertainty avoidance:** The degree to which a society, organization, or group relies on social norms, formal rules, and formal procedures to alleviate the unpredictability of future events.	
3a	Disadvantages of deregulation Critics argue that excessive deregulation has adverse effects, such as: Control of the economy by a few people A decrease in product quality Increase the systemic risk of the financial system Increase the cost of negative externalities Essential services to be exclusive	

PRINCIPAL
SIET, TUMAKURU

SHRIDEVI
EDUCATION

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA
IV Semester Internal Assessment Test– 1, June 2022
20MBAHR403 International Human Resource Management

Time- 1 1/2 Hrs

Max. Marks: 50

Answer all the following Questions:

1.a) Define IHRM.	03 Marks
b) Are IHRM models applicable to other contexts? Explain.	07 Marks
c) Name the 4 approaches to IHRM. Elucidate the reviews on the approaches.	10 Marks
2.a) Distinguish between Tacit and Explicit knowledge	03 Marks
b) Explain Knowledge Retention Strategies	07 Marks
c) Explain the different types of expatriate training.	10 Marks
3. a) Explain how technology is used in training and development.	05 Marks
b) Write a short note on importance of context.	05 Marks

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA

Scheme of Evaluation – I Internals

IV sem20MBAHR403 :International Human Resource Management Max.Marks:50

Q.No	Question and Answers	Marks
1 a.	The process of procuring, allocating, motivating, training & development, and compensating and utilizing human resources in international business is called international human resource management.	3 marks
b.	Models of IHRM **MATCHING MODEL** • Highlights the resource aspect of HRM . • It emphasises the efficient utilisation of human resources to meet organizational objectives . • It also emphasises a "right fit" b/w organizational strategy ,organizational structure & HRM systems. **HARVARD MODEL** • It Stresses the "human", soft, aspect of HRM. • It is more concerned with the employer-employee relationship . • It highlights the interests of different stakeholders in the organization. **CONTEXUAL MODEL** • It is based on the premise that organizations may follow a number of different pathways in order to achieve the same results. • This is mainly because of the existence of a number of linkages b/w external environmental context(. • These linkages contribute directly to forming the content off an organization's HRM **EUROPEAN MODEL** • According to Brewster---- It is based on the argument that European organization are constrained at both international European union)& national level by national culture & legislation. • They are also constrained at the organizational level by patterns of ownership & at the HRmlevel by trade union involvement & consultative arrangements .	7marks Listing 2m Explanation 5m
C	Essentially four approaches **Ethnocentric Approach** All important positions in MNCs are filled up by PCNs in the early stages of internationalizing – This approach is also adopted for certainbusiness-related reasons • A perception that qualified HCNs may not be available for the units **• Polycentric Approach** PCNs occupy positions at HQs, the HCNs are recruited to manage the subsidiary units in foreign locations • Employing HCNs eliminate language problems for the expatriates and their family members, reduces cost on costly awareness training programs, and takes care of the adjustment problems to a large extent. **Geocentric Approach** – Regardless of nationalities, the best talents are recruited by the MNCs for key jobs throughout the organization • Overcoming the "federation" drawback of polycentric approach • Building a truly dynamic and international team of executives	Listing 3m Explanation 7m

PRINCIPAL
SIET., TUMAKURU.

	Regiocentric Approach – Also referred to as "'more than one countryapproach" – A regional approach which relies on the region specific This approach helps in building communication network between managers from various subsidiaries in that region and the executives who have been transferred from the firm's parent country HQ	
2 a	Distinguish between Tacit & explicit knowledge. • **Tacit Knowledge** 1. It is person specific. 2. It consists of personal experiences, skills,& attitudes 3. It is hard to formalize or communicate to others. 4. It is transferred to others through some measure of personnel interaction • **Explicit knowledge** 1. It is independent of person. 2. It is easily communicated. 3. It is shared in the form of hard data ,formulae& principles.	
B	**Knowledge Retention Strategy** Understanding your risk factor **Classifying your knowledge** **Understanding which knowledge** **Understanding the pillars of knowledge retention** **Understanding the success factors**	7marks Listing 2m Explanation 5m
C	Explain the types of Expatriate Training • Expatriates may be Parent Country Nationals(PCN"S) or THIRD COUNTRY NATIONALS(TCN"S)or HOME COUNTRY MNATIONALS (HCN"S). • Training Programmes given to PCN's & TCN's : • Cultural Awareness Programme or Cross Cultural Training. • Language Training. • Diversity Training.	
3a	**eLearning services** **Webinars and video training sessions** Mobile Learning Social Learning Simulation-Based Scenarios in Training	
B	**The importance of context** • Context Context in the general business literature is often captured by the notion of contingency, refers to the differences in management processes created by the size of the business, the sector(s) in which it operates and the situation in which it is embedded. It is the last of these, particularly geographic context, that is by definition a key issue in the CHRM stream. CHRM are based around the impact of cultural or institutional differences between nations. Culturalists argue that there are deep-rooted differences in values and beliefs between and these are inevitably reflected in the way people are managed at work, e.g. in terms of leadership or career management. Institutionalists on the other hand believe that it is the structures and mechanisms of social order that support and constrain the behaviour of businesses. Synthesising and developing these ideas, the comparative capitalisms literature suggest that the elements of the system external to the business tend to be reflected in internal relationships – or HRM.	7marks Listing 2m Explanation 5m

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA
IV Semester Internal Assessment Test I – 24th June 2022
20MBAHR401: ORGANISATIONAL LEADERSHIP

Duration: 1½ Hrs **Max. Marks: 50**

Answer the following questions.

1. a. Distinguish between Trait and Process Leadership. **(03 Marks)**
   b. Discuss the relationship between the following :
      i. Leadership and Coercion
      ii. Leadership and management. **(07 Marks)**
   c. Explain in detail the major leadership traits according to trait approach and Illustrate its strengths and weakness. **(10 Marks)**
2. a. Define Emotional Intelligence. **(03 Marks)**
   b. Discuss in brief the Technical, Human and Conceptual Skills of a leader. **(07 Marks)**
   c. Explain in detail the Skills Model of Skills Approach . **(10 Marks)**
3. a. Discuss the findings of The Ohio State studies. **(03 Marks)**
   b. Explain in detail Blake and Mouton's managerial Grid of behavioral approach and state its application . **(07 Marks)**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA
IV Semester Internal Assessment Test I – 24th June 2022
20MBAHR401: ORGANISATIONAL LEADERSHIP

Duration: 1½ Hrs **Max. Marks: 50**

Answer the following questions.

1. a. Distinguish between Trait and Process leadership. **(03 Marks)**
   b. Discuss the relationship between the following :
      i. Leadership and Coercion
      ii. Leadership and management. **(07 Marks)**
   c. Explain in detail the major leadership traits according to trait approach and Illustrate its strengths and weakness. **(10 Marks)**
2. a. Define Emotional Intelligence. **(03 Marks)**
   b. Discuss in brief the Technical, Human and Conceptual Skills of a leader. **(07 Marks)**
   c. Explain in detail the Skills Model of Skills Approach **(10 Marks)**
3. a. Discuss the findings of The Ohio State studies. **(03 Marks)**
   b. Explain in detail Blake and Mouton's managerial Grid of behavioral approach and state its application. **(07 Marks)**

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA

Scheme of Evaluation – Internal Assessment I

Subject : ORGANISATIONAL LEADERSHIP	**Code: 20MBAHR401**
Max marks: 50	**No Choice**

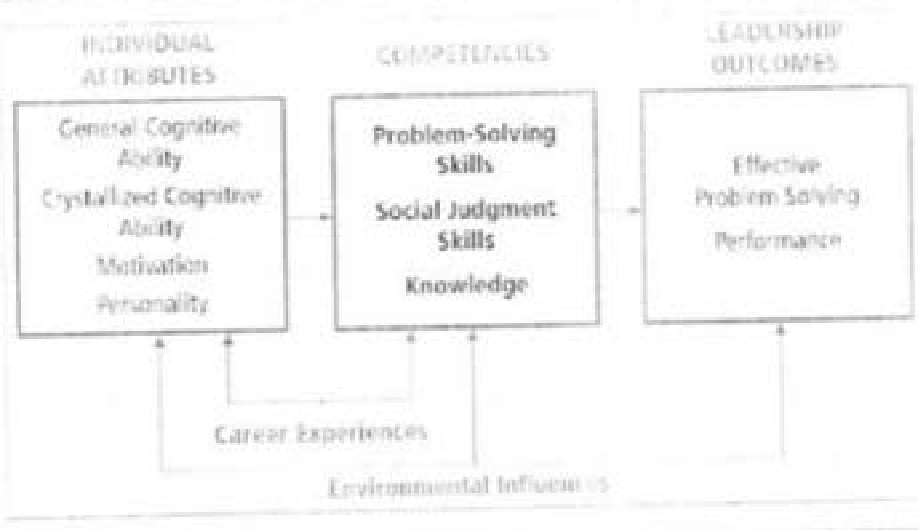
Sl. No	Answer Script	Marks 50
1.a	**Trait Theory**: The trait theory of leadership suggests that certain inborn or innate qualities and characteristics make someone a leader. These qualities might be personality factors, physical factors, intelligence factors, and so on. **Process leadership**: In contrast, 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.	03 Marks
b.	**Leadership and Coercion:** 1. Coercive power is one of the specific kinds of power available to leaders. Coercion involves the use of force to effect change. 2. To coerce means to influence others to do something against their will and may include manipulating penalties and rewards in their work environment. Coercion often involves the use of threats, punishment, and negative reward schedules and is most often seen as a characteristic of the dark side of leadership. 3. It is important to distinguish between coercion and leadership because it allows us to separate out from our examples of leadership the behaviors of individuals such as Hitler 4. Leaders who use coercion are interested in their own goals and seldom are interested in the wants and needs of followers. Using coercion runs counter to working with followers to achieve a common goal. **Leadership and Management:** 1. Leadership is a process that is similar to management in many ways. Leadership involves influence, as does management. Leadership entails working with people, which management entails as well. Leadership is concerned with effective goal accomplishment, and so is management. 2. But leadership is also different from management. Whereas the study of leadership can be traced back to Aristotle, management emerged around the turn of the 20th century with the advent of our industrialized society. Management was created as a way to reduce chaos in organizations, to	07 marks 02 Marks for listing and 05 Marks for explanation

PRINCIPAL
SIET., TUMAKURU.

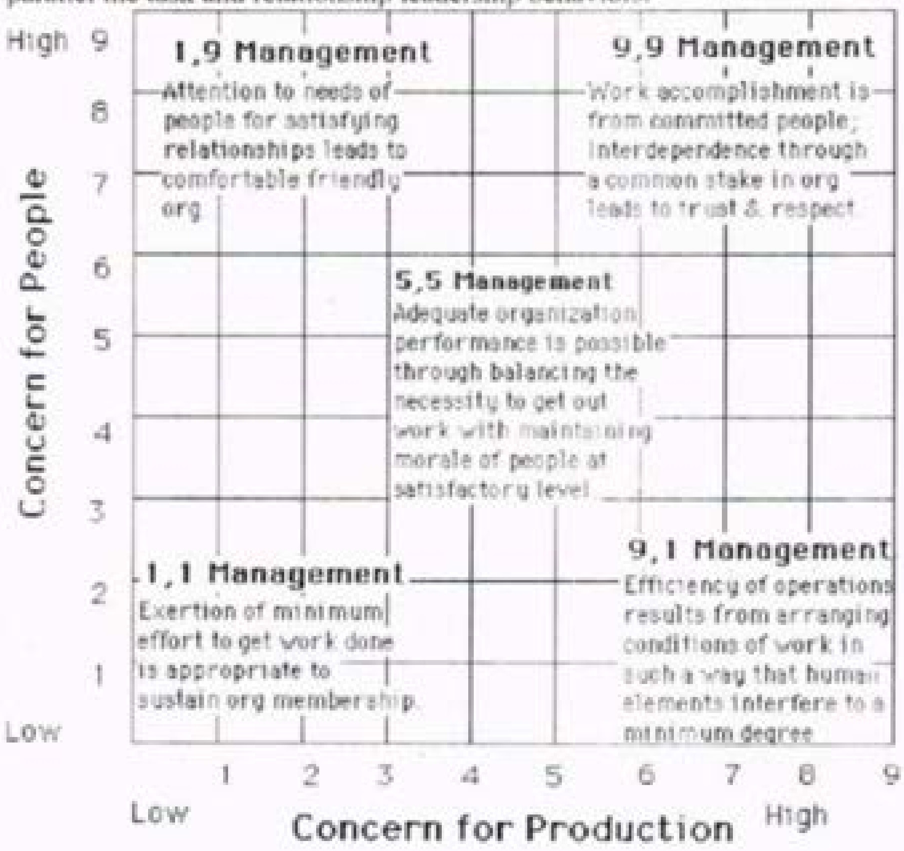
	make them run more effectively and efficiently. The primary functions of management, as first identified by Fayol (1916), were planning, organizing, staffing, and controlling. These functions are still representative of the field of management today.	
c.	The major leadership traits according to trait approach are: 1. **Intelligence**: Intelligence or intellectual ability is positively related to leadership. Based on their analysis of a series of recent studies on intelligence and various indices of leadership. Having strong verbal ability, perceptual ability, and reasoning appears to make one a better leader. 2. **Self-Confidence**: Self-confidence is another trait that helps one to be a leader. Self-confidence is the ability to be certain about one's competencies and skills. It includes a sense of self-esteem and self-assurance and the belief that one can make a difference. Leadership involves influencing others, and self-confidence allows the leader to feel assured that his or her attempts to influence others are appropriate and right. 3. **Determination**: Many leaders also exhibit determination. Determination is the desire to get the job done and includes characteristics such as initiative, persistence, dominance, and drive. People with determination are willing to assert themselves, are proactive, and have the capacity to persevere in the face of obstacles. Being determined includes showing dominance at times and in situations where followers need to be directed. 4. **Integrity**:, another of the important leadership traits, is the quality of honesty and trustworthiness. People who adhere to a strong set of principles and take responsibility for their actions are exhibiting integrity. Leaders with integrity inspire confidence in others because they can be trusted to do what they say they are going to do. They are loyal, dependable, and not deceptive. Basically, integrity makes a leader believable and worthy of our trust. 5. **Sociability**: A final trait that is important for leaders is sociability. Sociability is a leader's inclination to seek out pleasant social relationships. Leaders who show sociability are friendly, outgoing, courteous, tactful, and diplomatic. They are sensitive to others' needs and show concern for their well-being. Social leaders have good interpersonal skills and create cooperative relationships with their followers.	**10 Marks** **03 Marks for listing and 07 marks for explanation**
2.a	**Emotional Intelligence**: As the two words suggest, emotional intelligence has to do with our emotions (affective domain) and thinking (cognitive domain), and the interplay between the two. Whereas intelligence is concerned with our ability to learn information and apply it to life tasks, emotional intelligence is concerned with our ability to understand emotions and apply this understanding to life's tasks. Specifically, emotional intelligence can be defined as the ability to perceive and express emotions, to use emotions to facilitate thinking, to	**03 Marks**

	understand and reason with emotions, and to effectively manage emotions within oneself and in relationships with others	
b.	According to the Three-Skill Approach, a leader should have the following skills: 1. **Technical skills**:Technical skills are knowledge about and proficiency in a specific type of work or activity. They include competencies in a specialized area, analytical ability, and the ability to use appropriate tools and techniques (Katz, 1955). For example, in a computer software company, technical skills might include knowing software language and programming, the company's software products, and how to make these products function for clients. Similarly, in an accounting firm, technical skills might include understanding and having the ability to apply generally accepted accounting principles to a client's audit. 2. **Human Skills**: Human skills are knowledge about and ability to work with people. They are quite different from technical skills, which have to do with working with things. Human skills are "people skills." They are the abilities that help a leader to work effectively with followers, peers, and superiors to accomplish the organization's goals. Human skills allow a leader to assist group members in working cooperatively as a group to achieve common goals. For Katz, it means being aware of one's own perspective on issues and, at the same time, being aware of the perspective of others. Leaders with human skills adapt their own ideas to those of others. 3. **Conceptual Skills**: Broadly speaking, conceptual skills are the ability to work with ideas and concepts. Whereas technical skills deal with things and human skills deal with people, conceptual skills involve the ability to work with ideas. A leader with conceptual skills is comfortable talking about the ideas that shape an organization and the intricacies involved. He or she is good at putting the company's goals into words and can understand and express the economic principles that affect the company. A leader with conceptual skills works easily with abstractions and hypothetical notions.	**07 Marks 02 marks for listing and 04 marks for explanation**
c.	Skills Model Beginning in the early 1990s, a group of researchers, with funding from the U.S. Army and Department of Defense, set out to test and develop a comprehensive theory of leadership based on problem-solving skills in organizations. The studies were conducted over a number of years using a sample of more than 1,800 Army officers, representing six grade levels, from second lieutenant to colonel. The project used a variety of new measures and tools to assess the skills of these officers, their experiences, and the situations in which they worked. The researchers' main goal was to explain the underlying elements of effective performance. They addressed questions such as these: What accounts for why some leaders are good problem solvers and others are not? What specific skills do high-performing leaders exhibit? How do leaders' individual characteristics, career experiences, and environmental	**10 Marks** **03 marks for listing and 07 marks for explanation**

PRINCIPAL
SIET., TUMAKURU.

	influences affect their job performance? As a whole, researchers wanted to identify the leadership factors that create exemplary job performance in an actual organization. Figure 3.3 Skills Model of Leadership 	
3a.	**The Ohio State Studies:** A group of researchers at Ohio State believed that the results of studying leadership as a personality trait seemed fruitless and decided to analyze how individuals acted when they were leading a group or an organization. This analysis was conducted by having followers complete questionnaires about their leaders. On the questionnaires, followers had to identify the number of times their leaders engaged in certain types of behaviors. Researchers found that followers' responses on the questionnaire clustered around two general types of leader behaviors: **initiating structure and consideration**. Initiating structure behaviors are essentially task behaviors, including such acts as organizing work, giving structure to the work context, defining role responsibilities, and scheduling work activities. Consideration behaviors are essentially relationship behaviors and include building camaraderie, respect, trust, and liking between leaders and followers.	**03 Marks**
b.	**Blake and Mouton's Managerial (Leadership) Grid:** Perhaps the best known model of managerial behavior is the Managerial Grid, which first appeared in the early 1960s and has been refined and revised several times (Blake & McCanse, 1991; Blake & Mouton, 1964, 1978, 1985). It is a model that has been used extensively in organizational training and development. The Managerial Grid, which has been renamed the Leadership Grid, was designed to explain how leaders help organizations to reach their purposes through two factors: concern for production and concern for people. Although these factors are described as leadership orientations in the model, they closely	**07 marks** **02 marks for listing and 05 marks for explanation**

parallel the task and relationship leadership behaviors.



Concern for production refers to how a leader is concerned with achieving organizational tasks. It involves a wide range of activities, including attention to policy decisions, new product development, process issues, workload, and sales volume, to name a few.

Concern for people refers to how a leader attends to the people in the organization who are trying to achieve its goals. This concern includes building organizational commitment and trust, promoting the personal worth of followers, providing good working conditions, maintaining a fair salary structure, and promoting good social relations

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA

Second Semester Preparatory Examination, September 2022

20MBA26: Entrepreneurship and Legal Aspect 24/09/22

Duration: 3 hrs. **Max. Marks: 100**

Answer any Four Questions from 1 to 7, Question No. 8 is compulsory

1. a.Who is an Entrepreneur and Define entrepreneurship? **(3 Marks)**
b. What is BusinessPlan? What are the advantages of the Business Plan **(7 Marks)**
c.Explain the Ethical and social responsibility and challenges faced by an entrepreneur. **(10 Marks)**

2. a. Differentiate between strike and lockout. **(3 Marks)**
b. Explain the latest industrial policy by Government of India. **(7 Marks)**
c. Formulate a model project report for starting a new venture of your choice. **(10 Marks)**

3. aList out the types of business model. **(3 Marks)**
b.Explain the steps in innovation process. **(7 Marks)**
c. Write a note on: SIDBI, NABARD. **(10 Marks)**

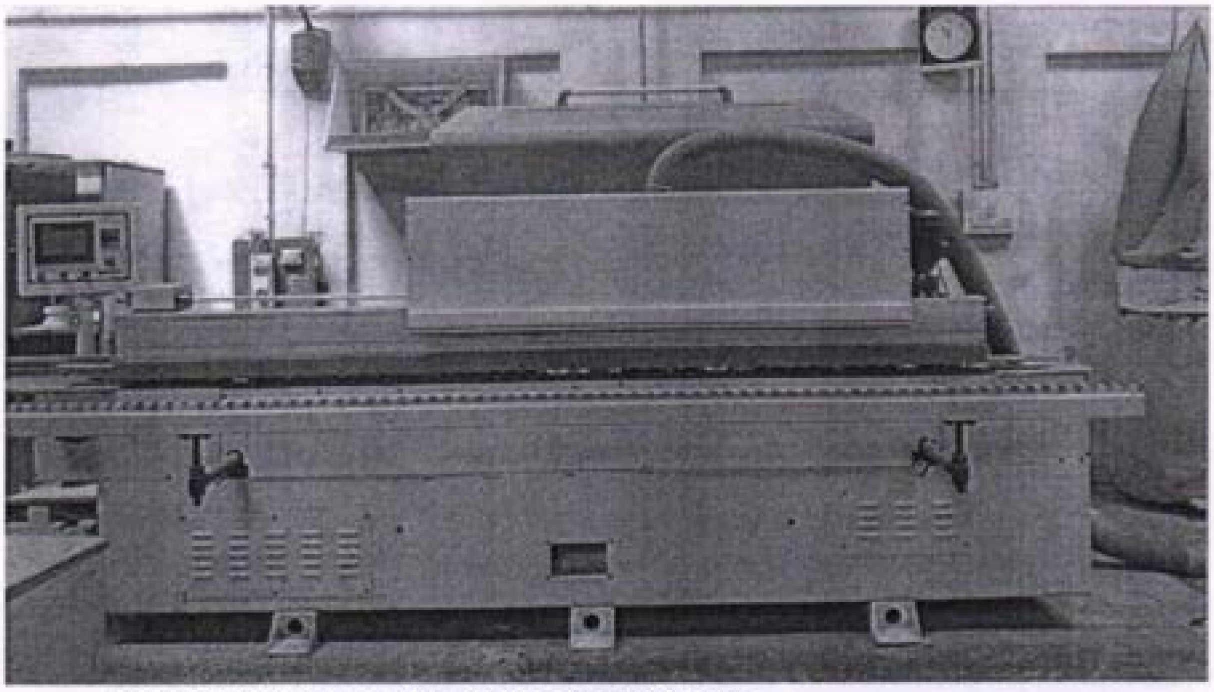
4. a.What is a Single window? **(3 Marks)**
b.Discuss how Marketing Research is carried out for the New Venture. **(7 Marks)**
c.Explain the types of industry analysis **(10 Marks)**

5. a.What is a Copyright and a Trademark? **(3 Marks)**
b. Explain the Forms of business organization. **(7 Marks)**
c. Explain in detail the machinery for the settlement of industrial disputes. **(10 Marks)**

6. a.What do you mean by standing order? **(3 Marks)**
b.Discuss the process of incorporation(registration) of a company. **(7 Marks)**
c. Briefly explain entrepreneurial process. **(10 Marks)**

7. a.Define creativity and innovation **(3 Marks)**
b. Explain the provisions of Factories Act, 1948 in protecting the health and safety of workers. **(7 Marks)**
c. Explain the internal and external sources of (funds)finance for starting the enterprise? **(10 Marks**

PRINCIPAL
SIET., TUMAKURU



HOLY TECH EDGE BLEADING MECHINE

For this process they will using. Gum , Pallet strapping, or banding is the process of using a metal or plastic strap to unitize, palletize or bundle products together. Strapping is used in a variety of industries from shipping large industrial equipment and lumber to reinforcing cases in e-commerce fulfilment centres.

The machine will be heated 175° heating for edge bleding they will hot melt glue Most edge banding is applied with hot melt glue. The two main choices for hot melt glues are EVA (Ethylene Vinyl Acetate) and PUR (Polyurethane).

8. Case Study (Compulsory) **(5*4=20 Marks)**

Read the following case and answer the questions given below:

Happy Sequira was only 21 when she joined Palm Beach Resorts as a foodand beverages (F&B) helper. She had just graduated from one of thepremium catering colleges in the city. She was young, energetic andpossessed a pleasantdisposition.Due to her experimenting nature she was not very successful with her F&B.However, when one of her managers tried her out in guest relations, she was aninstant hit. From then on there was no looking back for her. She soon rose to theposition of a Banquets Manager.Even as a Banquets Manager she loved the Kitchen section. She felt likecooking. Many a times she went to the Kitchen of one of the Palm Beach ResortRestaurants and experimented. Many a times she was successful, or this is whather Kitchen staff often told her. She was enjoying every bit her life.Unfortunately for her this was to be her glass ceiling. Due to a cateringeducational background not many in the Palm Beach Resorts Managementthought that she could take up hardcore marketing assignments.Happy was unhappy. She felt stifled. Her stagnation in position was makingher feel truncated. She decided to go independent.Over the years, being single, she had gathered enough money. Moreover, her father was a successful businessman and would love to fund any of his onlydaughter's ventures. Also being in guest relations, Happy herself knew a lot of influential people.On the other hand, Happy Sequira was now 30. She had to seriouslycontemplate marriage due to parental pressures. Her rise at Palm Beach Resortswas meteoric, which implied that she was not used to serious failure. BesidesHappy wondered what kind of a start-up could she design to suit her needs?

Questions:

(a) Should Happy Sequira go independent?

(b) Should Happy follow her heart (F&B) or head (Guest relations)?

(c) If Happy decides to take up Guest relations what kind of a start-up do you suggest?

(d) If Happy decides to take up F&B what kind of a start-up do you suggest?

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA

Scheme of Evaluation Preparatory Examination

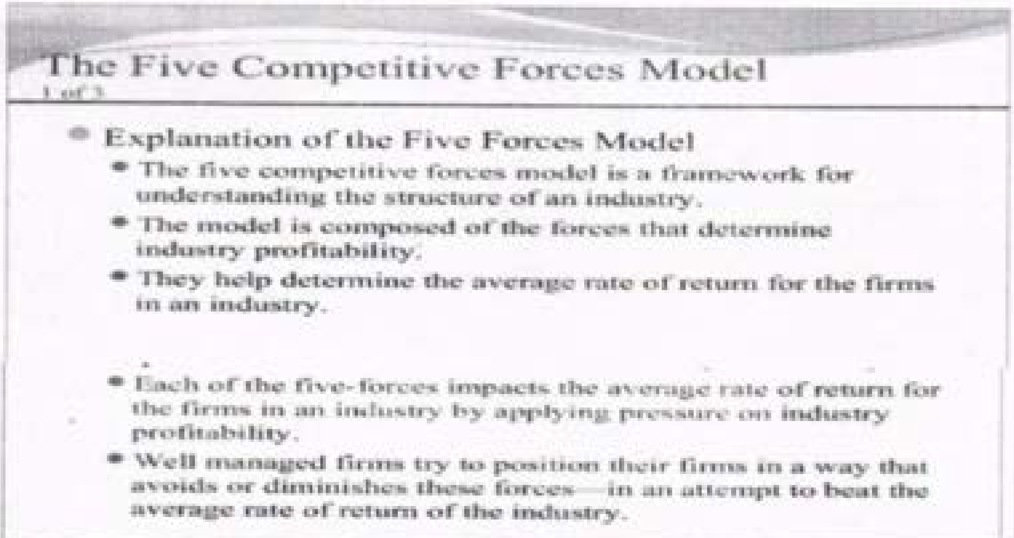
II Sem 20MBA26 : Entrepreneurship and Legal AspectsMax.Marks:100

Q.No	Question and Answers	Marks
1a	Entrepreneur is a person who creates an enterprise. The word entrepreneur is derived from a French word " Enterpendre which means to undertake. The process of creation is called Entrepreneurship	3m
B	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) •	2+5=7m
C	**Advantages of business planning:** • Seeking to develop a broader and deeper view of their market opportunities, today and tomorrow • Being more innovative in strategy and structure than their competitors, more collaborative with partners and more questioning of themselves and their potential • Taking a much more holistic and long-term approach to their people and communicating more frequently and transparently to both their internal and external stakeholders • Broadening their understanding of risk in their market and from their actions, and tightening their execution and key support processes to mitigate that risk • Pursuing and attaining greater speed in making and executing decisions to take advantage of their changing market	3+7=10
2a	Strike is Cessation of work by abody of persons[workman]Concerted refusal to workDuration & Time of Strike -immaterial Lockout is Temporary closing of place of employmentRefusal by employer to continue to employ	3m
B	**New Industrial Policy, 1991** The New Industrial Policy, 1991 had the main objective of providing facilities to market forces and to increase efficiency. Larger roles were provided by • L – Liberalization (Reduction of government control) • P – Privatization (Increasing the role & scope of the private sector) • G – Globalisation (Integration of the Indian economy with the world economy) Because of LPG, old domestic firms have to compete with New Domestic firms, MNC's and imported items The government allowed Domestic firms to import better technology to improve efficiency and to have access to better technology. The Foreign	2+5=7m

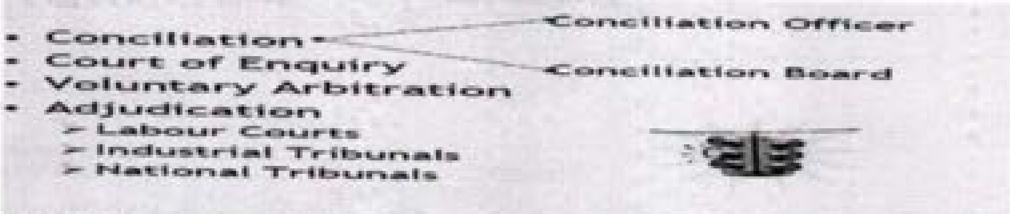
PRINCIPAL
SIET., TUMAKURU

	Direct Investment ceiling was increased from 40% to 51% in selected sectors. The maximum FDI limit is 100% in selected sectors like infrastructure sectors. Foreign Investment promotion board was established. It is a single-window FDI clearance agency. The technology transfer agreement was allowed under the automatic route. Phased Manufacturing Programme was a condition on foreign firms to reduce imported inputs and use domestic inputs, it was abolished in 1991. Under the Mandatory convertibility clause, while giving loans to firms, part of the loan will/can be converted to equity of the company if the banks want the loan in a specified time. This was also abolished.	
C	Preparing a Project Report I Cover sheet II Table of Content III Executive Summary IV Business V Fund Request VI Product/ Services VII Plan – Marketing, operation, Organisational, Financial	3+7=10
3a	1. Product 2. Processs 3. Shared Assets	3m
B	**Steps of Innovation Process** • **Step 1: Idea Generation And Mobilization –** • New ideas are created during idea generation. Successful idea generation should involve the pressure to compete and the freedom to explore. • Mobilization occurs when the idea is moved to a different logical or physical location. • **Step 2: Advocacy And Screening –** • Advocacy and screening help to evaluate the feasibility of a business idea with its potential problems and benefits. • Hence, a decision can be made about an idea's future. Companies looking to develop a culture can establish a few best practices. • **Step 3: Experimentation –** • The experimentation stage tests the sustainability of ideas for an organization at a specific time. Experimentation generates new ideas with the information that is gathered on the results and feasibility of the original idea. • **Step 4: Commercialization –** • Commercialization develops market value for an idea by focusing on its impact. An important part is establishing the specifications of any given idea. • Commercialization is the stage that involves the change of focus developments to persuasion. After the idea is clarified and a business plan is developed, it will be ready for diffusion and implementation. • **Step 5: Diffusion And Implementation –** • Diffusion is the company-wide acceptance of an innovative idea, and implementation sets up everything needed to develop the innovation. Diffusion and implementation allow the organization to determine the next set of needs for customers. Receiving feedback, indicators for success metrics, and other benchmarks enable the organization to stimulate the innovation process.	2+5=7m
C	**1)Small Industries Development Bank of India (SIDBI)** With a view to ensuring larger flow of a financial and non financial assistance to the small scale sector, the Govt of India set up the Small Industries Development Bank of India under a special Act of Parliament in October 1989 as a wholly- owned subsidiary of the IDBI. The Bank commenced its operations from April 2, 1990 with its head office in Lucknow.	3+7=10

PRINCIPAL
SIET., TUMAKURU.

	OBJECTIVES: Four basic objectives are set out in the SIDBI Charter for orderly growth of industry in the small scale sector. They are: Financing Promotion Development Co-ordination . **FUNCTIONS OF SIDBI**: To initiate steps for technological upgradation and modernisation of existing units.To expand the channels for marketing the products of SSI sector in domestic and international markets.To promote employment oriented industries especially in semi urban areas to create more employment opportunities and thereby checking migration of people to urban areas.	
4a	The Single Window Scheme envisages sanction and disbursement of working capital and term loan together from a single agency. It is applicable to projects with cost upto Rs. 50 lakhs. The Scheme is operated both by banks and financial institutions. State Financial Corporations under Single Window Scheme provide working capital loan along with the term loan to new tiny and small scale sector units so as to overcome the initial difficulties and delays faced by them to start production expeditiously.	3m
B	Steps involved in MR 1. Defining the purpose or objectives 2. Gathering data through secondary sources- magazines, annual reports, Indian statistical orgn, govt agencies, news papers article, libraries etc 3. Gathering data through primary sources- Observation, networking, interviewing, questionnaire, focus group 4. Analysis & Interpreting results 5. Understanding the mkting plan	2+5=7m
C	 The Five Competitive Forces Model 1 of 3 • Explanation of the Five Forces Model • The five competitive forces model is a framework for understanding the structure of an industry. • The model is composed of the forces that determine industry profitability. • They help determine the average rate of return for the firms in an industry. • Each of the five-forces impacts the average rate of return for the firms in an industry by applying pressure on industry profitability. • Well managed firms try to position their firms in a way that avoids or diminishes these forces—in an attempt to beat the average rate of return of the industry.	3+7=10
5a	The Copyright Act 1987 provides comprehensive protection for copyrightable works. The Act outlines the nature of works eligible for copyright (which includes computer software), the scope of protection, and the manner in which the protection is accorded. There is no registration of copyright works.	3m
B	**Forms of Business** Sole Proprietorship Partnerships Corporations Limited Liability Company (LLC). Cooperative Society Joint Stock Company	2+5=7m

PRINCIPAL
SIET., TUMAKURU.

c	Machinery for the settlement of Industrial Dispute  - Conciliation - Court of Enquiry - Voluntary Arbitration - Adjudication ➢ Labour Courts ➢ Industrial Tribunals ➢ National Tribunals Conciliation Officer Conciliation Board	3+7=10
6a	This Act is to require employers in industrial establishments to formally define conditions of employment under them and submit draft standing orders to certifying Authority for its Certification. It applies to every industrial establishment wherein 100 (reduced to 50 by the Central Government in respect of the establishments for which it is the Appropriate Government) or more workmen are employed.	3m
b	**Formation of a company** • Promotion • Incorporation • Capital Subscription • Commencement of Business	2+5=7m
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.	3+7=10
7a	According to **Paul E. Pisek**, "Creativity is the connecting and rearranging of knowledge in the minds of people who will allow them to think flexibly- to generate new, often surprising ideas that others judge to the useful." **Herbert Fax** defines, "The creative process is any thinking process which solves a problems in an original and useful way.	3m
b	Provisions regarding health : • Cleanliness (sec.11) • Disposal of Wastes & Effluents (sec.12) • Ventilations & Temperature (sec.13) • Dust & Fumes (sec.14) • Artificial Humidification (sec. 15) • Overcrowding (sec.16) • Lighting (sec.17) • Drinking Water (sec.18) • Latrines & Urinals (sec.19) • Spittoons (sec.20)	2+5=7m
c	**External Funds** **1. Personal Funds** • Least expensive funds in terms of cost and control. Essential in attracting outside funding. • **Typical sources of personal funds:** • Savings. • Life insurance. • Mortgage on a house or car. • **Internally generated funds** are most frequently employed; sources include: • Profits. • Sale of assets and little-used assets. • Working capital reduction. • Accounts receivable. • **Short-term internal source of funds:** • Reducing short-term assets - inventory, cash, and other working-capital items. • Extended payment terms from suppliers. 11	3+7=10
8ab	• Marks to given based on the justification given by students	10*2=20

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA

Second Semester Internal Assessment Test-I, July 2022

Time-1 ½ Hrs **20MBA26 Entrepreneurship and Legal Aspects** Max. Marks: 50

Answer the following Questions:

1.	a. Define Entrepreneurship.	**03 Marks**
	b. Elucidate the statement "Intrapreneur- an emerging class"	**07 Marks**
	c. Explain the stages in Stages in entrepreneurial process.	**10 Marks**
2.	a .Define Creativity and innovation.	**03 Marks**
	b. Explain the Sources of New Ideas.	**07 Marks**
	c. Explain the innovation Process.	**10 Marks**
3.	a. Explain the types of entrepreneurs.	**10 Marks**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

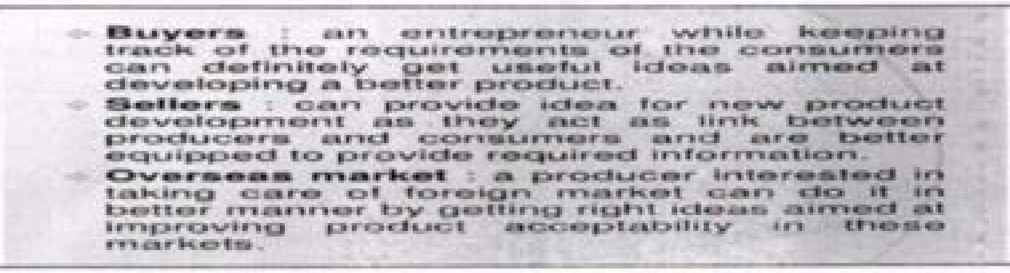
Department of MBA

Scheme of Evaluation – I Internals

II Sem 20MBA26 : Entrepreneurship and Legal AspectsMax.Marks:50

Q.No	*Answers*	*Marks*
1 a.	Entrepreneur is a person who creates an enterprise. The word entrepreneur is derived from a French word " Enterpendre which means to undertake. The process of creation is called Entrepreneurship	3 marks
b.	**Intrapreneur:** An employee of a large corporation who is givenreedom and financial support to create new products, services, systems, etc., and does nothave to follow the corporation's usual routines or protocols • Intrapreneurs bridge the gap between investors and managers. They take new ideas & turn them to profitable realities. • They have a vision and the courage to realise it. • They can image what business prospects will follow from the way customers respond to their innovations • They have the ability to plan necessary steps for actualisation of the idea. • They have high need achievement & they lack moderate calculated risk	7marks Listing: 2m Explana tion" 5m
C	• The process has five di**stinct** 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	According to **Paul E. Pisek**, "Creativity is the connecting and rearranging of knowledge in the minds of people who will allow them to think flexibly- to generate new, often surprising ideas that others judge to the useful." **Herbert Fax** defines, "The creative process is any thinking process which solves a problems in an original and useful way.	3 marks
B	 SOURCES OF NEW IDEAS ➢ **Basic research** : all firms are engaged in some kind of basic research and development , which can lead to development of new product ideas that have already passed the initial screening stage. ➢ **Production stage** : workers actively engaged in the production of products can suggest certain modifications and improvements. These workers can provide ideas aimed at improving quality , cost and performance of potential product. ➢ **Sales force** : sales representative are directly in touch with the customers and are thus better equipped to take note of customer needs by this they can provide better product development idea. ➢ **Management** : management team based on their knowledge, skill and experience can come out with new ideas for product development. ➢ **Magazines and trade journal** : useful ideas about new products can be obtained from these magazines and trade journals. ➢ **Competitors** : in order to survive in present day competitive environment, it is in the interest of the entrepreneur to keep a eye on activities of his rivals.	7marks Listing: 2m Explana tion" 5m

PRINCIPAL
SIET., TUMAKURU

	 - **Buyers** : an entrepreneur while keeping track of the requirements of the consumers can definitely get useful ideas aimed at developing a better product. - **Sellers** : can provide idea for new product development as they act as link between producers and consumers and are better equipped to provide required information. - **Overseas market** : a producer interested in taking care of foreign market can do it in better manner by getting right ideas aimed at improving product acceptability in these markets.	
C	**Steps of Innovation Process** • **Step 1: Idea Generation And Mobilization –** • New ideas are created during idea generation. Successful idea generation should involve the pressure to compete and the freedom to explore. • Mobilization occurs when the idea is moved to a different logical or physical location. • **Step 2: Advocacy And Screening –** • Advocacy and screening help to evaluate the **feasibility of a business idea** with its potential problems and benefits. • Hence, a decision can be made about an idea's future. Companies looking to develop a culture can establish a few best practices. • **Step 3: Experimentation –** • The experimentation stage tests the sustainability of ideas for an organization at a specific time. Experimentation generates new ideas with the information that is gathered on the results and feasibility of the original idea. • **Step 4: Commercialization –** • Commercialization develops market value for an idea by focusing on its impact. An important part is establishing the specifications of any given idea. • Commercialization is the stage that involves the change of focus developments to persuasion. After the idea is clarified and a business plan is developed, it will be ready for diffusion and implementation. • **Step 5: Diffusion And Implementation –** • Diffusion is the company-wide acceptance of an innovative idea, and implementation sets up everything needed to develop the innovation. • Diffusion and implementation allow the organization to determine the next set of needs for customers. Receiving feedback, indicators for success metrics, and other benchmarks enable the organization to stimulate the innovation process.	Listing 3m Explanation 7m
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

PRINCIPAL
SIET., TUMAKURU

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution

Department of MBA

Scheme of Evaluation

Subject : Services Marketing	Code: 20MBAMM303
Max marks: 50	No Choice
03 Marks - 03 questions	Meanings and definitions
07 Marks - 03 questions	02 marks for listing and 05 marks for explanation
10 marks – 02 questions	03 marks for listing and 07 marks for explanation

Sl. No	Answer Script	Marks 50
1.a	**Services Marketing:** Service marketing is a strategy which promotes and showcases the intangible benefits and offerings delivered by a company to drive end customer value. This can be for standalone service offerings or complementary services to tangible products. Service marketing is a concept which focuses mainly on the business of non-physical intangible goods. It is done for company given benefits which cannot be seen, touched and felt.	03 Marks
b.	**Types of services Research:** Major Market Research types in services marketing are based on the goals. They are as follows - **Awareness** - **Targeting** - **Retention** - **Acquisition** 	07 Marks
c.	**Factors influencing customer expectation of services:**	10 Marks

PRINCIPAL
SIET., TUMAKURU.

	Factors that influence adequate service: • Transitory Service Intensifiers • Perceived Service • Alternatives • Self-Perceived • Situational Factors Factors that influence desired service: • Explicit Service Promises • Implicit Service Promises • Word-of-Mouth • Past Experience • Predicted Service	
2. a	**Zone of Tolerance in Services:** The zone of tolerance ZoT, represents a range of service performances that customer considers satisfactory, which recognizes multiple expectation standards, specifically ADEQUATE and DESIRED. The Tolerance GAP is the difference between desired service and the level of service considered adequate. The larger that gap, the more likely the customer will be dissatisfied.	**03 Marks**
b.	The Services Marketing Triangle:	**07 Marks**

Each actor works together to develop, promote, and deliver a company's service. As you can see from the diagram we represent actors by the points of the triangle. Our actors are:

c.

- **Company**: refers to the leadership team of the company in question.
- **Employees**: refers to all employees, including subcontractors who deliver the company's service.
- **Customers**: refers to all customers and potential customers of the company.

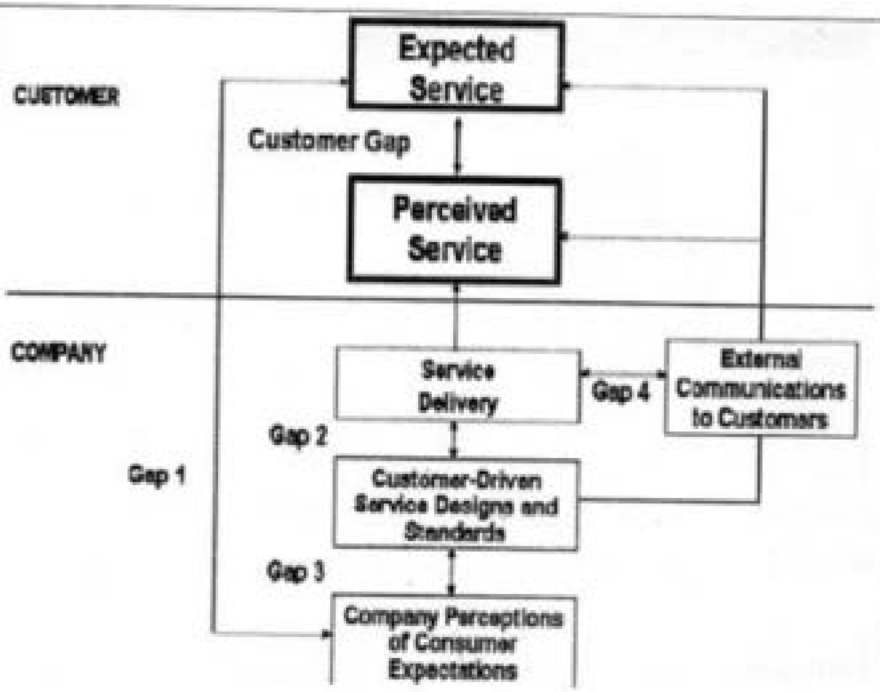
External Marketing: occurs between the company and its customers.

- **Internal Marketing**: occurs between the company and its employees.
- **Interactive Marketing**: occurs between the employees and the customers.

Gap model in services:

- Customer Gap:
    - difference between expectations and perceptions
- Provider Gap 1:
    - not knowing what customers expect
- Provider Gap 2:
    - not having the right service designs and standards
- Provider Gap 3:
    - not delivering to service standards
- Provider Gap 4:
    - not matching performance to promises

PRINCIPAL
SIET., TUMAKURU.



3. a

- <u>Experience Qualities</u>
  attributes a consumer can determine after purchase (or during consumption) of a product
- <u>Credence Qualities</u>
  characteristics that may be impossible to evaluate even after purchase and consumption

b. -

Customer Relationship is a philosophy of doing business that focuses on keeping and improving current customers. It does not necessarily emphasize acquiring new customers. Relationship marketing is a form of marketing developed from direct response marketing campaigns that emphasizes customer retention and satisfaction rather than sales transactions.

Customer retention strategies for relationship marketing:

I. Financial Bonds:
  Volume and Frequency Rewards
  Stable Pricing
  Bundling and Cross Selling

II. Social Bonds:
  Continuous Relationships
  Personal Relationships
  Social Bonds Among Customers

	III. Customization Bonds Anticipation/ Innovation Mass Customization Customer Intimacy **IV. Structural Bonds** Integrated Information Systems Joint Investments Shared Processes and Equipment	

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
III Semester I Internal Assessment Test, December, 2021
Subject: Investment Management (20MBAFM303)

Time: 90 Minutes

Answer the following Questions: **Max. Marks: 50**

1. a. What do you mean by Investment? 03 Marks
   b. Explain the investment process? 07 Marks
   c. Explain the Financial instruments? 10 Marks
2. a. What is Primary Market? 03 Marks
   b. Explain the modes of raising funds in primary market? 07 Marks
   c. What is Stock exchange? Explain its functions? 10 Marks
3. a. 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

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
III Semester I Internal Assessment Test, December, 2021
Subject: Investment Management (20MBAFM303)

Time: 90 Minutes

Answer the following Questions: Max. Marks: 50

1. a. What do you mean by Investment? 03 Marks
   b. Explain the investment process? 07 Marks
   c. Explain the Financial instruments? 10 Marks
2. a. What is Primary Market? 03 Marks
   b. Explain the modes of raising funds in primary market? 07 Marks
   c. What is Stock exchange? Explain its functions? 10 Marks
3. a. 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

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
III Semester I Internal Assessment Test, December, 2021
Subject: Investment Management (20MBAFM303)
Scheme of Evaluation **Max. Marks: 50**

1.a. Investment management refers to the handling of financial assets and other investments—not only buying and selling them. Management includes devising a short- or long-term strategy for acquiring and disposing of portfolio holdings. **03 Marks**

Investment Process

The process of investment includes five stages:

1. **Investment Policy**: The policy is formulated on the basis of investible funds, objectives and knowledge about investment sources.
2. **Security Analyses**: Economic, industry and company analyses are carried out for the purchase of securities.
3. **Valuation**: Intrinsic value of the share is measured through book value of the share and P/E ratio.
4. **Portfolio Construction**: Portfolio is diversified to maximise return and minimise risk.
5. **Portfolio Evaluation**: The performance of the portfolio is appraised and revised.

(3+4=7Marks)

c. **Money Market Instruments:**

Treasury Bills (T-Bills):
Certificate of Deposits (CDs):
Commercial Papers (CPs):
Repurchase Agreements (Repo):
Banker's Acceptance:
Federal Agency Notes
Short-Term Tax Exempts

Capital market Instruments:

Debt Instruments ,
Preference Shares

Equities, Derivatives **(6+4=10Marks)**

PRINCIPAL
SIET., TUMAKURU.

2.a. **Primary markets**

The primary market is that part of the capital markets that deals with the issuance of new securities. Companies, governments or public sector institutions can obtain funding through the sale of a new stock or bond issue.

03 Marks

b. Debt Instruments ,

Preference Shares

Equities

(2+5=07 Marks)

c. **Functions of Stock Exchanges**

1. Continuous and ready market for securities
2. Facilitates evaluation of securities
3. Encourages capital formation
4. Provides safety and security in dealings
5. Regulates company management
6. Facilitates public borrowing
7. Provides clearing house facility
8. Facilitates healthy speculation

(4+6=10 Marks)

3.

			2M	**2M**	**2.5M**	**2.5M**
Probability (Pi)	Security A(Ra)	Security B(Rb)	Pi*Ra	Pi*Rb	Pi*(Er-Ra)2	Pi*(Er-Rb)2
0.5	4	0	2	0	0.72	1.125
0.4	2	3	0.8	1.2	0.256	0.9
0.1	0	3	0	0.3	0.784	0.225
			2.8	1.5		

	1M	
	Risk	Return
Security A	1.3	2.8
Security B	1.5	1.5

Select Security A Risk is less and Returns are good

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
III Semester I Internal Assessment Test, December, 2021
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

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
III Semester I Internal Assessment Test, December, 2021
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

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI EDUCATION

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

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. Italso 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.

PRINCIPAL
SIET., TUMAKURU.

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)

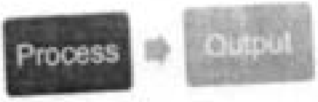
1.c) Each fishbone diagram starts the same: a central problem or effect is placed on the far right of the diagram. Then a line, which is called the "spine", is drawn straight to the left and branches are added off shooting both above and below it. These branches become known as "affinities" or types 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:

PRINCIPAL
SIET., TUMAKURU.

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)**

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
III Semester II Internal Assessment Test, January, 2022
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. Prem is considering the purchase of a bond currently selling at Rs.878.50. The bond has four years of 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. 10 Marks

i) Calculate the intrinsic value of the bond. Should Prem buy the bond? (PV/FA (10%, 4 yrs) = 3.170)

ii) What is the value of Bond if expected rate of return is 12%?

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)

Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
III Semester I Internal Assessment Test, December, 2021
Subject: Investment Management (20MBAFM303)
Scheme of Evaluation

Max. Marks: 50

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. **3 Marks**

1.b) Credit Instrument **(3+4= 7 Marks)**

- 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) Beta = 0.3152, **(4+3+3 = 10 Marks)**

Alpha = 11.5002

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: **3 Marks**

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.

PRINCIPAL
SIET., TUMAKURU

2.b) Types of Bonds **(3+4 =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) Covxy = 72 **(2+4+4= 10 Marks)**

Expected Portfolio return = 14.4 %

3.a) **(5+5 = 10 Marks)**

The Value of Bond = 936.6

We would like to recommend prem to buy the bond

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution

Department of MBA

III Semester Internal Assessment Test II – 11th JAN 2022

20MBAHR303: RECRUITMENT AND SELECTION

Duration: 1½ Hrs **Max. Marks: 50**

Answer the following questions.

1. a. Define a recruitment strategy. **03 Marks**
   b. Explain the Process of developing Behavioral Specification **07 Marks**
   c. Explain in detail legal and ethical considerations regarding recruitment **10 Marks**

2. a. Define Employer Branding. **03 Marks**
   b. Explain the relevance of Social Media with respect to recruitment of millennials. **07 Marks**
   c. Define Job Evaluation. Explain in detail its Process. **10 Marks**

3. a. Define Motivational Job Specification **03 Marks**
   b. What are KSAOs? Explain the process of obtaining job KSAOs **07 Marks**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution

Department of MBA

III Semester Internal Assessment Test II – 11th JAN 2022

20MBAHR303: RECRUITMENT AND SELECTION

Duration: 1½ Hrs **Max. Marks: 50**

Answer the following questions.

1. a. Define a recruitment strategy. **03 Marks**
   b. Explain the Process of developing Behavioral Specification **07 Marks**
   c. Explain in detail legal and ethical considerations regarding recruitment **10 Marks**

2. a. Define Employer Branding. **03 Marks**
   b. Explain the relevance of Social Media with respect to recruitment of millennials. **07 Marks**
   c. Define Job Evaluation. Explain in detail its Process. **10 Marks**

3. a. Define Motivational Job Specification **03 Marks**
   b. What are KSAOs? Explain the process of obtaining job KSAOs **07 Marks**

PRINCIPAL
SIET., TUMAKURU

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

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	**A recruiting strategy** is formal plan of action involving an organization's attempts to successfully identify, recruit, and hire high-quality candidates for the purpose of filling its open positions. It is a clear plan that explains what roles you'll recruit for, when, why and how. It should be tied to your overall company objectives. Your strategy must be possible to implement and easy to communicate	**03 Marks**
b.	**Behavioral Job specification:** Behavioural specification (or behavioural competencies) are a way of describing a range of individual characteristics that can be measured and can be shown to differentiate effective and ineffective performance. A job role will usually require the postholder to demonstrate both behavioural attributes and technical (or role specific) skills. Behavioural specification are made up of a range of motives, traits, skills and knowledge. In a given situation these are evidenced by the way an individual behaves, and can be a significant factor in helping to predict job performance. The core purpose of the behavioural specification developed by the University is to identify what separates best practice from the rest: what do those individuals who display best practice do differently, and why is it they are different from the others (i.e. what qualities are the basis of their behaviour)? What are the key qualities and attributes required in a role to accomplish the organisational or institutional goals? Process:	**07 Marks** **02 marks for listing and 05 marks for explanation**

PRINCIPAL
SIET., TUMAKURU.

10 Marks

c.

02 marks for listing and 05 marks for explanation

Ethical considerations in recruitment:

- Never place misleading advertisements
- Interview correctly to ensure proper matching
- Treat all candidate equally
- Solicit information that is necessary
- Maintain confidentiality on use and storage of candidate information
- Never practice redirection
- Inform candidates appropriately of the selection decision

Legal considerations in recruitment:

When starting the recruiting process, it is important to be aware of certain legal issues in order to minimize risk. Job postings, interview questions, checking references and making job offers all need to be done in a way that meets legal requirements.

- Job postings: According to the BC Human Rights Code (Discrimination in employment advertisements), you must not publish job postings or advertisements that give preference to:
- Race
- Colour
- Ancestry
- Place of origin
- Political belief
- Religion
- Marital status
- Family status
- Physical or mental disability
- Sex
- Sexual orientation
- Gender identity or expression
- Age

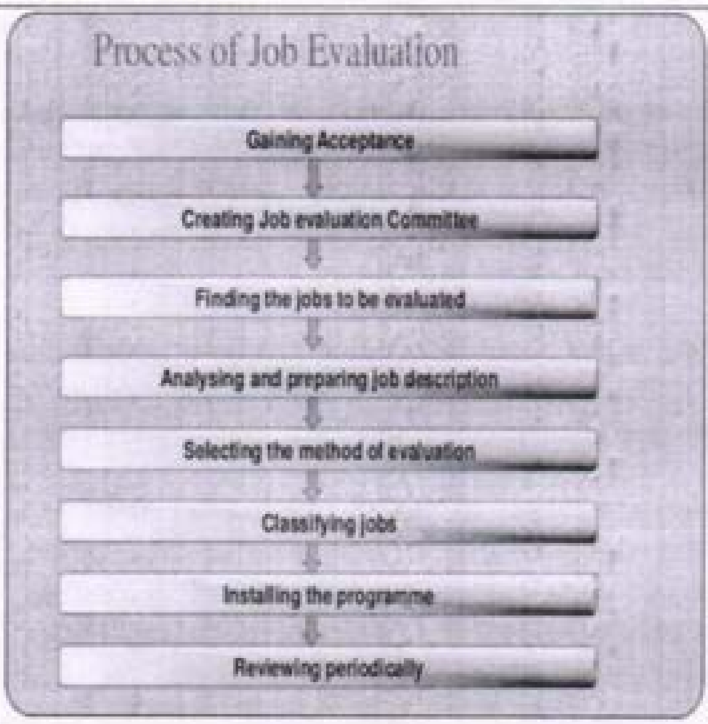
2.a.

03 Marks

Employer branding is the process of positioning your company as the employer of choice to a target group of potential

	candidates. An employer brand refers to the perception your current and potential employees have of your company. As an action, employer branding involves deliberately establishing your company's values, work culture, and personality to ensure they align with your ideal candidates' aspirations. Employer branding is not about misleading people into thinking that a company is better than it actually is. It is about defining your unique employee value proposition.	
b.	Social media allows recruiters to spread information about job openings and the organization so that passive and active candidates receive such messages. Traditional recruiting methods, such as online job boards or advertisements, most often engage only active candidates who are looking for that information. Social media recruitment has become the most commonly used platform for recruitment of millennials because of: • New generation of workers • Reaching huge crowd • Reach passive and insecure candidates • Background checks are easy • Live recruitment • Forthcoming and friendly	**07 Marks** **02 marks for listing and 05 marks for explanation**
c.	Job evaluation is the process of analyzing and assessing various jobs systematically to ascertain their relative worth in an organization. Job evaluation is an assessment of the relative worth of various jobs on the basis of a consistent set of job and personal factors, such as qualifications and skills required.	**10 Marks** **03 marks for listing and 7 marks for explanation**

PRINCIPAL
SIET., TUMAKURU.

3. a	 	**03 Marks**
b.	**Motivational job specification:** Supporting a work environment that motivates employees is one of the most important things within any business. If you don't have motivated employees to put forth the effort required to do well, it's likely that your company will face some challenges. A motivational job specification is a psychological theory of motivation that is defined as the systematic and purposeful allocation of tasks to groups and individuals within an organization. The five core characteristics of job design are skill variety, task identity, task significance, autonomy, and job feedback. Including these characteristics in your jobs affects the following work-related outcomes — motivation, satisfaction, performance, absenteeism, and turnover Knowledge, skills, abilities and other characteristics (KSAOs) are the attributes required to perform a job: • Knowledge refers to the body of factual or procedural information that can be applied, such as knowledge of foreign languages or computer programming languages. • Skills are the capabilities require to perform tasks accurately, such as psychomotor activities like typing	**07 Marks** **02 marks for listing and 05 marks for explanation**

	speed or driving ability. - Abilities are more stable characteristics that can include cognitive, sensory and physical abilities, such as empathy. - Other characteristics are traits that do not fit into the other categories, including values, work style, personality and degrees and certifications. How to write KSAOs/process of obtaining KSAOs; - Prepare a short summary or range of appropriate skills in the relevant area - Describe the situation or context - Explain the task - Describe your actions - Detail the results	

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA

III Semester Internal Assessment Test II - 11th Jan 2022
20MBAMM303: SERVICES MARKETING

Duration: 1½ Hrs **Max. Marks: 50**

Answer the following questions.

1. a. Define Yield Management. **03 Marks**
   b. Discuss in brief the key reasons for GAP-2. **07 Marks**
   c. Explain in detail the strategies for matching Capacity and Demand. **10 Marks**

2. a. What is Optimum v/s Maximum use of capacity? **03 Marks**
   b. What is a Conflict? Discuss various sources of Conflicts. **07 Marks**
   c. Discuss the Balanced Score Card approach to leadership & measurement system for market driven service performance. **10 Marks**

3. a. Differentiate between Hard and Soft Standards of Service performance. **03 Marks**

   b. Define Service Vision. Explain in detail the implementation of service vision. **07 Marks**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
III Semester Internal Assessment Test II – 11th JAN 2022
20MBAMM303: SERVICES MARKETING

Duration: 1½ Hrs **Max. Marks: 50**

Answer the following questions.

1. a. Define Yield Management. **03 Marks**
   b. Discuss in brief the key reasons for GAP-2. **07 Marks**
   c. Explain in detail the strategies for matching Capacity and Demand. **10 Marks**

2. a. What is Optimum v/s Maximum use of capacity? **03 Marks**
   b. What is a Conflict? Discuss various sources of Conflicts. **07 Marks**
   c. Discuss the Balanced Score Card approach to leadership & measurement system for market driven service performance. **10 Marks**

3. a. Differentiate between Hard and Soft Standards of Service performance. **03 Marks**

   b. Define Service Vision. Explain in detail the implementation of service vision. **07 Marks**

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI
EDUCATION
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA

Scheme of Evaluation – Internal Assessment II

Subject : Services Marketing	**Code: 20MBAMM303**
Max marks: 50	**No Choice**

Sl. No	Answer Script	Marks 50
1.a	**Yield management** is a **variable pricing strategy**, based on understanding, anticipating and influencing consumer behavior in order to maximize revenue or profits from a fixed, time-limited resource (such as airline seats or hotel room reservations or advertising inventory). As a specific, inventory-focused branch of revenue management, yield management involves strategic control of inventory to sell the right product to the right customer at the right time for the right price.	**03 Marks**
b.	**Gap 2: The Policy Gap** The policy gap is the difference between management's understanding of the customer needs and the translation of that understanding into service delivery policies and standards. There are a number of reasons why this gap can occur: • Lack of customer service standards. • Poorly defined service levels. • Failure to regularly update service level standards.	**07 marks** **02 Marks for listing and 05 Marks for explanation**
c.	**Strategies to match demand and capacity** • Shifting demand and capacity • Vary the service offering. • Communicate with customers. • Modify timing and location of service delivery. • Differentiate on price. • Flexing capacity to meet demand. • Rent or share facilities or equipment. • Schedule downtime during periods of low demand. • Cross train Employees	**10 Marks** **03 Marks for listing and 07 marks for explanation**

PRINCIPAL
SIET., TUMAKURU.

	- Modify or move facilities or equipments	
2.a	**Optimum v/s Maximum use of capacity** Using capacity at an optimum level means that resources are fully employed but not overused and that customers are receiving quality service in a timely manner. Maximum capacity represents the absolute limit of service availability. Demand and supply are balanced at the level of optimum capacity-staff and facilities are occupied at an ideal level	**03 Marks**
b.	Service organizations and their employees may sometimes enter into conflict with customers during the course of interaction with them. The conflicts can be classified as follows - individual-role conflict, customer-employee conflict, inter-employee conflict, client-organization conflict and inter-client conflict. **Sources of Conflict:** 1. Person or Role Conflict 2. Organisation/Client Conflict 3. InterClient Conflict	**07 Marks** **02 marks for listing and 04 marks for explanation**
c.	**The balanced scor card approach** has emerged in recent years as what can perhaps be best described as a strategic measurement and control tool. The balanced score card is a framework that firms can use to verify that they have established both finncial and strategic controls to assess their service performance	**10 Marks** **03marks for listing and 07 marks for explanation** **03 Marks**

3a.

10 marks 03 marks for listing and 07 marks for explanation

b.

Hard and Soft standards: Hard standards often involve counts or timed actions of how many, how accurately, how quickly. Two of the five quality dimensions are particularly receptive to hard measures. Soft standards are areas that are more difficult to measure objectively and agree a standard. Soft standards are developed in response to customers, who invariably ask themselves:

How was I made to feel?
Was I involved, informed and consulted?
Did I like how I was treated?

Service vision:

Strategic service vision is a concept and a methodology for bringing together marketing and operations. In this stage, functions such as operations, finance, marketing, quality, and other activities that are strategically important to service organizations are identified.

James L. Heskett made and important contribution to the discussion of ervice strategy formulation when he introduced the concept of strategic vision in his book **'managing service economy'.**

The four basic elements of Heskett's model are as follows:

1. Target Market

PRINCIPAL
SIET., TUMAKURU.

	2. Definition of organisation's primary business 3. Development of an operational strategy 4. Delivery of the service	

SHRIDEVI
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution

Department of MBA

Third Semester Internal Assessment Test II **12th January 2022**

Time: 1 ½ **20MBAHR304: Human Resource Analytics** **Max. Marks: 50**

Answer the following Questions:

1. a. Define Data analytics. **03 Marks**
   b. Briefly explain the Pitfalls of HR Analytics. **07 Marks**
   c. Explain the steps in conducting HR analytics.. **10 Marks**

2. a What do mean by metrics? **03 Marks**
   b. Briefly explain HR Metrics measuring efficiency. **07 Marks**
   c. Bring out the steps in using excel charts to visualize in an excel dashboards. **10 Marks**

3. a. Explain the Scope of Big Data in HR Analytics. **10 Marks**

SHRIDEVI
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution

Department of MBA

Third Semester Internal Assessment Test II **12th January 2022**

Time: 1 ½ **20MBAHR304: Human Resource Analytics** **Max. Marks: 50**

Answer the following Questions:

1. a. Define Data analytics. **03 Marks**
   b. Briefly explain the Pitfalls of HR Analytics. **07 Marks**
   c. Explain the steps in conducting HR analytics.. **10 Marks**

2. a What do mean by metrics? **03 Marks**
   b. Briefly explain HR Metrics measuring efficiency. **07 Marks**
   c. Bring out the steps in using excel charts to visualize in an excel dashboards. **10 Marks**

3. a. Explain the Scope of Big Data in HR Analytics. **10 Marks**

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA

Scheme of Evaluation – II Internals

III Sem 20MBAHR304 : HR ANALYTICS Max.Marks:50

Q.No	Answers	Marks
1 a.	**Data analytics** is a multidisciplinary field. There is extensive use of computer skills, mathematics and statistics, the use of descriptive techniques and predictive models to gain valuable knowledge from data.. The insights from data are **used** to recommend action or to guide decision making rooted in business context.	3 marks
b.	**PITFALLS OF HR ANALYTICS** 1. **HR WILL FAIL MISERABLY IN GIVING EMPIRICAL EVIDENCE FOR THE USE OF HR ANALYTICS TO A COMPANY.** In short there is a big problem with evidence-based practice. The problem with evidence based practice is that outside of areas like health care and aviation / technology is **that most people in organisations don't care about having research evidence for almost anything they do**. One more thing happens with evidence based decisions as the decision based on the evidence may not be liked by the management and the management may change the decisions and where the evidence based decision my fail miserably. 2. **THE QUALITY OF THE RESULTS DEPENDS ON BOTH THE QUALITY AND QUANTITY OF DATA** Nowadays, because machine learning requires a large amount of training data, the internal datasets within an organization are in high demand. In addition, the analytics are always hungry for data and constantly search for data assets that can potentially add value, which has led to quick adoption of new datasets or data sources not explored or used before. **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** In business, System Analysis and Design refers to the process of examining a business situation with the intent of improving it through better procedures and methods. System analysis and design relates to shaping organizations, improving performance and achieving objectives for profitability and growth. The emphasis is on systems in action, the relationships among subsystems and their contribution to meeting a common goal. Looking at a system and determining how adequately it functions, the changes to be made	7marks Listing 2m Explanation 5m

PRINCIPAL
SIET., TUMAKURU.

	and the quality of the output are parts of system analysis. Organizations are complex systems that consist of interrelated and interlocking subsystems. Changes in one part of the system have both anticipated and unanticipated consequences in other parts of the system. The systems approval is a way of thinking about the analysis and design of computer based applications. It provides a framework for visualizing the organizational and environmental factors that operate on a system. **3. HRA MAY WELL BE MISUSED IN ORDER TO CONVINCE THE STAKEHOLDERS ON THE STORY 'THE' POWERFUL OR INFLUENTIAL PERSON WOULD LIKE TO CONVEY** A big data initiative requires HR to acquire data from all the different departments within the business. They have to acquire, sanitize, unify, and analyse data from multiple departments as well as from multiple business functions, including payroll and finance. Only one out of three HR managers describes their big data proficiency as either "good" or "excellent." For many managers, the problem goes all the way to back to graduate university. Those who complete an MS in HR Management instead of the MBA don't experience the same quantitative rigor.	
c	**CONDUCTING HR ANALYTICS** • **(DETERMINE CRITICAL OUTCOMES {Organization Vision and Mission }** **1. CREATE CROSS-FUNCTIONAL DATA TEAM {Lot of interlinking – redundant data are shaded off from the data}** **2. ASSESS OUTCOME MEASURES {Procedure or the methodology used to capture the current employee data}** **3. ANALYSIS OF THE DATA {ADVANCED STATISTICAL TECHNIQUES AND TOOLS}** **4. BUILD PROGRAM AND EXECUTE {ACTION PLAN BASED ON THE RESULTS FROM THE DATAANALYSIS AND EXECUTE IF PERMIT}**	10marks Listing 3m Explanation 7m
2 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. The most intuitive, user-friendly HR administration programs can make employing HR metrics easy, straightforward, and uncomplicated.	
b	**HR METRICS MEASURING EFFICIENCY**	7marks

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**

Listing 2m
Explanation 5m

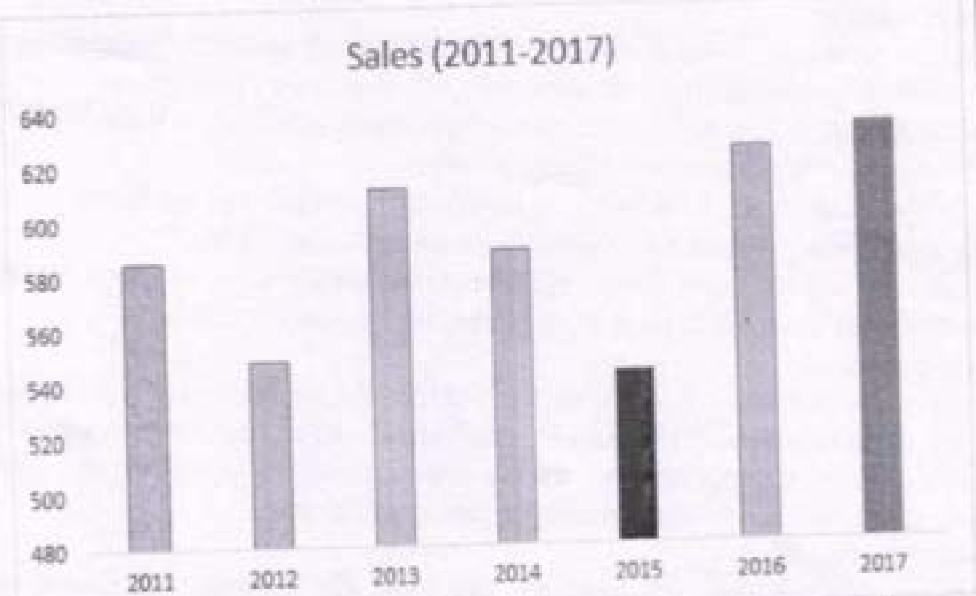
c

Using Excel Charts to Visualize Data in an Excel Dashboard

10marks

Listing 3m
Explanation 7m

- **Select the right Chart**: Excel gives you a lot of charting options and you need to use the right chart. For example, if you have to show a trend, you need to use a line chart, but if you want to highlight the actual values, a bar/column chart could be the right choice. While a lot of experts advise against using a pie chart, I would suggest you use your discretion. If your audience is used to seeing pie charts, you may as well use these.
- **Use combination charts:** I highly recommend using combination charts as these allow the user to compare values and draw meaning insights. For example, you can show the sales figure as a column chart and growth as a line chart.
- **Use dynamic charts:** If you want to allow the user to make selections and want the chart to update with it, use dynamic charts. Now a dynamic chart is nothing but a regular chart whose data updates in the back-end when you make selections.
- **Use Sparklines to make your data more meaningful**: If you have a lot of data in your dashboard/report, you can consider using Sparklines to make it visual. A sparkline is a tiny chart that resides in a cell and can be created using a data set. These are useful when you want to show a trend over time and at the same time save space on your dashboard.



- **Use contrasting colors to highlight data**: This is a generic charting tip where you should highlight data in a chart so it's easy to understand. For example, if you have sales data, you can highlight the year with a lowest sales value in red.

Things to avoid while creating an Excel dashboard

- Don't Clutter Your Dashboards: Just because you have data and

	charts doesn't mean it should go in your dashboard. Remember the objective of the dashboard is to help identify a problem or aid in taking decisions. So keep it relevant and remove everything that doesn't belong there. • Don't use volatile formulas: As it will slow down the calculations. • Don't keep extra data in your workbook: If you need that data, create a copy of the dashboard and keep it as the backup.	

Scope of Big Data

1. Recruit the best talent

Since most organizations have many competitors, it can be a real challenge to attract the most talented professionals. Through big data, HR managers can filter through thousands of resumes and narrow down their search to the most promising prospects. Without the use of big data, recruiting top talent would be a far more inefficient and time-consuming process.

2. Prioritize recruitment channels

These days, organizations use a variety of recruitment channels to fill vacant positions. Taking advantage of big data can reveal which recruitment channels are delivering results and which ones aren't very effective. If an organization finds they are having more success with internal recruitment rather than online job boards, they may prioritize internal recruitment efforts over external initiatives.

3. Detect employee health and injuries

The reality is that if many employees face health issues and injuries, an organization will be less productive and profitable. Big data allows HR managers to detect and properly prepare for common health issues in their organizations. For example, it may reveal that employees are often sick between November and January, prompting the hiring of additional temporary staff during this time period.

4. Improve training

Training can be an expensive and time-consuming part of the hiring process. Big data gives organizations the opportunity to measure how effective a potential training initiative, which can reduce the risk of training programs that lead to poor employee retention.

5. Enhance employee motivation and engagement

Through big data, organizations can identify and reward top performers. Through data governance solutions, violations of policies or standards can be identified, and prompt action can be taken to resolve these issues. In addition, big data can reveal if employees are facing performance problems and in need of additional training and/or resources.

6. Increase retention

Hiring the right employees is one aspect of HR but getting them to stay is a whole new ball game. By using big data, HR managers can quickly figure out what causes employees to leave and implement programs to increase retention. While recruiting and training a new employee is expensive, losing an employee can cost even more.

7. Forecast the future

Through big data analysis, organizations can view HR patterns and trends, and use that information to make predictions about the future. Future forecasting provides HR managers the chance to improve their long-term HR strategy and avoid issues with hiring, retention, and performance down the road.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution

Department of MBA

Third Semester Internal Assessment Test II **10th January 2022**

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 weak, general and strong 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 any 5 platforms of AI.. **10 Marks**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution

Department of MBA

Third Semester Internal Assessment Test I **6th December 2021**

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 weak, general and strong 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 any 5 platforms of AI.. **10 Marks**

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA

Scheme of Evaluation – II Internals

III Sem20MBA301 : **Emerging Exponential Technologies** **Max.Marks:50**

Q.No	Question and Answers	Marks
1 a.	• 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. • The simulation of human intelligence in machines that are programmed to think like humans and mimic their action refers to AI. To any machine that exhibits traits associated with a human mind such as learning and problem-solving. .	3 marks
b.	**Artificial Narrow Intelligence (ANI)** • Narrow AI is a type of AI which is able to perform a dedicated task with intelligence. The most common and currently available AI is Narrow AI in the world of Artificial Intelligence. • Narrow AI cannot perform beyond its field or limitations, as it is only trained for one specific task. Hence it is also termed as weak AI. Narrow AI can fail in unpredictable ways if it goes beyond its limits. • Apple Siri a good example of Narrow AI, but it operates with a limited pre-defined range of functions. **General AI** • General AI is a type of intelligence which could perform any intellectual task with efficiency like a human. • The idea behind the general AI to make such a system which could be smarter and think like a human by its own. • Currently, there is no such system exist which could come under general AI and can perform any task as perfect as a human. **Super AI** • Super AI is a level of Intelligence of Systems at which machines could surpass human intelligence, and can perform any task better than human with cognitive properties. It is an outcome of general AI. • Some key characteristics of strong AI include capability include	7marks Listing 2m Explanation 5m

PRINCIPAL
SIET., TUMAKURU.

	the ability to think, to reason,solve the puzzle, make judgments, plan, learn, and communicate by its own.	
c	• **1. Voice assistants are closest to human teachers** • **2. Voice technology eliminates the need to break eye contact** • **3. Voice technology reduces touchpoints and helps to prevent the spread of COVID-19** • **4. Voice-enabled devices can help collect data in real-time** • **5. Ask questions and get answers immediately** • **6 Routine learning exercises** • **7.Customizable quizzes and tests**	Listing 3m Explanation 7m
2 a	• It is an interrelated system of objects, digital and mechanical machines, animals r people, computing devices that are provided with UID(unique identification) and with data transferability through networks without considering human to computer or human to human. • Example : Implant heart monitor, animal biochips, automobile built in sensors etc • The Internet of things (IoT) is connecting all the devices in the world thought internet.	
b	**History of IOT** Internet was introduced first in 1860. **<u>In 1980:</u>** The first connected device was Coco-cola vending machine which is hard to believe and this was situated at the Carneigie Melon UVinversity and was operated by the local programmers. The microswitches were integrated machines and were an early form of internet to look if the device of cooling keeps the drinks cold enough and there are availability of the cans of coke. This invention fostered studies further in various field and development of machines which are interconnected all over the world. **<u>In 1990:</u>** John Romkey in 1990 connected a toaster to the internet for the first time with the protocol of TCP/IP . After a year, Cambridge University scientists came up with the an idea for the first time to the use the web camera prototype to monitor the coffee amount available in their computers locally. The webcam was programmed o take pictures of the office pot which was three times per minutes, then the images were sent to local computers allowing everyone to look if there is availability of coffee **In 2000:** In the 21 centuary beginning the word IoT came into a larger sene which was used in media with outlets like Forbes, Guardians and the Boston Globr. The IoT interests steadily increased which led to the first international conference on IoT which was held in 2008 in Switzerland, in which 23 countries participated and discussed FRID, sensors networks and the short range wireless communications.	

c **Advantages of IoT**

Internet of things facilitates several advantages in our daily lives. Some of its advantages are given below:

1. **Minimize human effort:**
2. **Save time:**
3. **Enhanced data collection:**
4. **Improved security**
5. **Efficient resource utilization:Reduced use of other electronic equipment.**
6. **Use in traffic systems**
7. **Useful for safety concerns:**
8. **Useful in the healthcare industry:**

3a

- **Google**

Google AI Platform allows for the creation of applications that run on both the Google Cloud Platform and on-premises. It targets machine learning developers, data scientists and data engineers with an easier route from the ideas to the production stage, thanks to its flexibility and support for other Google platforms such as Kubeflow.

With native support for other Google AI products such as TensorFlow, Google's solution promises an end-to-end approach, with everything from preparing data to validation and deployment contained under one umbrella.

Amazon

Amazon emphasises the accessibility of its services, and the potential to add AI to applications without any machine learning skills required.

Amazon touts the capabilities of its advanced machine learning in fields such as video analysis, natural language, virtual assistants and more to enable businesses to get the same level of insight via AI that Amazon itself does.

Microsoft

- Microsoft's AI platform integrates with its Azure cloud product, which it says is suitable for mission-critical solutions. Enabling features such as image analytics, speech comprehension and prediction, Microsoft's solution claims to be useful for all developers, from data scientists to app developers and machine learning engineers.

PRINCIPAL
SIET., TUMAKURU.

- Part of its offering is based around an ethical and responsible approach to AI, with systems to mitigate bias as well as ensure confidentiality and compliance.

H2O.ai

H2O.ai is the AI and machine learning for everyone. With an open source platform, the company claims to be used by hundreds of thousands of data scientists in over 20,000 organisations across the world, in industries such as financial services, healthcare, retail and insurance.

The Mountain View, California-based business has raised over $150mn since its 2012 foundation, with its latest Series D in 2019 raising $72.5mn

IBM Watson

- Operating on any cloud system, IBM's Watson Studio allows for the building and training of AI models. It is one of the core services of IBM Cloud Pak for Data, a multicloud data and AI platform. Together with IBM Watson® Machine Learning and IBM Watson® OpenScale™, Watson Studio provides tools for data scientists, application developers and subject matter experts to collaborate and easily work with data to build, run and manage models at scale.
- You can deploy IBM Cloud Pak for Data in your private clouds (inside the firewalls), hybrid clouds, Amazon Web Services (AWS), Microsoft Azure and Google Cloud
- In 2020, the revenue of IBM reached more than 73 billion U.S. dollars

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution

Department of MBA

Third Semester Internal Assessment Test I **8th December 2021**

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**

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution

Department of MBA

Third Semester Internal Assessment Test I 8th December 2021

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

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

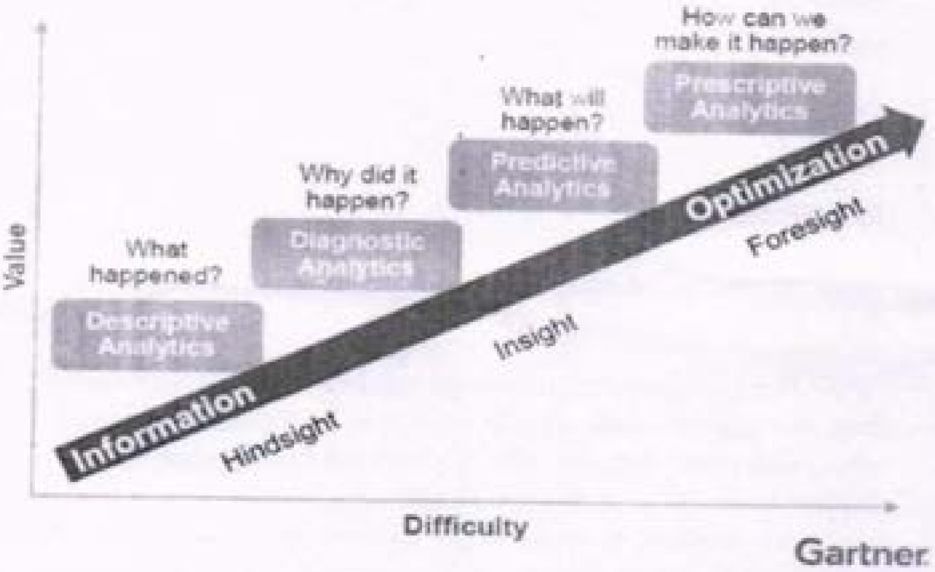
Department of MBA

Scheme of Evaluation

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 Explanation 7m

PRINCIPAL
SIET., TUMAKURU.

	Personalize the customer experience Inform business decision-making Streamline operations Mitigate risk and handle setbacks Enhance security	
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

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA

III Semester Internal Assessment Test I – 7th Dec 2021

20MBAHR303: RECRUITMENT AND SELECTION

Duration: 1½ Hrs **Max. Marks: 50**

Answer the following questions.

1. a. Differentiate between work and job. **03 Marks**
   b. Explain the Recruitment Metrics in detail. **07 Marks**
   c. Explain the key characteristics and types of Millennials at work place **10 Marks**

2. a. Define strategic job redesign. **03 Marks**
   b. Explain the process of preparing a job description. **07 Marks**
   c. What makes a bad recruitment? Explain in detail about the mistakes an organization should avoid **10 Marks**

3. a. Define Job Analysis. **03 Marks**
   b. Define Competency. Explain the Competency Iceberg Model in detail **07 Marks**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognized by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA

III Semester Internal Assessment Test I – 7th Dec 2021

20MBAHR303: RECRUITMENT AND SELECTION

Duration: 1½ Hrs Max. Marks: 50

Answer the following questions.

1. a. Differentiate between work and job. 03 Marks
   b. Explain the Recruitment Metrics in detail. 07 Marks
   c. Explain the key characteristics and types of Millennials at work place 10 Marks

2. a. Define strategic job redesign. 03 Marks
   b. Explain the process of preparing a job description. 07 Marks
   c. What makes a bad recruitment? Explain in detail about the mistakes an organization should avoid 10 Marks

3. a. Define Job Analysis. 03 Marks
   b. Define Competency. Explain the competency Iceberg Model in detail 07 Marks

---

PRINCIPAL
SIET., TUMAKURU

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA

Scheme of Evaluation

Subject : Recruitment and Selection	**Code: 20MBAHR303**
Max marks: 50	**No Choice**
03 Marks - 03 questions	**Meanings and definitions**
07 Marks - 03 questions	**02 marks for listing and 05 marks for explanation**
10 marks – 02 questions	**03 marks for listing and 07 marks for explanation**

Sl. No	**Answer script**	**Marks**
1.a	The term '**work**' is the most commonly used word in our day to day life, which refers to the activities, i.e. physical or mental performed by us, so as to achieve the desired outcome. It includes everything that we do to get the intended result like studying, dancing, cooking, singing, playing, etc. On the contrary, the word '**job**' is used by us to represent a particular position in the company, **for instance**, a sales manager job (designation). It is a regular and constant activity performed by the employee, for adequate consideration.	**03 Marks**
2.a	**Recruitment metrics:** 1. **Time to fill** Time to fill in the time it takes to identify a candidate and fill an open position in your organisation. Tracking Time to fill is imperative because it directly impacts your ability to onboard the most lucrative talent. 2. **Time in process step** These recruiter productivity metrics describe the time a candidate spends in each step. You should be able to see this rate in your ATS. Examples of process steps include phone screens, submissions to the hiring manager, and interviews. 3. **Quality of hire** Quality of Hire (also known as First-Year Quality), is the percentage of candidates submitted by recruiters who are accepted for employment plus the percentage of these that do not leave, divided by two 4. **Interview to Hire ratio** Another way to quantify the Quality of Hire is with the Interview to Hire metric. This recruitment metric	

PRINCIPAL
SIET., TUMAKURU

calculates the percentage of candidates submitted by the recruiting function that is ultimately hired

5. **Offer acceptance rate**
   Essentially, it's a comparison between the number of candidates given a job offer and the number that accept
6. **Candidate net promoter score**
   Net Promoter Score (NPS) is a metric commonly used to gauge consumer satisfaction, but it can also gauge the satisfaction of candidates. To measure NPS, ask candidates: "How likely are you to recommend this experience to a friend or colleague?" on a scale of 0-10
7. **Cost to fill**
   Cost to fill is a metric that measures the average cost to fill a position, from candidate attraction to onboarding.

c.

Characteristics of Millennials :

- Socially Conscious
- Technology-based
- Ethnically Diverse and Optimistic
- Embrace Experiences and Ethical Spending
- Health Conscious
- Financially Conscious
- Spiritually Conscious

Types of Millennials

- Global Givers
- Up and Comers
- Traditionalists
- Nostalgics
- Trendsetters
- Skeptics

2.a

Strategic job redesign: Restructuring the elements including tasks, duties and responsibilities of a specific job in order to make it more encouraging and inspiring for the employees or workers is known asstarategic job redesigning. The process includes revising, analyzing, altering, reforming and reshuffling the job-related content and dimensions to increase the variety of assignments and functions to motivate employees and make them feel as an important asset of the organization at the strategic level.

b.

process of preparing a job description:

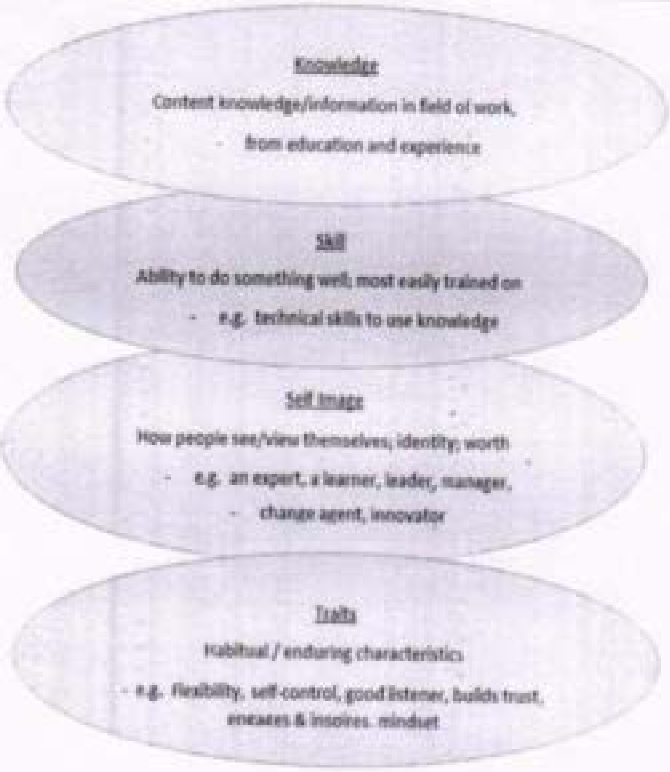
Step 1: Perform a Job Analysis

This process of gathering, examining and interpreting data about the job's tasks will supply accurate information about

	the job so that an organization can perform efficiently **Step 2: Establish the Essential Functions** Once the performance standard for a particular job has been made, essential functions of the position must be defined. **Step 2: Establish the Essential Functions** Once the performance standard for a particular job has been made, essential functions of the position must be defined. This will provide a better avenue for evaluating Americans with Disabilities Act (ADA) accommodation requests **Step 4: Add the Disclaimer** It is a good idea to add a statement that indicates that the job description is not designed to cover or contain a comprehensive listing of activities, duties or responsibilities that are required of the employee. Duties, responsibilities and activities may change or new ones may be assigned at any time with or without notice. **Step 5: Add the Signature Lines** Signatures are an important part of validating the job description. They show that the job description has been approved and that the employee understands the requirements, essential functions and duties of the position. Signatures should include those of the supervisor and of the employee. **Step 6: Finalize** A draft of the job description should be presented to upper management and the position supervisor for review and approval. A draft allows a chance to review, add or subtract any detail before the final job description is approved.	
c.	**Mistakes an organization should avoid**:\\ • Failing to prepare an accurate job description • Failing to consider recruitment from within • Relying too much on the interview • Using unconscious bias • Hiring people less qualified than you • Rejecting and over qualified candidate • Waiting for the perfect candidate	

PRINCIPAL
SIET., TUMAKURU.

	- Rushing the process/hire - Relying too much on references - Expecting too much too soon from the new hire	
3. a	**Job analysis** is a family of procedures to identify the content of a job in terms of the activities it involves in addition to the attributes or requirements necessary to perform those activities. The job analysis specifies how each job is performed, step by step, allowing HR professionals to develop training materials to teach trainees how to perform each task. An example of a job analysis-based form would be one that lists the job's tasks or behaviors and specifies the expected performance level for each.	
b.	**A competency** is a cluster of highly interrelated attributes, including knowledge, skills, and abilities (KSAs) that give rise to the behaviors needed to perform a given job effectively. Competencies can be either technical or behavioral. Technical competencies reflect the knowledge required to perform a specific role. Behavioral competencies reflect the social role, self – image, traits and motives required to perform a job. **Competency Ice-Berg Model :** 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. **Components of the model:**	

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
I Semester II Internal Assessment Test, April 2022
Subject: Business Statistics (20MBA14)

Time: 90 Minutes **Max. Marks: 50**

Answer the following Questions:

1.a) For a variables x and y, it was computed that $b_{xy} = 0.85$, $b_{yx} = 0.89$ and $\sigma_x = 8$. Establish the relationship between the variables x and y. **03 Marks**

b) Define Correlation? Explain the types of correlation? **07 Marks**

c) Calculate spearman's rank correlation coefficient between advertisement cost ('000 Rs) and sales (lakhs Rs) from the following data and interpret your results. **10 Marks**

Advertisement cost	57	16	24	65	16	16	9	40	48	33
Sales:	19	6	9	20	4	15	6	24	13	13

2.a) Define Linear Regression? **03 Marks**

b) Calculate standard deviation and coefficient of variation from the following data: **07 Marks**

Age under (in year)	10	20	30	40	50	60	70	80
Number of persons dying	15	30	53	75	100	110	115	125

c) Calculate the value of the correlation coefficient for the following data? **10 Marks**

Student	A	B	C	D	E	F	G
Absences(x)	6	2	15	9	12	5	8
Grade (y)	82	86	43	74	58	90	78

3.a) The following data relate to the scores obtained by salesman of a company in an intelligence test and their weekly sales in thousands of rupees: **10 Marks**

Salesman	A	B	C	D	E	F	G	H	I
Test Score:	50	60	50	60	80	50	80	40	70
Weekly sales	30	60	40	50	60	30	70	50	60

Obtain the regression line of sales on intelligence test score of the salesmen. If the intelligence test score of salesmen is 65, what would be his expected sales?

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
I Semester II Internal Assessment Test, April 2022
Subject: Business Statistics (20MBA14)
Scheme of Evaluation

1.a) r= 0.869 **3 Marks**
σy = 8.2

1.b) Correlation analysis is used as a statistical tool to ascertain the association between two variables. The problem in analyzing the association between two variables can be broken down into three steps:

- Try to know whether the two variables are related or independent of each other.
- If there is a relationship between the two variables, then know its nature & strength. (i.e., positive/negative; how close is that relationship)
- Know if there is a causal relationship between them. i.e., variation in one variable causes variation in another. **(3+4=7 Marks)**

Types of Correlation

- Positive and negative
- Linear and non-linear
- Simple, partial and multiple

1.c) **(3+3+4 = 10 Marks)**

R1	2	8	6	1	8	8	10	4	3	5
R2	3	8.5	7	2	10	4	8.5	1	5.5	5.5
(R1-R2)2	1	.25	1	1	4	16	2.25	9	6.25	.25

R = 1-(6(41+6.5+.5+.5))/990) = 1-.29 = 0.706

2.a) In statistics, linear regression is a linear approach for modelling the relationship between a scalar response and one or more explanatory variables (also known as dependent and independent variables). The case of one explanatory variable is called *simple linear regression*; for more than one, the process is called multiple linear regression. **3 Marks**

2.b) Σf = 125, Σfd = 20 fd2 = 48,800. Mean = 35.16 **(3+2+2 = 7 Marks)**
σ = 19.75. CV = 56.17

2.c) Σdx= -6, Σdy= -7, Σdx2 = 120, Σdy2 = 1697, Σ xdy = -410
r = -0.944 **(3+3+4 = 10 Marks)**

3) Y-50 = 0.75 (x-60) **(3+3+4 = 10 Marks)**

At X = 65 Y = 53.75. if the test score is 65 then the Weekly sales is Rs 53750/-

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA
I Semester Internal Assessment Test II – 28th April 2022
20MBA11: Management and Organizational Behavior

Duration: 1½ Hrs **Max. Marks: 50**

Answer the following questions.

1. a. Define Organizational Behavior. **(03 Marks)**
   b. Explain the Goals and Importance of OB. **(07 Marks)**
   c. Explain in detail the Approaches to Organizational Behavior. **(10 Marks)**

2. a. "Resistance to control affects the Organizational Effectiveness". Explain **(03 Marks)**
   b. Explain the different Types of Control. **(07 Marks)**
   c. Define Decision-making. Explain the Decision-making Models with its difficulties in implementation. **(10 Marks)**

3. a. What is Centralization and Decentralization of Authority. **(03 Marks)**
   b. Explain in detail Elements and Principles of Directing. **(07 Marks)**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.

Department of MBA

Scheme of Evaluation – Internal Assessment II

Subject : Services Marketing	**Code: 20MBAMM303**
Max marks: 50	**No Choice**

Sl. No	Answer Script	Marks 50
1.a	**Organizational Behavior:** The field of organisational behaviour deals with human behaviour in organisation. It is the multidisciplinary field that seeks knowledge of behaviour in organisational settings by objective based on studying individual, group and oganisational processes. The role and field of organisation behaviour is not only concerned with a particular organisation. The concepts and approaches of organisation behaviour are also more concerned with the society. 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."	**03 Marks**
b.	**Goals of Organizational Behaviour:** 1. To describe 2. To understand 3. To predict 4. To control **Importance of Organizational Behaviour** 1. Understanding the relationship between an organisation and its employees 2. Motivating employees 3. Improving industrial/ labour relations 4. Effective utilisation of Human Resource 5. Predicting human behaviour	**07 marks 02 Marks for listing and 05 Marks for explanation**
c.	**Approaches to Organizational Behaviour:** **1. Human Resources Approach** The human resources approach is concerned with the growth and development of peopletowards higher levels of competency, creativity and fulfillment, because people are the central resource in any organization. This approach help employees become better in terms of work and responsibility and then it tries to create a climate in which they can	**10 Marks** **03 Marks for listing and 07 marks for explanation**

PRINCIPAL
SIET., TUMAKURU.

	contribute to the best of their improved abilities. **2. A Contingency Approach** Situations are much more complex than first perceived and the different variables may require different behavior which means that different environments required different behavior for effectiveness. Each situation much be analyzed carefully to determine the significant variables that exist in order to establish the kinds of practices that will be more effective. **3. Productivity Approach** Productivity is a ratio that compares units of output with units of input. It is often measured in terms of economic inputs and outputs. Productivity is considered to be improved, if more outputs can be produced from the same amount of inputs. It helps in measuring the organizations effectiveness, it also reveals the managers efficiency in optimizing the resources. **4. Systems Approach** A system is an interrelated part of an organization or a society that interacts with everyone related to that organization or society and functions as a whole. Within the organization 'people' employ 'technology' in performing the 'task' that they are responsible for, while the 'structure' of the organization serves as a basis for co-ordinating all their different activities. **5. An Interdisciplinary Approach** It is integrating many disciplines. It integrates social sciences and other disciplines that can contribute to Organizational Behavior. It draws from these disciplines any ideas that will improve the between people and organization **6. Scientific Management Approach** The fundamental concern of the scientific management school was to increase the efficiency of the worker basically through good job design and appropriate training of the workers. Taylor is the father of the scientific management movement and he developed many ides to increase organizational efficiency	
2.a	**"Resistance to control affects the Organizational Effectiveness":** Resistance to control results in the following: • Delay in work • Change in attitude • Behavioral displacement	**03 Marks**
b.	**Types of control:** 1. **Feedback control**: Feedback control involves gathering information about a past activity or action, and evaluating that information, and taking steps to improve similar activities or action in the future. Feedback control is	**07 Marks** **02 marks** **for listing**

	historical in nature and is also known as post-action control 2. **Concurrent control:** The process of monitoring and adjusting ongoing activities and processes is known as concurrent control. Concurrent controls are dynamic engagement in a current process where observations are made in real-time. Such controls are not necessarily proactive, but they canprevent problems from getting worse. 3. **Feedforward:** controls are future-directed, they attempt to detect and anticipate problems or deviations from the standards in advance of their occurrence. They are in-process control and are very active, aggressive in nature, allowing corrective action to be taken in advance of the problem. 4. **Behavioral control:** Behavioral control involves direct evaluation of managerial and employee decision making, not the results of managerial decisions. Behavioral control identified rewards for a wide range of criteria, such as in a balanced scorecard 5. **Financial and non-financial controls**: Financial controls involve the management of a firm's costs and expenses so that they can be controlled in relation to budgetary amounts. At a strategic level, total sales and indicators of profitability will be relevant strategic controls.	**and 04 marks for explanation**
c.	**Decision Making Models in Organizations:** **A.The Rational Model** To improve how we make decisions in organizations, we must understand the decision-makingerrors people commit. The Rational Model consists of 6 steps Step 1: Defining the problem Step 2: Identify the decision criteria important to solving the problem. Step 3: Weight the previously identified criteria in order to give them the correct priority in thedecision. Step 4: Generate possible options that could succeed in resolving the problem.Step 5: Rate each option on each criterion. Step 6: The final step is to compute the optimal decision. **B. Bounded Rationality Model** When faced with a complex problem, most people respond by reducing the problem to a level at which it can be readily understood. Individuals operate within the confines of bounded rationality. They construct simplified models that extract the essential features. How does bounded rationality work? Once a problem is identified, the search for criteria and options begins. The decision maker will identify a limited list made up of the more conspicuous choices, which are easy to find, tend to be highly visible, and they will represent familiar criteria and previously tried-and-true solutions. **C.Retrospective decision model:** This decision-making model focuses on how decision-makers attempt to rationalise their choices after they have been made and try to justify their	**10 Marks** **03 marks for listing and 07 marks for explanation**

	decisions. This model has been developed by Per Soelberg.	
3a.	**Centralisation and decentralisation of Authority:** An organisation structure can be said to be centralised when all the power for decision making rests at a single point in the organisation – frequently in the hands of one person. An organisation can be said to be decentralised when decision making power is dispersed among many people throughout the organisation.	**03 Marks**
b.	**Elements of Directing:** **(1) Supervision:** It refers to monitor the progress of routine work of one's subordinates and guiding them properly. Supervision is an important element of the directing function of management. **(2) Communication:** It refers to an art of transferring facts, ideas, feeling, etc. from one person to another and making him understand them. A manager has to continuously tell his subordinates about what to do, howto do, and when to do various things. **(3) Leadership:** It refers to influence others in a manner to do what the leader wants them to do. Leadership plays an important role in directing. Only through this quality, a manager can inculcate trust and zeal among his subordinates. **(4) Motivation:** It refers to that process which excites people to work for attainment of the desired objective. Among the various factors of production, it is only the human factor which is dynamic and provides mobility to other physical resources **Principles of Directing:** **1.** Maximum Individual Contribution **2.** Harmony of Objectives **3.** Unity of Command **4.** Appropriate Direction Technique **5.** Managerial Communication **6.** Use of Informal Organization **7.** Leadership **8.** Follow Through	**07 marks 02 marks for listing and 05 marks for explanation**

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA

Third Semester Internal Assessment Test I 6th December 2021

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**

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA

Third Semester Internal Assessment Test I 6th December 2021

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**

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.

Department of MBA

Scheme of Evaluation

III Sem20MBA301 :Emerging Exponential TechnologiesMax.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 16^{th}centuary. 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).	

PRINCIPAL
SIET., TUMAKURU

	• 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	

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

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
TUMAKURU-572106
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: III
COURSE: Computer Networks and Security(18CS52)

DATE: 23/01/23
MAX MARKS: 40 SEM: V

NOTE: Answer the TWO full questions Q1 or Q2 and Q3 or Q4

1 a) Explain distance vector algorithm with an example. 6M[CO3

b) Write the link state algorithm and apply it to the following graph with source node is'A'. 7M[CO3

c) List the broadcast routing algorithms. Explain any two of them. 7M [CO3

(OR)

2 a) Explain the intra-AS routing protocol in detail. 6M[CO3]

b) Discuss about the uncontrolled flooding and controlled flooding in broadcast routing algorithm. 7M[CO3]

c) What are the elements of network security? Explain the threats to network security. 7M[CO4]

3 a) Briefly explain the steps of DES algorithm along with diagram. 6M[CO4]

b) Explain RSA algorithm. Using RSA algorithm encrypt a message m=9. Assume p=3 and, Find the public and private keys and also show the cipher text. 7M[CO4]

c) Discuss about (i) Cryptographic techniques (ii) Authentication techniques. 7M[CO4]

(OR)

4 a) Explain the RTP protocol header fields. 6M[CO5]

b) Briefly explain the properties of Audio and Video. 7M[CO5]

c) What do you mean by jitter and how to remove jitter at the receiver for audio by fixed and adaptive play out delay. 7M[CO5]

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
TUMAKURU-572106
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

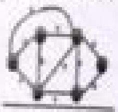
INTERNAL ASSESMENT TEST: III
COURSE: Computer Networks and Security(18CS52)

DATE: 23/01/23
MAX MARKS: 40 SEM: V

NOTE: Answer the TWO full questions Q1 or Q2 and Q3 or Q4

1 a) Explain distance vector algorithm with an example. 6M[CO3]

b) Write the link state algorithm and apply it to the following graph with source node is'A'. 7M[CO3]



c) List the broadcast routing algorithms. Explain any two of them. 7M [CO3]

(OR)

2 a) Explain the intra-AS routing protocol in detail. 6M[CO3]

b) Discuss about the uncontrolled flooding and controlled flooding in broadcast routing algorithm. 7M[CO3]

c) What are the elements of network security? Explain the threats to network security. 7M[CO4]

3 a) Briefly explain the steps of DES algorithm along with diagram. 6M[CO4]

b) Explain RSA algorithm. Using RSA algorithm encrypt a message m=9. Assume p=3 and, Find the public and private keys and also show the cipher text. 7M[CO4]

c) Discuss about (i) Cryptographic techniques (ii) Authentication techniques. 7M[CO4]

(OR)

4 a) Explain the RTP protocol header fields. 6M[CO5]

b) Briefly explain the properties of Audio and Video. 7M[CO5]

c) What do you mean by jitter and how to remove jitter at the receiver for audio by fixed and adaptive play out delay. 7M[CO5]

PRINCIPAL
SIET., TUMAKURU

Computer Networks & Security.

I a) Explain distance Vector algorithm with an example.

=>

The distance vecto routing algorithm works by having each router maintain a routing table. giving the best-known distance from source to destination and which route is used to get there neighbours nodes.

-> Distributive. Iterative. Asynchronous.

-> $D_x(y)$ - distance in least-cost path from node x to node y.

-> Bellman-Ford Equation:

-> $D_x(y) = \min\{c(x,v) - D_v(y)\}$

Algorithm :-

At each node x.

```
1. Initialization
2. for all destination node N.
3.    $D_x(y) = c(x,y)$
4. for each neighbour w
5.    $D_w(y) = ?$ for all destination in N
6.    for each neighbor w
         distance vector $D_x = (D_x(y)$ y in N]
7.
```

```
Loop
    wait (until I see alink cost change a
            I recieve a DV from neighbor w)
    for each y in N.
        $D_x(y) = \min_v\{c(x,v) + D_v(y)\}$
    if $D_x(y)$ is changed
        send DV to all neighbors
forever.
```

2) a) Explain the intra AS routing protocol in detail.

=> The routing with an autonomous System is Called AS routing protocol

- All routers in Same AS must have Same routing protocols.
- Here Each router towards the packet along the Optimal path.

Intra AS Routing Protocols.

The Routing protocols between the autonomous System is called Intra-As Routing protocols.

=> Here Gateway routing are used to Connected As to each other.

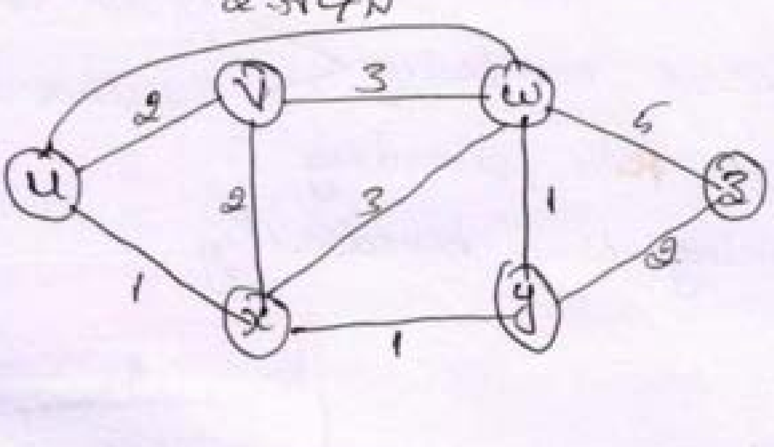
=> Gateway router are responsible for forwarding packet to destination outside the AS

1(b) Link State algorithm :-

Algorithm

```
Initialization
N' = {u}
for all nodes v
  if v is a neighbor of u
    then $D(v) = c(u.v)$
  else
    $D(v) = \infty$
find w not in N' such that D(w) is minimum
add w to N'
update D(v) for each neighbor v of w and
        not in N'
  $D(v) = \min\{D(v). D(w) + c(w.v)\}$
until N' = N
```

2 steps



PRINCIPAL
SIET., TUMAKURU

Step	N'	D(v) p(v)	D(w) p(w)	D(x) p(x)	D(y) p(y)	D(z) p(z)
0	u	2. v	5. w	1. x	∞	∞
1	ux	2. v	4. x	1. x	2. x	∞
2	uxy	2. v	3. y		2. x	4. y
3	uxyv	2. v	3. y			4. y
4.	uxyvw		3. y			4. y
5.	uxyvwz					

c) Broadcast Routing Algorithm :-

(1) Uncontrolled Broadcast : Each router receive packets from sender and duplicates the packets the send duplicates packets from sender to receiver.

It uses Broadcast storm.

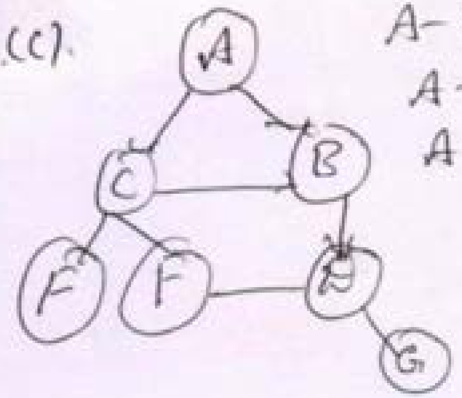
(2) Controlled (Broadcast) Flooding

-> Sequence numbering < source address, sequence no

-> Reverse path forwarding

-> Spanning tree broadcasting

1.(c).



A-B-D-C
A-C-F
A-C-E

Sapanning Tree Broadcast

·Cost of tree - Source of costs of all the edges.

→ Connects all the nodes that are their in tree.
present in graph

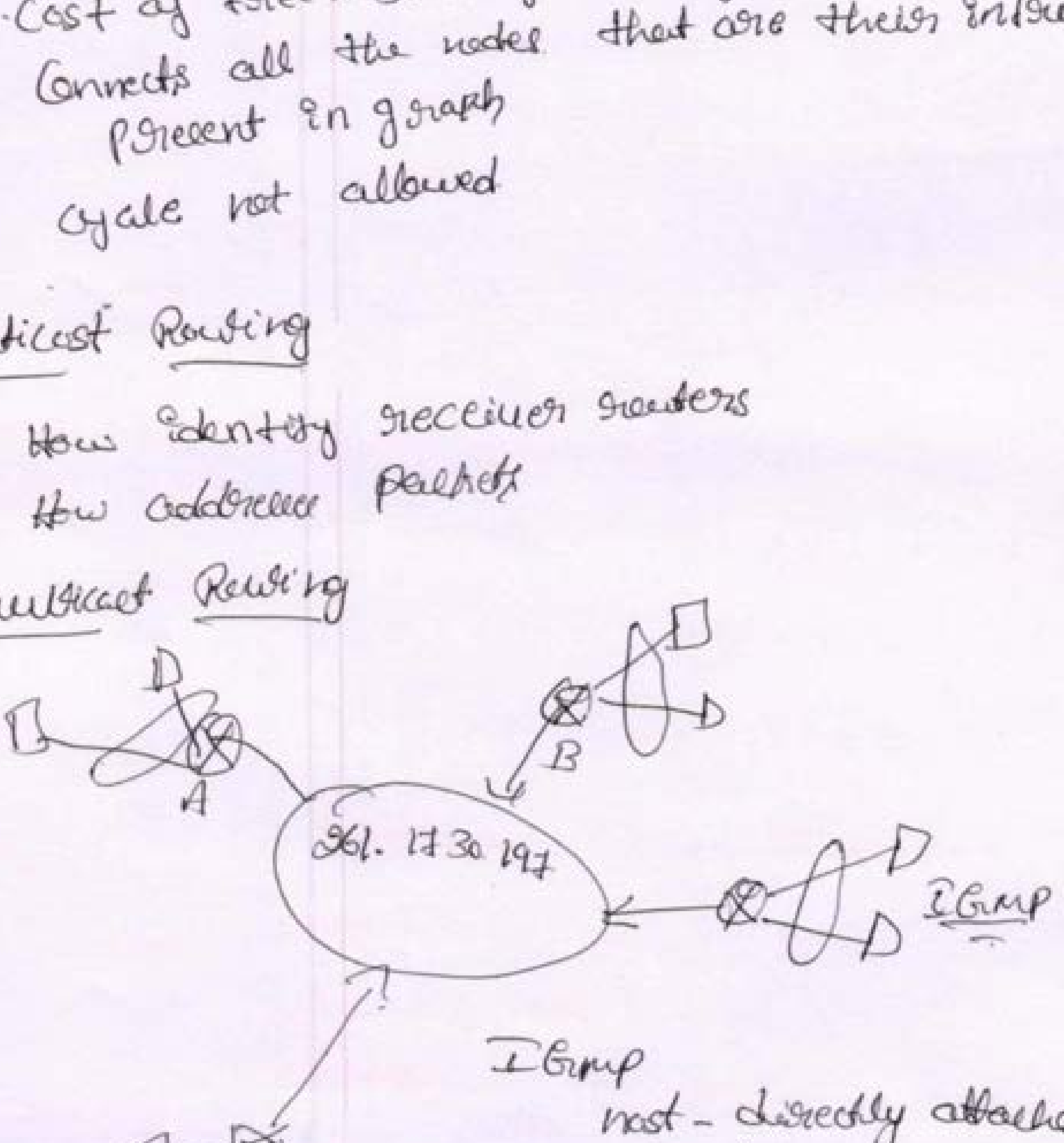
→ cycle not allowed

multicost Routing

→ How identify receiver routers

→ How addresses packets

multicast Routing



IGmp
host - directly attached router

↳ membership - query

↳ —u— Report

↳ leave graph

Two Main task :->

It is obtaining the reachability to neighbours is propagating reachabilities to all routers.

Intra AS Routing in the Internet [RIP].

=> This is also known as interior gateway protocols
=> Intra AS routing protocol is used to deter-mine that how routing is performed in AS.

b) Discuss about the uncontrolled flooding & Controlled flooding in broadcast routing algorithm.

=> Uncontrolled flooding:- Here Source Node Send a Copy of Packet to all Neighbours.

- When Node receives a packet them Node duplicate and forward the packet to all Neighbours.
- It Connected graph. a Copy of packet is derived to all graph.

Advantages:-

- If Graph has Cycle then loop will be execute which mode to indefenately.

Controlled flooding :- Broadcast storm can be avoided by using judiciary Selection that when we have to a packet & when we dont.

The Methods are there for Controlled flooding:-

i) Sequence number Controlled flooding.

- Here a Source Node puts it address as Well as broadcast Sequence no. into broadcast packet.

*) Sends the packet to all Neighbours

c) What are the elements of Network Security ? Explain the threads to Network Security.

=>. Elements of Network Security:->

i) Confindentiability:-> the information Should be available to only those who have rights to access it (or) authorized person

ii) Authenticity and integrity:-> The Sender of the msg and the message itself will be Verified at the receiver side. So that the clear view will emerge from this.

Threads to Network Security./ Classification of Network attacks.

Network threads are of So many types but they are broodly classified into 4 categories.

i) DNS Hacking.

ii) Packet mismatching.

iii) Routing Table poisoning.
iv) Denial of Seavices (DOS).

DNS Hacking.

i) DNS stands for Domain Name Seavers. It is a distributed heirarchy & global directory which converts Domain Names into IP address.

ii) DNS itself is a Critical infrastructure so all hosts Contact, DNS to access the Seaver and start connect.

3] a) Briefly Explain the steps of DES algorithm along with diagram.

=> Message is Converted in 64 bit block & each block is encrypted using a key.

* the length of the key is 56 bits.
* the DES Consist 16 identical round of Operation:-

DES algorithm. [DES and AES are Segmentric Encryption]. Secret key encryption

* It is a block Cipher of 64 bits
* It Converts plain text to Ciphear text.

Algorithm

1] Before round 1 begin. all 64 bits of message & bits of the Secret key Separately Permitted.

3] Each incoming 64 bits msg is broken into two halves of 32 bits & it is known as Li & Ri.

4] All 56 bits of key are permitted & produce version ki of the key on roundi

5] Li & Ri of msg are determined by :-

$L_i = R_{i-1}$

and

$R_i = L_{i-1} \oplus F(R_{i-1}, k_i)$,,

6] All 64 bits of msg are also permitted.

function 'F()' Operation.

b] Explain RSA algorithm. Using RSA algorithm encrypt a message m= 9, Assume P=3 and, find the public & private keys and also show the cipher text.

⇒ RSA Algorithm.

If we have to convert a plain text "m" into cipher text "c". So it will go to three phase.

i) Key Generation.
ii) Encryption
iii) Decryption.

1] choose two prime number a & b.

2] Calculate n = a.b

3] calculate $\phi(n) = (a-1)(b-1)$

take a=13 b=17,

$\phi(n) = (13-1)(17-1) = 192$.

5] Calculate 'd' such that $de \bmod \phi(n) = 1$

(or)

$$de \equiv 1 \bmod \phi(n).$$

for eg:-

$$d \times 35 \bmod 192 = 1$$

$$de = 1 + k\phi(n). \quad k = 0,1,2$$

$$d = \frac{1 + k\phi(n)}{e}$$

$$= \frac{1 + 0 \times 192}{35} = \frac{1}{35}$$ so this is decimal we will not consider.

Now $k = 1$

so,

$$d = \frac{1 + 1 \times 192}{35} = \frac{193}{35} = 5.5.$$ so this is also not acceptable.

Now $k = 2$

$$d = \frac{1 + 2 \times 192}{35} = 11$$ so this is value of d.

c] Discuss about (i) Cryptographic Techniques (ii) Authentication techniques.

=> i) Cryptographic techniques :-

On this method it is a process of transforming a piece of information shared b/w two parties in sort way. means, the message / information will be breakdown in code.

The original message scrambled before transmission and outside will not be able to detect the message

At receiver end the scrambled message starts to be do decoding for further transmission

-> The main tool to encrypt a message M is a secret key 'K'

-> The fundamental operation which is used to encrypt a message is Exclusive OR (⊕)

<u>Authentication</u> <u>technique</u> :-

Encryption allows the message transmission fully & the proper fetching of message is ensure by authentication technique

it is categorized as:-

i) authentication with message digest

ii) authentication with digital signature

There are two methods to encrypt a message

is i) DES (Data encryption standard)

ii) AES (Advance encryption -ıı-)

PRINCIPAL
SIET., TUMAKURU

Sri Shridevi Charitable Trust (R.)

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

SHRIDEVI EDUCATION

(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org

An ISO 9001:2015 Certified Institution

INTERNAL ASSESMENT TEST: I
SUB : APPLICATION DEVELOPMENT USING PYTHON (18CS55)
SEM : V

DATE: 14/11/2022
MAX MARKS : 40
TIME : 90 min

USN: ☐☐☐☐☐☐☐☐☐☐

NOTE: Answer TWO full questions

1 a. Explain String Concatenation and Replication and demonstrate with a program? 10M [CO1]
b. Explain if, else, elif control statements and demonstrate with a program? 10M [CO1]

OR

2 a. Explain while, break, continue statements and demonstrate with a program? 10M [CO1]
b. Explain for loops and range() functions and demonstrate with a program? 10M [CO1]

3 a. Explain the Importing Modules and Ending a Program Early with sys.exit() with program? 10M [CO1]
b. Explain def Statements with Parameters, Return Values and return Statements and global Statement and demonstrate with a program? 10M [CO1]

OR

4 a. Explain the Local and Global Scope with examples, and demonstrate with a program? 10M [CO1]
b. What are Blocks of Code? What are the rules for defining blocks, demonstrate with a program? 10M [CO1]

****

Sri Shridevi Charitable Trust (R.)

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

SHRIDEVI EDUCATION

(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org

An ISO 9001:2015 Certified Institution

INTERNAL ASSESMENT TEST: I
SUB : APPLICATION DEVELOPMENT USING PYTHON (18CS55)
SEM : V

DATE: 14/11/2022
MAX MARKS : 40
TIME : 90 min

USN: ☐☐☐☐☐☐☐☐☐☐

NOTE: Answer TWO full questions

1 a. Explain String Concatenation and Replication and demonstrate with a program? 10M [CO1]
b. Explain if, else, elif control statements and demonstrate with a program? 10M [CO1]

OR

2 a. Explain while, break, continue statements and demonstrate with a program? 10M [CO1]
b. Explain for loops and range() functions and demonstrate with a program? 10M [CO1]

3 a. Explain the Importing Modules and Ending a Program Early with sys.exit() with program? 10M [CO1]
b. Explain def Statements with Parameters, Return Values and return Statements and global Statement and demonstrate with a program? 10M [CO1]

OR

4 a. Explain the Local and Global Scope with examples, and demonstrate with a program? 10M [CO1]
b What are Blocks of Code? What are the rules for defining blocks, demonstrate with a program? 10M [CO1]

verified

PRINCIPAL
SIET, TUMAKURU

18CS55

Internal Assesment Test : 1 Scheme of Evaluation

Application Development Using Python

① Explain String Concatenation and Replication and demonstrate with a program
ⓐ

→ String concatenation is the technique of combining two strings, string concatenation can be done using many ways

ⓘ using + Operator ⓘⓘ using join() method ⓘⓘⓘ using % Operator
ⓘⓥ using format () function ⓥ using (comma) ; -5M

Replication :- the Replication Operator acts as a replication operator when we have one String and one integer as operands

Ex for concatenation

```
var1 = "Hello"
var2 = "world"
var3 = var1 + var2
print(var3)
```

output
Helloworld

-5M

Ex for Replication

```
num = " bye "
num * 3
```

output
byebyebye

① Explain if, else, elif control statements and determonstrate with a program
ⓑ

→ if statement :- it is a condition statement in python, that is used to determine whether a block of code will be executed or not

→ elif statement :- it is used when the first if statement isn't true, but want to check for another condition.

→ else statement :- it is used in conditional statement and decides what to do if the condition is false -5M

if statement Ex :-

```
number = 10
if number > 0:
    Print ('Number is +Ve')

print ('the if statement is
        easy ')
```

else & elif statement Ex :-

```
number = 0
if number > 0:
    print ("+ ")
elif number = = 0:
    print (" zero ")
else:
    print (" Negative number")
```

PRINCIPAL
SIET., TUMAKURU

5M

② Explain while, break, continue statements and demonstrate
ⓐ with a program?

→ **while**:- it exicute the set of statements repetdly untill condition fail, once condition fail it come out of from the loop

→ **Break statement**: it is used to terminate the loop containing the statement and brings the control out of loop

→ **continue statement**:- it is used to end the current iteration in a for loop (or) a while loop and continues to the next iteration.

-5M

Example for while loop

```
i = 1
n = 5
while i <= n:
    print(i)
    i = i+1
```

Example for Break statement

```
for i in range(5):
    if i == 3:
        break
    print(i)
```

Example for continue statement

```
while True :
    if x == 10 :
        continue
    print(x)
```

-5M

② Explain for loops and range() functions and demonstrate
ⓑ with a program?

for loop:- it is used for iterating over a sequence (that is either a list, a tuple, a dictionary, a set, (or) a string).

range():- it returns a sequence of numbers, starting from 0 by default and increments by 1 (by default), and ends at a specified number.

Example for for loop

```
fruits = ["apple", "banana",
"cherry"]
for x in fruits:
    print(x)
```

Example for range ()

Ex1:-
```
for x in range(6):
    print(x)
```

-5M

Ex2:-
```
for x in range(2,6):
    print(x)
```

Ex3:-
```
for x in range(2,30,3):
    print(x)
```

5M

3] a) Explain the Importing Modules & Ending a program Early with sys.exit() with program?

- * All Python programs can call a basic set of functions called built-in functions, including the print(), input(), & len() functio
- * Python also comes with a set of modules called the std libra-ry.
- * Each module in Python program contains related grp of functio

```
import random
for i in range(5):
    Print (random.randint (1, 10))
```

o/p:

```
4
1
8
4
1
```

-5M

- * The last flow control concept is how to terminate the program. This always happen if the program executio reaches the bottom of the instructions.

```
import sys
while True:
  Print ('Type exit to exit.')
  response = input()
  if response = = 'exit':
    sys. exit ()
  Print ('You typed'+ response + '.')
```

-5M

3] b) Explain def statements with parameters, Return values & return statements & global statement & demonstrate with a program?

- When we call the print() or len() function, we pass in values, called arguments in this context, by type them b/w parenthesis.

```
def hello (name):
Print ('Hello'+ name)
```

o/p: Hello Alice.

- → * The value that a function call evaluates to is called the return value of the function.
- * It consist of return keyword.
- * The value or expression that the function should return.

```
def return_multiple_values():
    return 1,2,3
Print(return_multiple_values())
Print(type(return_multiple_values()))
```

O/P: (1,2,3)

- → * If we need to modify a global variable from within a fun use the global statement.
- * In this eggs refers to the global variable, so don't create a local variable with this name.

```
def spam():
    global eggs
    eggs = 'spam'
eggs = 'global'
spam()
Print(eggs)
```

op:- spam

5×2M=10M

4] a) Explain the local & Global scope with examples, and demonstrate with a program?

- Parameters & variables that are assigned in a called function are said to exist in that function's local scope.
- variables that are assigned outside all functions are said to exist in the global scope.
- A variable that exists in a local scope is called a local variable, while a variable that exists in the global scope is called a global variable. $\boxed{5M}$
- A variable must be one / the other; it cannot be both local and global.
- When a scope is destroyed, all the values stored in the scope's variable are forgotten.
- When your program terminates, the global scope is destroyed

Ex:
```
var global = 10;  (global variable)
function fun() {
    var local = 5;  (local variable)      5M
}
```

4] b) What are Blocks of code? What are the rules for defining blocks, demonstrate with a program.

→ Lines of python code can be grouped together in blocks. There are 3 rules for blocks.

① Blocks begin when the indentation increases.
(ii) Blocks can contain other blocks.
(iii) Blocks end when the indentation decreases to zero or to a containing block's indentation. $\boxed{5M}$

```
   if name == 'mary':
①    print ('Hello mary')
     if password == 'swordfish':
(ii)    print ('Access granted.')
     else
(iii)   print ('wrong password.')
```

- ① starts at the line print ('Hello mary') & contains all the lines after it. Inside this block is another block.
(ii) which has single line in it: print ('Access Granted.')
(iii) is also one line long: print ('wrong password.').

Explanation $\boxed{5M}$

Sri Shridevi Charitable Trust (R.)
SHRIDEVI EDUCATION
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org
An ISO 9001:2015 Certified Institution

INTERNAL ASSESMENT TEST:II
SUB : APPLICATION DEVELOPMENT USING PYTHON (18CS55)
SEM : V

DATE: 16/12/2022
MAX MARKS : 40
TIME : 90 min

USN: ☐☐☐☐☐☐☐☐☐☐

NOTE: Answer TWO full questions

1 a. Explain the List Data Type, and Getting Sublists with Slices? 10M [CO2]
b. Explain the Mutable, Immutable Data Types and the Tuple Data Type? 10M [CO2]

OR

2 a. Explain the Pretty Printing and Copying and Pasting Strings with the pyperclip Module? 10M [CO2]
b. Explain the Project: Phone Number and Email Address Extractor? 10M [CO2]

3 a. Write a python program to demonstrate dictionary with the names as keys and the birthdays as values? 10M [CO3]
b. Explain briefly the Greedy,Nongreedy Matching and findall() Method? 10M [CO3]

OR

4 a. Explain Using Data Structures to Model Real-World Things: A Tic-Tac-Toe Board? 10M[CO3]
b. Explain making your own character classes with example? 10M[CO3]

Sri Shridevi Charitable Trust (R.)
SHRIDEVI EDUCATION
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org
An ISO 9001:2015 Certified Institution

INTERNAL ASSESMENT TEST:II
SUB : APPLICATION DEVELOPMENT USING PYTHON (18CS55)
SEM : V

DATE: 16/12/2022
MAX MARKS : 40
TIME : 90 min

USN: ☐☐☐☐☐☐☐☐☐☐

NOTE: Answer TWO full questions

1 a. Explain the List Data Type, and Getting Sublists with Slices? 10M [CO2]
b. Explain the Mutable , Immutable Data Types and the Tuple Data Type? 10M [CO2]

OR

2 a. Explain the Pretty Printing and Copying and Pasting Strings with the pyperclip Module? 10M [CO2]
b. Explain the Project: Phone Number and Email Address Extractor? 10M [CO2]

3 a. Write a python program to demonstrate dictionary with the names as keys and the birthdays as values? 10M [CO3]
b. Explain briefly the Greedy,Nongreedy Matching and findall() Method? 10M [CO3]

OR

4 a. Explain Using Data Structures to Model Real-World Things: A Tic-Tac-Toe Board? 10M[CO3]
b. Explain making your own character classes with example? 10M[CO3]

PRINCIPAL
SIET., TUMAKURU

Scheme of Evaluation ADP-IA-2

1 a) Explaination of List data types -4M
Slices -3M
Sublists -3M

b) Explaination of Mutable Data types -4M
Immutable Data types -3M
Tuple Data types -3M

(OR)

2 a) Explaination of pretty printing -4M
Copying & pasting with pyperclip Module -6M

b) Explaination of project -
Regular expression to match phone no -3M
Email address extractor -3M
Remaining flow of the program -4M

3 a) Explaination of Dictionary -1M
prg to demonstrate dictionary with the names as keys and birthdays as values - 9M

b) Explaination of Greedy Matching -3M
Non Greedy Matching -3M
and
findall() method -4M

(OR)

4 a) Explaination of Data Structures involved to Model Real world things of Tic-Tac-Toe board -2M
Tic-Tac-Toe board -Diagrams- 2M
Prg fragments - 6M

b) Explaination character classes definitions -1M
own character classes with examples -9M

PRINCIPAL
SIET., TUMAKURU

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shridevienginееring.org | Web: http://www.shridevienginееring.org

DEPT. OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: II

DATE: 27 /12/2021

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) Give the format of IPv6 datagram and explain the fields. 08M [CO1]
b) Explain the different techniques used for transition from ipv4 to ipv6 with diagram. 08M [CO1]
c) What is routing ? Write the structure of a router and list it's components. 04M[CO1]

OR

2 a) Define switch fabric. Explain in detail 3 different switching techniques with diagram. 08M [CO1]
b) Illustrate Routing Information Protocol (RIP) with suitable diagram 08M [CO1]
c) Write a short note on distance vector routing algorithm. . 04M[CO1]

3 a) Define an autonomous system. Differentiate between RIP and OSPF protocol. 08M [CO2]
b) Explain the spanning tree algorithm and give it's advantages and disadvantages. 08M [CO2]
c) Write a short note on link state routing algorithm. 04M[CO2]

OR

4 a) What are the message types used in IGMP, explain briefly with diagram. 08M [CO2]
b) List the broadcast routing algorithms ? Explain any one of them. 08M [CO2]
c) Differentiate multicast and Broadcast routing with neat diagram. 04M[CO2]

Staff Name: Dr. Charan K V

Signature:

HOD Signature ____________

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
SHRIDEVI EDUCATION
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org
An ISO 9001:2015 Certified Institution

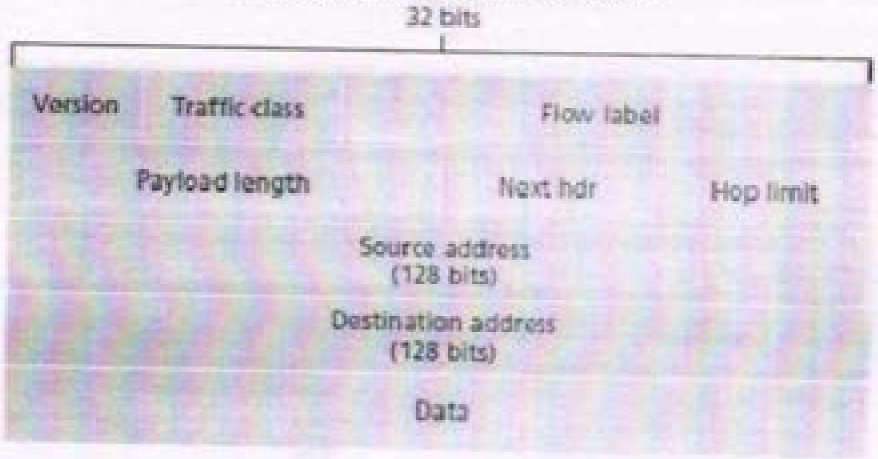
Department of Computer Science And Engineering

IAScheme of Evaluation

B.E.V Semester SECOND Internal Assessment Test NOV 2021

Subject Name: CNS
Faculty In charge: Dr.Charan K V

Subject code:18CS52
Max Marks:40

Q.No.	Brief Solution	Allotted Marks
1 a	**Give the format of IPv6 datagram and explain the fields.**  • CIDR, subnetting and NAT could not solve address-space exhaustion faced by IPv4. • IPv6 was evolved to solve this problem. **3.4.5.1 Changes from IPv4 to IPv6 (Advantages of IPv6)** **1) Expanded Addressing Capabilities** IPv6 increases the size of the IP address from 32 to 128 bits (Supports upto 3.4×1038 nodes). In addition to unicast & multicast addresses, IPv6 has an anycast address. Anycast address allows a datagram to be delivered to only one member of the group. **2) A Streamlined 40-byte Header** A number of IPv4 fields have been dropped or made optional. The resulting 40-byte fixed-length header allows for faster processing of the IP datagram. A new encoding of options field allows for more flexible options processing. **3) Flow Labeling& Priority** A flow can be defined as "Labeling of packets belonging to particular flows for which the sender requests special handling".	10
1 b	**Explain the different techniques used for transition from ipv4 to ipv6 with diagram.** **Transitioning from IPv4 to IPv6**	10 M

PRINCIPAL
SIET., TUMAKURU

- Two strategies have been devised for transition from IPv4 to IPv6:

1) Dual stack and
2) Tunneling.

3.4.5.5.1 Dual Stack Approach

- IPv6-capable nodes also have a complete IPv4 implementation. Such nodes are referred to as

IPv6/IPv4 nodes.

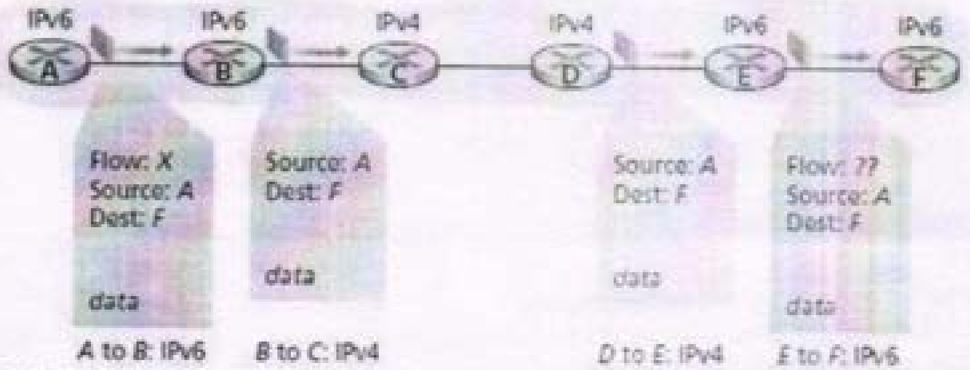
- IPv6/IPv4 node has the ability to send and receive both IPv4 and IPv6 datagrams.
- When interoperating with an IPv4 node, an IPv6/IPv4 node can use IPv4 datagrams.

When interoperating with an IPv6 node, an IPv6/IPv4 node can use IPv6 datagrams.

- IPv6/IPv4 nodes must have both IPv6 and IPv4 addresses.
- IPv6/IPv4 nodes must be able to determine whether another node is IPv6-capable or IPv4-only.
- This problem can be solved using the DNS.

If the node name is resolved to IPv6-capable, then the DNS returns an IPv6 address Otherwise, the DNS return an IPv4 address.

- If either the sender or the receiver is only IPv4-capable, an IPv4 datagram must be used.
- Two IPv6-capable nodes can send IPv4 datagrams to each other.



Dual stack is illustrated in Figure 3.20.

- Here is how it works:

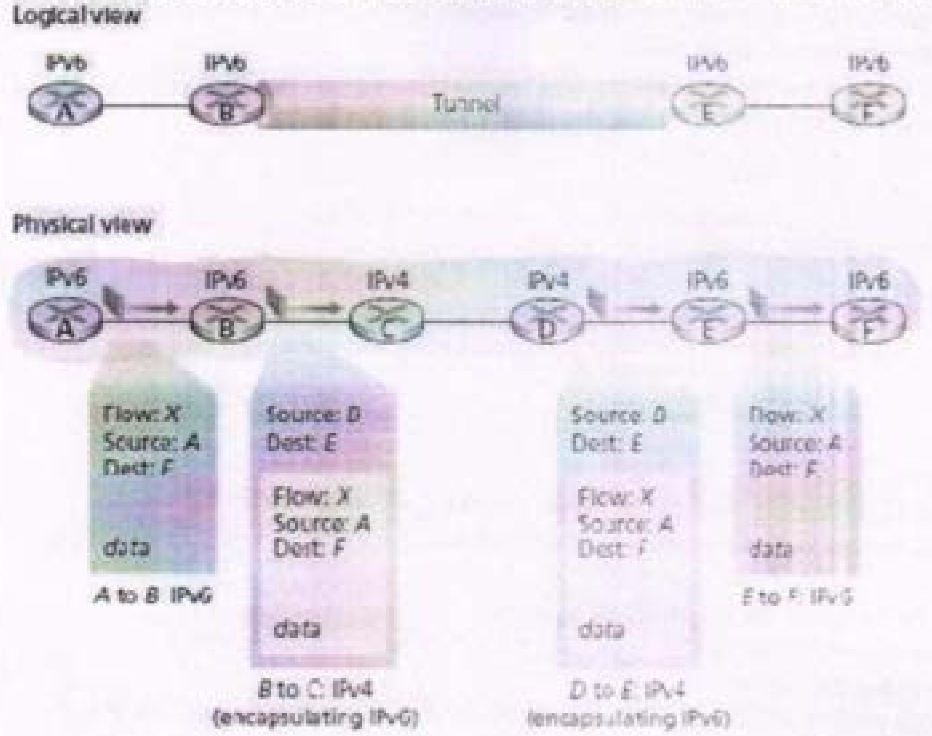
1) Suppose IPv6-capable Node-A wants to send a datagram to IPv6-capable Node-F.
2) IPv6-capable Node-B creates an IPv4 datagram to send to IPv4-capable Node-C.
3) At IPv6-capable Node-B, the IPv6 datagram is copied into the data field of the IPv4 datagram

and appropriate address mapping can be done.

4) At IPv6-capable Node-E, the IPv6 datagram is extracted from the data field of the IPv4datagram.
5) Finally, IPv6-capable Node-E forwards an IPv6 datagram toIPv6-capableNode-F.

- Disadvantage: During transition from IPv6 to IPv4, few IPv6-specific fields will be lost.

PRINCIPAL
SIET., TUMAKURU

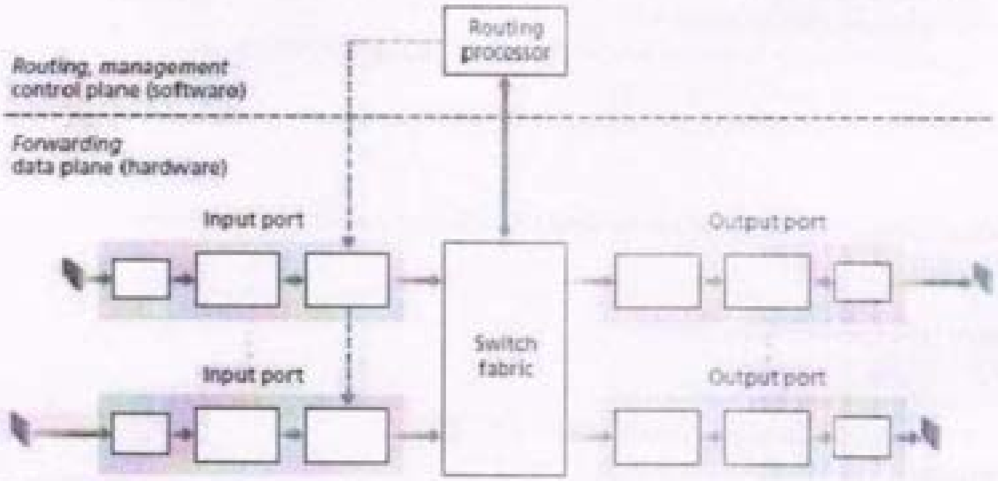


2 a

What is routing ? Write the structure of a router and explain it's components with diagram.

10 M

The router is used for transferring packets from an incoming-links to the appropriate outgoing-links.



- Four components of router

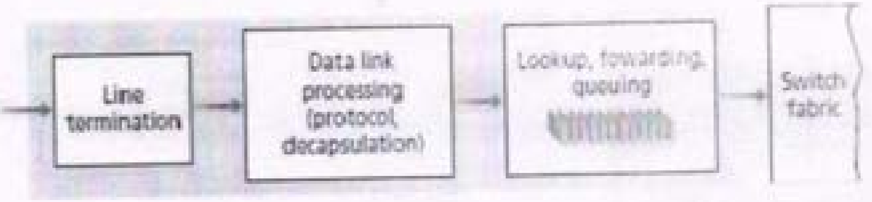
1) Input Ports

- An input-port is used for terminating an incoming physical link at a router • It is used for interoperating with the link layer at the other side of the incoming-link.
- It is used for lookup function i.e. searching through forwarding-table looking for longest prefix match.
- It contains forwarding-table.
- Forwarding-table is consulted to determine output-port to which arriving packet

PRINCIPAL
SIET., TUMAKURU

- Control packets are forwarded from an input-port to the routing-processor.
- Many other actions must be taken:

i) Packet's version number, checksum and time-to-live field must be checked.
ii) Counters used for network management must be updated.



2) Switching Fabric

- The switching fabric connects the router's input-ports to its output-ports.
- In fabric, the packets are switched (or forwarded) from an input-port to an output-port.
- In fact, fabric is a network inside of a router.
- A packet may be temporarily blocked if packets from other input-ports are currently using the fabric.
- A blocked packet will be queued at the input-port & then scheduled to send at a later point in time.

3) Output Ports

- An output-port

→ stores packets received from the switching fabric and
→ transmits the packets on the outgoing-link.

- For a bidirectional link, an output-port will typically be paired with the input-port.

4) Routing Processor

- The routing-processor

→ executes the routing protocols
2 b → maintains routing-tables & attached link state information and
→ computes the forwarding-table. 10

- It also performs the network management functions.

Define switch fabric. Explain in detail 3 different switching techniques with diagram.

Three types of switching fabrics
1) Switching via memory
2) Switching via a bus and
3) Switching via an interconnection network.

Switching via Memory

- Switching b/w input-ports & output-ports is done under direct control of CPU i.e. routing-processor.
- Input and output-ports work like a traditional I/O devices in a computer.
- Here is how it works (Figure 3.7a):

i) On arrival of a packet, the input-port notifies the routing-processor via an interrupt.
ii) Then, the packet is copied from the input-port to processor-memory.
iii) Finally, the routing-processor

PRINCIPAL
SIET., TUMAKURU

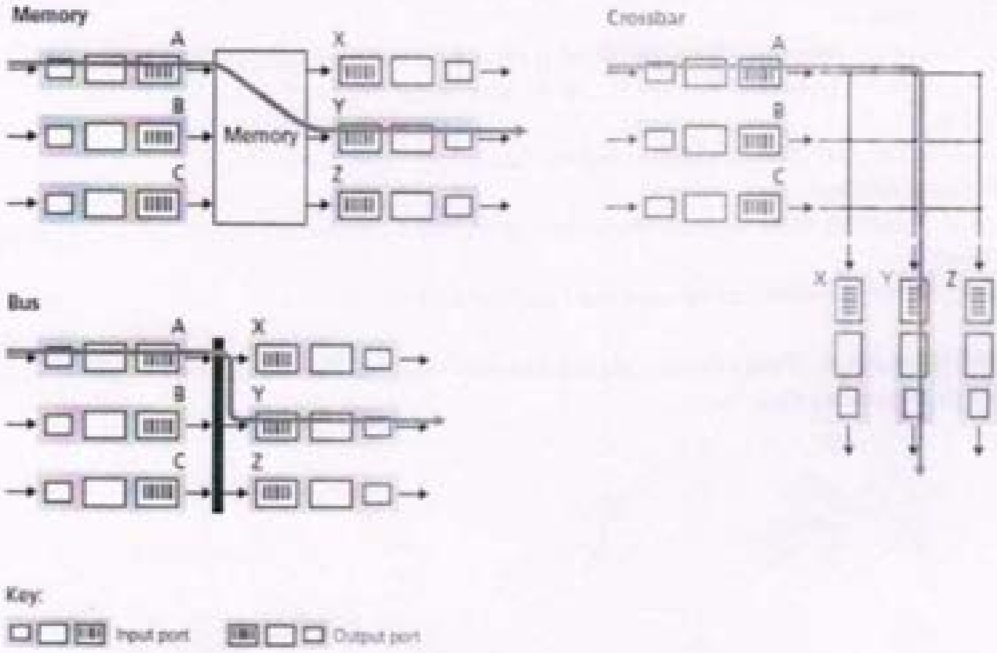
→ looks up the appropriate output-port in the forwarding-table and
→ copies the packet into the output-port's buffers.

- Let memory-bandwidth = B packets per second.

Thus, the overall forwarding throughput must be less than B/2.

- Disadvantage:

Multiple packets cannot be forwarded at the same time. This is because
→ only one memory read/write over the shared system bus can be done at a time.



Switching via a bus

output-ports is done without intervention by the routing-processor.

- Here is how it works (Figure 3.7b):

i) The input-port appends a switch-internal label (header) to the packet.

☐ The label indicates the local output-port to which the packet must be transferred.

ii) Then, the packet is received by all output-ports.

☐ But, only the port that matches the label will keep the packet.

iii) Finally, the label is removed at the output-port.

- Disadvantages:

i) Multiple packets cannot be forwarded at the same time. This is because

→ only one packet can cross the bus at a time.

ii) The switching speed of the router is limited to the bus-speed.

Switching via an Interconnection Network

PRINCIPAL
SIET., TUMAKURU

- The network consists of 2N buses that connect N input-ports to N output-ports.
- Each vertical bus intersects each horizontal bus at a crosspoint.
- The crosspoint can be opened or closed at any time by the switch-controller.
- Here is how it works (Figure 3.7c):

1) To move a packet from port A to port Y, the switch-controller closes the crosspoint at the
intersection of buses A and Y.
2) Then, port A sends the packet onto its bus, which is picked up by bus Y.

- Advantage:

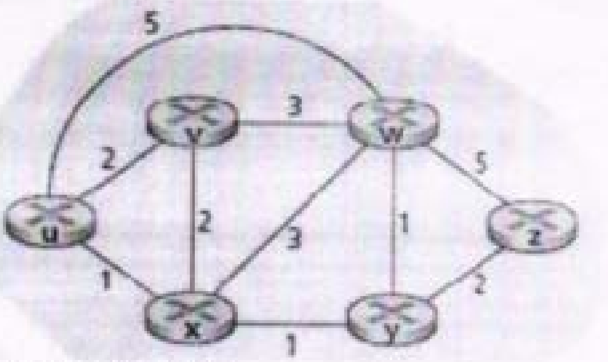
□ Crossbar networks are capable of forwarding multiple packets in parallel.
□ For ex: A packet from port B can be forwarded to port X at the same time. This is because
→ A-to-Y and B-to-X packets use different input and output buses. 10

3 a

- Disadvantage:

□ If 2 packets have to use same output-port, then one packet has to wait. This is because
→ only one packet can be sent over any given bus at a time.

Write the link state routing algorithm and apply it the following graph with source node is "u"



Dijkstra's Algorithm

- Dijkstra's algorithm computes the least-cost path from one node to all other nodes in the network.
- Let us define the following notation:

1) u: source-node
2) D(v): cost of the least-cost path from the source u to destination v.
3) p(v): previous node (neighbor of v) along the current least-cost path from the source to v.
4) N': subset of nodes; v is in N' if the least-cost path from the source to v is known

PRINCIPAL
SIET., TUMAKURU.

Link-State (LS) Algorithm for Source Node u

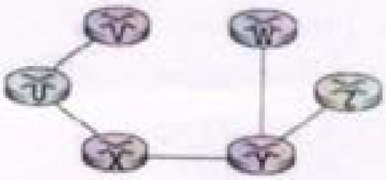
```
Initialization:
  N' = {u}
  for all nodes v
    if v is a neighbor of u
      then D(v) = c(u,v)
    else D(v) = ∞

Loop
  find w not in N' such that D(w) is a minimum
  add w to N'
  update D(v) for each neighbor v of w and not in N':
        D(v) = min( D(v), D(w) + c(w,v) )
  /* new cost to v is either old cost to v or known
   least path cost to w plus cost from w to v */
until N'= N
```

step	N'	D(v),p(v)	D(w),p(w)	D(x),p(x)	D(y),p(y)	D(z),p(z)
0	u	2,u	5,u	1,u	∞	∞
1	ux	2,u	4,x		2,x	∞
2	uxy	2,u	3,y			4,y
3	uxyv		3,y			4,y
4	uxyvw					4,y
5	uxyvwz					

10

3 b

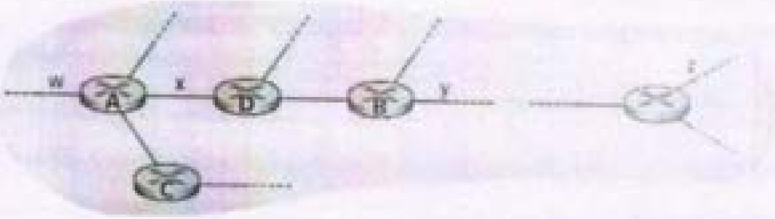


Destination	Link
v	(u, v)
w	(u, x)
x	(u, x)
y	(u, x)
z	(u, x)

Illustrate Routing Information Protocol (RIP) with suitable diagram

RIP is widely used for intra-AS routing in the Internet.

- RIP is a distance-vector protocol.
- RIP uses hop count as a cost metric. Each link has a cost of 1.
- Hop count refers to the no. of subnets traversed along the shortest path from source to destination.
- The maximum cost of a path is limited to 15.
- The distance vector is the current estimate of shortest path distances from router to subnets in AS.



PRINCIPAL
SIET., TUMAKURU

Each router maintains a RIP table known as a routing-table.

Destination Subnet	Next Router	Number of Hops to Destination
w	A	2
y	B	2
z	B	7
x	—	1

Routers can send types of messages: 1) Response-message & 2) Request-message

1) Response Message

☐ Using this message, the routers exchange routing updates with their neighbours every 30 secs.

☐ If a router doesn't hear from its neighbour every 180 secs, then that neighbour is not reachable.

☐ When this happens, RIP

→ modifies the local routing-table and

→ propagates then this information by sending advertisements to its neighbours.

☐ The response-message contains

→ list of up to 25 destination subnets within the AS and

→ sender's distance to each of those subnets.

☐ Response-messages are also known as advertisements.

2) Request Message

☐ Using this message, router requests info about its neighbor's cost to a given destination.

- Both types of messages are sent over UDP using port# 520.
- The UDP segment is carried between routers in an IP datagram.

4 a

10

Define an autonomous system. Differentiate between RIP and OSPF protocol.

An autonomous-system (AS) is a collection of routers under the same administrative control.

- RIP is widely used for intra-AS routing in the Internet.
- RIP is a distance-vector protocol.
- RIP uses hop count as a cost metric. Each link has a cost of 1.
- Hop count refers to the no. of subnets traversed along the shortest path from source to destination.
- The maximum cost of a path is limited to 15.
- The distance vector is the current estimate of shortest path distances from router to subnets in AS.

- OSPF is widely used for intra-AS routing in the Internet.
- OSPF is a link-state protocol that uses
→ flooding of link-state information and
→ Dijkstra least-cost path algorithm.
- Here is how it works:

1) A router constructs a complete topological map (a graph) of the entire autonomous-system.

2) Then, the router runs Dijkstra's algorithm to determine a shortest-path tree to all subnets.

3) Finally, the router broadcasts link state info to all other routers in the autonomous-system.

Specifically, the router broadcasts link state information

4 b

10

PRINCIPAL
SIET., TUMAKURU

→ whenever there is a change in a link's state. For ex: a change in up/down status.

- Individual link costs are configured by the network-administrator.
- OSPF advertisements are contained in OSPF messages that are carried directly by IP.
- HELLO message can be used to check whether the links are operational.
- The router can also obtain a neighboring router's database of network-wide link state.

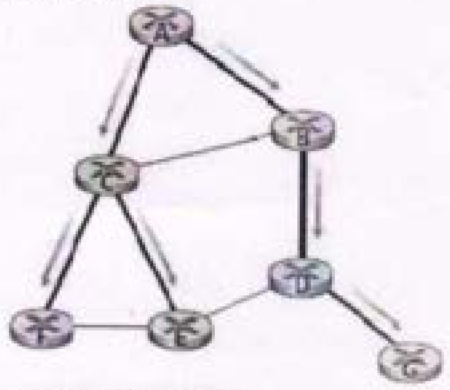
Explain the spanning tree algorithm and give it's advantages anddisadvantages

Spanning - Tree Broadcast

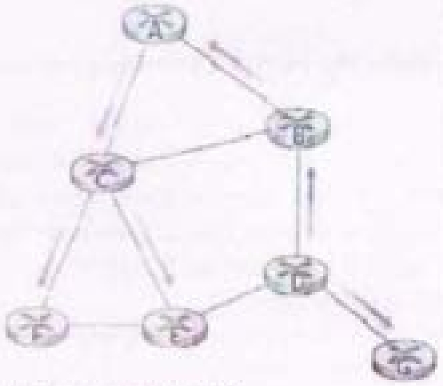
- This is another approach to providing broadcast. (MST Minimum Spanning Tree).
- Spanning-tree is a tree that contains each and every node in a graph.
- A spanning-tree whose cost is the minimum of all of the graph's spanning-trees is called a MST.

1) Firstly, the nodes construct a spanning-tree.
2) The node sends broadcast-packet out on all incident links that belong to the spanning-tree.
3) The receiving-node forwards the broadcast-packet to all neighbours in the spanning-tree

5



a. Broadcast initiated at A



b. Broadcast initiated at D

10

- Disadvantage:

Complex: The main complexity is the creation and maintenance of the spanning-tree.

What are the message types used in IGMP, explain briefly with diagram.

- IGMP messages are encapsulated within an IP datagram.
- Three types of message:

1) membership_query
2) membership_report
3) leave_group

1) membership_query

☐ A host sends a membership-query message to find active group-members in the network.

2) membership_report

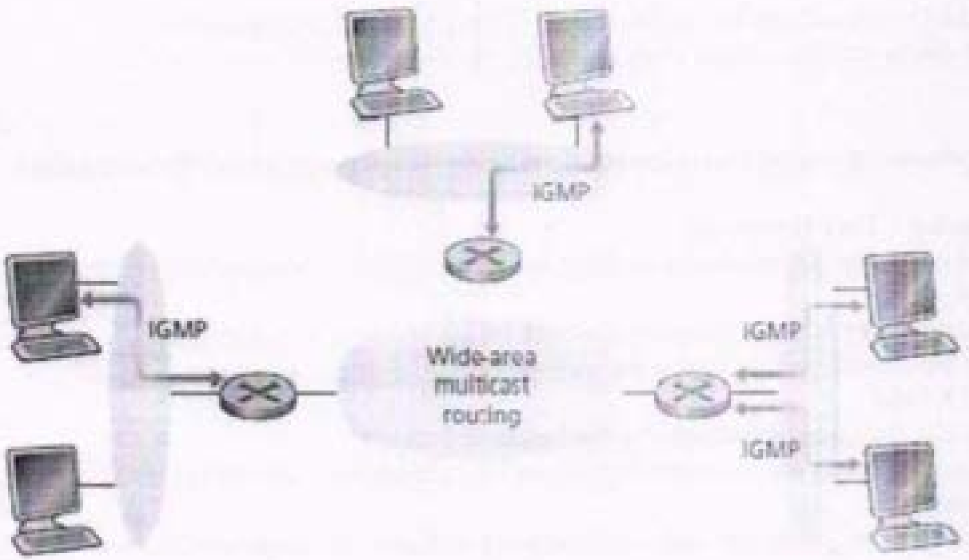
☐ A host sends membership_report message when an application first joins a multicast-group.

☐ The host sends this message w/o waiting for a membership_query message from

3) leave_group

☐ This message is optional.

☐ The host sends this message to leave the multicast-group.



10

6

Describe the intra- AS routing protocol in detail.

Intra-AS Routing in the Internet: OSPF

- OSPF is widely used for intra-AS routing in the Internet.
- OSPF is a link-state protocol that uses

→ flooding of link-state information and

→ Dijkstra least-cost path algorithm.

- Here is how it works:

1) A router constructs a complete topological map (a graph) of the entire autonomous-system.

2) Then, the router runs Dijkstra's algorithm to determine a shortest-path tree to all subnets.

3) Finally, the router broadcasts link state info to all other routers in the autonomous-system.

Specifically, the router broadcasts link state information

→ periodically at least once every 30 minutes and

→ whenever there is a change in a link's state. For ex: a change in up/down status.

- Individual link costs are configured by the network-administrator.
- OSPF advertisements are contained in OSPF messages that are carried directly by IP.
- HELLO message can be used to check whether the links are operational.
- The router can also obtain a neighboring router's database of network-wide link state.
- Some of the advanced features include:

1) Security

☐ Exchanges between OSPF routers can be authenticated.

☐ With authentication, only trusted routers can participate within an AS.

☐ By default, OSPF packets between routers are not authenticated.

☐ Two types of authentication can be configured: 1) Simple and 2) MD5.

□ The same password is configured on each router.
□ Clearly, simple authentication is not very secure.
ii) MD5 Authentication
□ This is based on shared secret keys that are configured in all the routers.
□ Here is how it works:
1) The sending router
→ computes a MD5 hash on the content of packet
→ includes the resulting hash value in the packet and
→ sends the packet
2) The receiving router
→ computes an MD5 hash of the packet
→ compares computed-hash value with the hash value carried in packet and
→ verifies the packet's authenticity
2) Multiple Same Cost Paths
□ When multiple paths to a destination have same cost, OSPF allows multiple paths to be used.
3) Integrated Support for Unicast & Multicast Routing
□ Multicast OSPF (MOSPF) provides simple extensions to OSPF to provide for multicast-routing.
□ MOSPF
→ uses the existing OSPF link database and
→ adds a new type of link-state advertisement to the existing broadcast mechanism.
4) Support for Hierarchy within a Single Routing Domain
□ An autonomous-system can be configured hierarchically into areas.
□ In area, an area-border-router is responsible for routing packets outside the area.
□ Exactly one OSPF area in the AS is configured to be the backbone-area.
□ The primary role of the backbone-area is to route traffic between the other areas in the AS.

PRINCIPAL
SIET., TUMAKURU.

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org
An ISO 9001:2015 Certified Institution

INTERNAL ASSESMENT TEST: I
SUB : DBMS (18CS53)
SEM : V

USN: ☐☐☐☐☐☐☐☐☐☐

Date: 21/11/2021
MAX MARKS : 40
TIME : 90 min

NOTE: Answer TWO full questions

1. a. Explain briefly simplified database system environment and characteristics of the database approach? 10M
   b. Explain briefly three-schema architecture and DBMS component modules? 10M

OR

2. a. Explain centralized and client/server architecture for DBMS? 10M
   b. Briefly explain high-level conceptual data models for database design? 10M

3. a. Explain relationship types, relationship sets, roles and structural constraints? 10M
   b. Explain with a diagram, alternative notations for ER diagrams in detail? 10M

OR

4. a. Explain EER diagram notation to represent subclasses, super classes, inheritance, specialization and generalization briefly? 10M
   b. Explain constraints and characteristics of specialization and generalization hierarchies? 10M

****

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org
An ISO 9001:2015 Certified Institution

INTERNAL ASSESMENT TEST: I
SUB : DBMS (18CS53)
SEM : V

USN: ☐☐☐☐☐☐☐☐☐☐

Date: 21/11/2021
MAX MARKS : 40
TIME : 90 min

NOTE: Answer TWO full questions

1. a. Explain briefly simplified database system environment and characteristics of the database approach? 10M
   b. Explain briefly three-schema architecture and DBMS component modules? 10M

OR

2. a. Explain centralized and client/server architecture for DBMS? 10M
   b. Briefly explain high-level conceptual data models for database design? 10M

3. a. Explain relationship types, relationship sets, roles and structural constraints? 10M
   b. Explain with a diagram, alternative notations for ER diagrams in detail? 10M

OR

4. a. Explain EER diagram notation to represent subclasses, super classes, inheritance, specialization and generalization briefly? 10M
   b. Explain constraints and characteristics of specialization and generalization hierarchies? 10M

PRINCIPAL
SIET, TUMAKURU

A
[Kamalaaradhya K C]

HOD.
COMPUTER SCIENCE & ENGG.
SIET, TUMAKURU-06.

Scheme of Evaluation

DBMS IA - 1

1a. Simplified database System environment - 5M
~~1b~~ Characteristics of database approach - 5M

1b. 3-Schema Architecture - 5M
DBMS component modules - 5M

2a. Centralized - 5M
Client /Server Architecture - 5M

2b. diagram - 4M.
explain - 6M.

3a. Relationship types - 3M
Relationship sets - 3M
Roles - 2M
Structural constraints - 2M

3b. diagrams - 5M.
Notation for ER-diagrams - 5M

4a. Subclass - 2M
Super class - 2M
Inheritance - 2M
Specialization - 2M
Generalization - 2M

4b. constraints & characteristics of Specification - 5M
Generalization ~~con~~ hierarchies - 5M.

[Renukaradhya P.C]

PRINCIPAL
SIET., TUMAKURU.

H.O.D.
COMPUTER SCIENCE & ENGG.
SIET, TUMAKURU-06.

Sri Shridevi Charitable Trust (R.)
SHRIDEVI EDUCATION
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shridevienginecring.org | Web: http://www.shridevienginecring.org

INTERNAL ASSESMENT TEST: I
SUB : Big Data Analytics (18CS82) **USN:** ☐☐☐☐☐☐☐☐☐☐
SEM : VII

Date: 20/11/2021
MAX MARKS : 40
TIME : 90 min

NOTE: Answer TWO full questions

1. a. Explain briefly bigdata, scalability and parallel processing? 10M
   b. Explain briefly data architecture, data sources and quality? 10M

OR

2. a. Explain pre-processing, storing and data storage and analysis briefly? 10M
   b. Briefly explain big data analytics applications and case studies? 10M

3. a. Explain briefly hadoop distributed file system? 10M
   b. Explain briefly hadoop map reduce framework? 10M

OR

4. a. Briefly explain the essential hadoop tools 10M
   b. Briefly explain hadoop YARN applications? 10M

****

Sri Shridevi Charitable Trust (R.)
SHRIDEVI EDUCATION
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shridevienginecring.org | Web: http://www.shridevienginecring.org

INTERNAL ASSESMENT TEST: I
SUB : Big Data Analytics (18CS82) USN: ☐☐☐☐☐☐☐☐☐☐
SEM : VII

Date: 20/11/2021
MAX MARKS : 40
TIME : 90 min

NOTE: Answer TWO full questions

1. a. Explain briefly bigdata, scalability and parallel processing? 10M
   b. Explain briefly data architecture, data sources and quality? 10M

OR

2. a. Explain pre-processing, storing and data storage and analysis briefly? 10M
   b. Briefly explain big data analytics applications and case studies? 10M

3. a. Explain briefly hadoop distributed file system? 10M
   b. Explain briefly hadoop map reduce framework? 10M

OR

4. a. Briefly explain the essential hadoop tools 10M
   b. Briefly explain hadoop YARN applications? 10M

****

[Chennakeshavadiya P C]

PRINCIPAL
SIET., TUMAKURU.

HOD.
COMPUTER SCIENCE & ENGG.,
SIET, TUMAKURU-06.

Scheme of Evaluation

BDA - IA - I

1 a) bigData - 4M Scalability - 3M. Parallel processing - 3M

b) Data Architecture - 4M DataSources - 3M, Quality - 3M

2 a) preprocessing - 2.5M Storing - 2.5M

Data Storage - 2.5M Analysis - 2.5M

3 a) HDFS Architecture Diagram - 4M

Explanation - 6M

b) HDFS Mapreduce framework Diagram - 4M.

Explanation - 6M

4

a) Essential Hadoop tools

10 tools - each tool carry 1M = 10 x 1M = 10M

b) Hadoop YARN applications Diagram - 4M

Explanation - 6M

[Renukaradhya P C]

PRINCIPAL
SIET., TUMAKURU

HOD.
COMPUTER SCIENCE & ENGG.,
SIET, TUMAKURU-06.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(An ISO 9001-2015 Certified Institution)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: II

SUB : Unix Programming(18CS56) **MAX MARKS : 40**

SEM : V Sem **DATE& TIME** : **29/12/21&90 min**

NOTE : Answer any **TWO** full questions.

1. a) With suitable example, discuss how wild cards can be used for pattern matching in Unix. 7M[CO2]
   b) Explain briefly with example escaping and quoting. 7M[CO
   c) Explain the following with example grep command with options. 6M[CO2]

OR

2. a) Explain briefly REDIRECTION: THE THREE STANDARD FILES. 7M[CO
   b) Explain briefly two types shell variables with example? 7M[CO
   c) Write a shell script that accepts a string from the terminal and echo a suitable message if it doesn't have at least 10 characters. 6M[CO2]

3. a) Explain briefly how fcntl API is used for file and record locking. 7M[CO3]
   b) Explain the following system call APIs i) open ii) read. 7M[CO3]
   c) Explain Device file API with example program. 6M[CO3]

OR

4. a) Explain the following system call APIs i) chmod,fchmod ii) lseek.. 7M[CO3]
   b) Explain Directory file API with example program. 7M[CO3]
   c) Explain with example program link and unlink API's. 6M[CO3]

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(An ISO 9001-2015 Certified Institution)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: II

SUB :Unix Programming(18CS56) MAX MARKS : 40

SEM : V Sem DATE& TIME : 29/12/21&90 min

NOTE : Answer any TWO full questions.

1. a) With suitable example, discuss how wild cards can be used for pattern matching in Unix. 7M[CO2]
   b) Explain briefly with example escaping and quoting. 7M[CO
   c) Explain the following with example grep command with options. 6M[CO2]

OR

2. a) Explain briefly REDIRECTION: THE THREE STANDARD FILES. 7M[CO
   b) Explain briefly two types shell variables with example? 7M[CO
   c) Write a shell script that accepts a string from the terminal and echo a suitable message if it doesn't have at least 10 characters. 6M[CO2]

3. a) Explain briefly how fcntl API is used for file and record locking. 7M[CO3]
   b) Explain the following system call APIs i) open ii) read. 7M[CO3]
   c) Explain Device file API with example program. 6M[CO3]

OR

4. a) Explain the following system call APIs i) chmod,fchmod ii) lseek.. 7M[CO3]
   b) Explain Directory file API with example program. 7M[CO3]
   c) Explain with example program link and unlink API's. 6M[CO3]

PRINCIPAL
SIET., TUMAKURU.

Staff Name : Mr Basavesha D

Signature:

HOD Signature

IInd I.A Scheme of Evaluation

Unix Programming →(18CS56)

1. a) list wilds cards used for Pattern matching in unix → 2M } 7M
Explenation of each → 5M

- * → Any no. of char including none
- ? → A single char
- [ijK] → A single char either an i, j, or K
- [x-z] → A single char that is within the ASCII range of x & z
- [!ijK] → A single char i.e not an i, j or K
- [!x-z] → A single char that is not within ASCII range of char x & z.

b) Escaping concept along with example } 3+4 } 7M
Quoting — " —

Placing \ immediately before a metacharacter turn off its special meaning

ls chap \[1-3\] file removed.

chap [1-3] not found

- * Escaping the space.
- * Escaping the \itself.
- * Escaping the newline char.

PRINCIPAL
SIET., TUMAKURU

__Quoting__ :- Another way to turn off the meaning of meta char. When u place command in quotes the meaning of all enclosed special char are turn off.

ex :- rm 'chap *' ↳ remove file chap*

c) ~~Absolute~~ grep command explanation → 2M
grep command options expln along → 4M } 6M
with example

- -i → ignores case for matching
- -v → Doesn't disp. lines matching Expression
- -n → Disp. line no. along with line.
- -c → Disp. count ~~of~~ no. of occurrance
- -l → Disp. list of filename only.
- -E → treats pattern as an ERE
- -lF → matches multiple fixed strings.

2. a) REDIRECTION. → 1M
The shell associate 3 std. files with the terminal for display & for keyboard → 6M } 7M.

1) standard Input
2) standard output
3) standard error

b) types of shell variables → 4M
1) Environment variable.
2) ordinary variable & local variable → 3M.

HOME, IFS, LOGNAME, MAIL, MAILCHECK, PATH
SHELL, TERM, etc.

PRINCIPAL
SIET., TUMKURU

c) Shell script that accepts a string from the terminal ②
& echo a suitable message if it doesn't have at least .
.
↳ 6M.

3. a) fnctl:

The function helps a user to query or set flags
& the close-on-exec flag of any file descriptor

```
#include <fcntl.h>
int fcntl (int fdesc, int cmd, ...);
```

int fcntl (int fdesc, int cmd, ...); → 2M } 7M
Explanation file & record locking → 5M }

① Exclusive lock
② Shared lock
③ Mandatory lock
④ Advisory lock.

b) system call API's
1) open → 3.5M } 7M.
2) read → 3.5M

int open (const char *pathname, int accessmode, mode_t permission);

size_t read (int fdesc, void *buf, size_t nbyte);

PRINCIPAL
SIET, TUMAKURU

c) Device file API

Breif explanation of Device file API's → 3M
Prototype & Syntax → 1M
Example → 2M
} 6M.

4. a) System call API's

i) chmod, fchmod
prototyte a syntax → 2
Example → 1
Explanation → 1
} 4M

ii) lseek
prototype or syntax → 1
Example → 1
Explanation of lseek function → 1
} 3M

} 7M.

b) Directory file API's
prototype or Syntax → 2
Example program → 3
Explanation → 2
} 7M.

c) Example program for link API → 3M
— " — unlink API → 3M
} 6M

HOD,
COMPUTER SCIENCE & ENGG.,
SIET, TUMAKURU-06.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(An ISO 9001-2015 Certified Institution)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: I

SUB :User Interface Design(18CS734) **MAX MARKS** : 40
SEM : VIII Sem **DATE& TIME** : 21/11/21&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) Explain the concept of Direct Manipulation for Graphical Systems. 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

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(An ISO 9001-2015 Certified Institution)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: I

SUB :User Interface Design(18CS734) MAX MARKS : 40
SEM : VIII Sem DATE& TIME : 21/11/21&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) Explain the concept of Direct Manipulation for Graphical Systems. 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

PRINCIPAL
SIET., TUMAKURU

Staff Name : Mr Basavesha D

Signature:

HOD Signature

21|11|21 ①

User Interface Design

1st I.A Scheme & Solution

1) a) Importance of good Design → 3M. } 7M

a) Complex tasks cannot be performed.

b) Interface is confusing & Inefficient

c) Poor design take people away from job

Benefits of good Design → 4M

a) Improves Screen Quality & readability.

b) It reduces decision making time.

c) Training cost are reduced

d) Supporting lines are lowered.

e) Employee satisfaction is increased.

b) Characteristics of GUI (~~7~~ × 1M) → } 7M

a) Sophisticated visual presentation

b) Pick & click interaction.

c) Restriction set of interface options

d) Visualization etc

c) Direct manipulation explanation along with below points/1M } 6M.

1) The system is portrayed as an extension of the real world } 5M

2) Continued Visibility of objects & actions

3) Actions are rapid & incremental

4) Incremental actions are easily ~~reve~~ reversible

PRINCIPAL
SIET., TUMAKU

2. a) Diff. b/w GUI & Webpage Design → 10x1 ⇒ 10M.

10 characteristics w.r.t. GUI & Web Design

① Devices ② user Focus ③ Data ④ Information

⑤ user Tasks ⑥ Presentation ⑦ Navigation ⑧ Interaction

⑨ Response time ⑩ Task efficiency.

b) General Principles of UID (Any 10) → 10 x1 ⇒ 10M

1> Aesthetically Pleasing
2> Clarity
3> Compatibility
4> Comprehensibility
5> Configurability
6> Consistency
7> Control
8> Directness
9> Efficiency
10> Familiarity
11> Flexibility
12> Forgiveness.
13> Recovery
14> Simplicity

3 a) obstacles in Development Path → 3M
Pit falls in — " — → 4M. } 7M.

1> Nobody ever gets it right the first time.
2> Good design requires living in a sea of changes.
3> No early analysis
4> No usability testing
5> No common design team vision of UID goals.

3.b) 5 commandments in designing for people. list → 1M.
Explanation of each → 6M } 7M.

1> Gain 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.

c> Concept of Direct manipulation → 1M.
Explanation of characteristics → 5M } 6M

1> The system is portrayed as an extension of the real world.
2> Continuous visibility of objects & actions.
3) Actions are rapid & incremental.
4) Incremental Actions are easily reversible.

4 a) Defination of usability. → 2M.
it is defined as "the capability to be used by humans easily & effectively where.
easily = to a specified level of subjective assessment.
effectively = to a specified level of human performance.
common usability problems & some objective measures of usability → 4+4 ⇒ 8M.

1) How effective is the interface?
2> How learnable is the interface?
3) How flexible is the interface?

b> Difference b/w.

a) Printed Pages vs webPage → 5M

1) Page size
2) Page rendering
3) Page layout
4) Page resolution
5) Page Navigation

b) Difference b/w Intranet vs Internet → 5M

10M.

1) users
2) Tasks
3) Type of information.
4) Amount of information
5) Hardware & software.

HOD.
COMPUTER SCIENCE & ENGG.
SIET, TUMAKURU-05.

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
TUMKUR-572106
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: I
SUB :OperatingSystems(18CS43)
SEM :IV

DATE: 26/05/22
MARKS :40
TIME : 120 min

NOTE: Answer Two full questions

1. a) Calculate total distance in cylinders for all your algorithms using a queue 98,183,37,122,14,124,65 and 67, head is starting from 53. 10M

b)Consider a page reference string 7,0,1,0,1,0,2,7,0,0,0,1,0,4,2,0,1,0,1with frame size 1,2,3,4,5,6,7. Calculate total number of page fault for all your algorithm. 10M

2.
a)

Arrival time	Burst time	Priority	Process
0.0	10	2	P1
1.0	1	4	P2
2.0	2	1	P3
3.0	4	3	P4
4.0	5	5	P5

For the table displayed above draw the gantt charts for FCFS, SJF, Priority, Pre-emptive SJF, Pre -emptivepriority,Round robin by taking time slice has 3. Calculate average waiting time and average turn around time. 8M

b)

Allocation	Max	Available	Process
0 0 1 2	0 0 1 2	1 5 2 0	P0
1 0 0 0	1 7 5 0		P1
1 3 5 4	2 3 5 6		P2
0 6 3 2	0 6 5 2		P3
0 0 1 4	0 6 5 6		P4

What is the content of matrix need, Is the system is in a safe state, if a request from process p1 arrives for 0,4,2,0. Deyermine can the request be granted immediately. 8M

c)Given a memory partitions of 100kb, 500kb, 200kb, 300kb and 600kb in order. How would each of first fit, best fit, best fit, worst fit algorithm play a process of 212kb, 417kb, 112kb, 426kb in order? Which algorithm is the best. 4M

****

PRINCIPAL
SIET, TUMAKURU

Operating Systems (18CS43)

Sem: IV

Scheme 1st Internals

1) a

FCFS DSA

Total distance in cylinders → 640 cylinders 2M

SSTF DSA – 236 cylinders 2M

SCAN | Elevator – 236 cylinders 2M

C-SCAN DSA – 384 cylinders 2M

LOOK SCAN DSA – 322 cylinders 2M

1) b

no of frames	FIFO	optimal	LRU	
1	20	20	20	1M
2	18	15	18	1M
3	16	11	15	1M
4	14	08	10	1M
5	10	07	08	2M
6	10	07	07	2M
7	07	07	07	2M

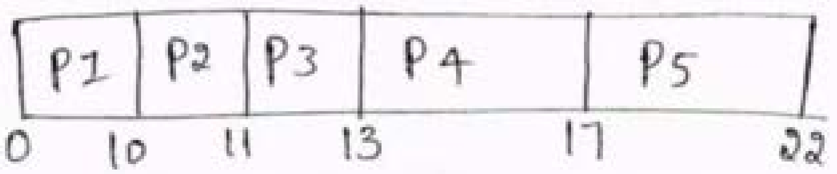
PRINCIPAL
SIET, TUMAKURU

2) a

BT	priority	process
10	2	P1
1	4	P2
2	1	P3
4	3	P4
5	5	P5

FCFS

Gantt chart

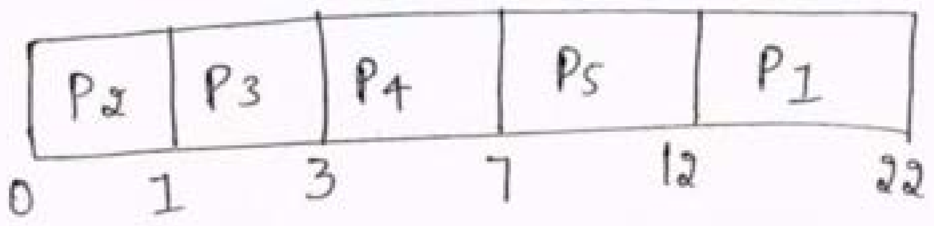


Avg waiting time -> 10.2 ms

Avg turn around time -> 14.6 ms

SJF

Gantt chart

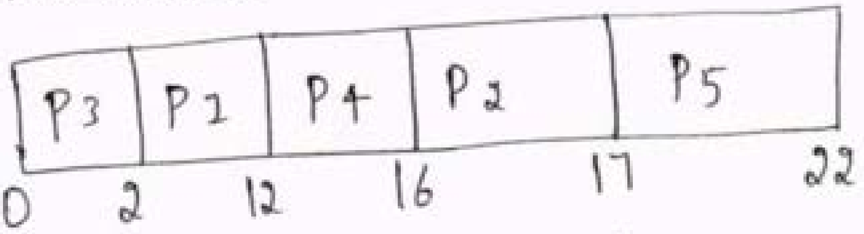


Avg waiting time -> 4.6 ms

Avg turn around time -> 9 ms

Priority

Gantt chart

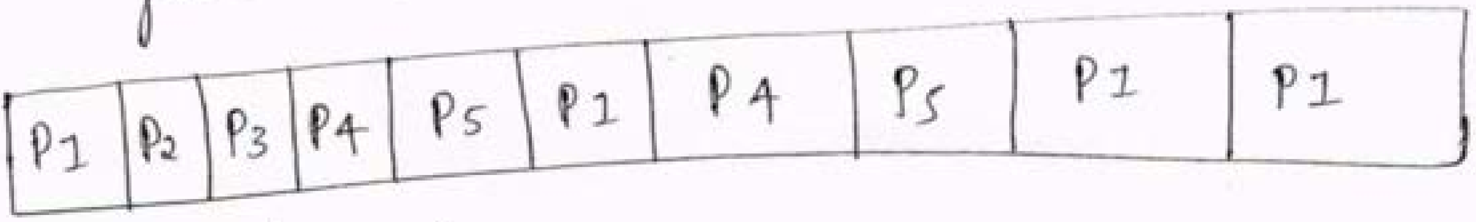


Avg waiting time → 9.4 ms

Avg Turn around time → 13.8 ms

Round Robin

Gantt chart



Avg waiting time → 9ms

Avg Turnaround time → 11.7 ms

2)b	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	0	0	1	2	0	0	1	2	1	5	8	0
P_1	1	0	0	0	1	7	5	0				
P_2	1	3	5	4	2	3	5	6				
P_3	0	6	3	2	0	6	5	2				
P_4	0	0	1	4	0	6	5	6				

$Need_4 \le Work$

0 6 4 2 ≤ 2 14 11 8

Present cycle is $\langle P_0, P_2, P_3, P_4, P_1 \rangle$

∴ System is in a Safe state

$W = W + A_4$

= 2 14 11 8 + 0 0 1 4

= 2 14 12 12

$W = W + A_1$

= 2 14 12 12 + 1 0 0 0

= 3 14 12 12

$Request_i \le Need_i$

$Request_1 \le Need_1$

0 4 2 0 ≤ 0 7 5 0

$Request_i \le available$

$Request_1 \le available$

0 4 2 0 ≤ 1 5 2 0

Since the request [0 4 2 0] is lesser than the need & available, the request can be granted

available = available − $Request_i$

= 1 5 2 0 − 0 4 2 0

= 1 1 0 0

10M

$allocation_i = allocation_i + Request_i$

$= allocation_1 + Request_1$

= 1 0 0 0 + 0 4 2 0 → 1 4 2 0

2021-22-Even

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
TUMAKURU-572106
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

An ISO 9001:2015 Certified Institution

INTERNAL ASSESMENT TEST: II **DATE:27/06/2022**
COURSE: Design and Analysis of Algorithms (18CS42) **MAX MARKS:40**
SEM: IV **TIME:90 min**

NOTE: Answer any **TWO** full questions

1. a. Explain Asymptotic notation in details with example? **10M-CO1**
   b. Write an algorithm to find uniqueness of element in an array and give the mathematical anlysis of this non recursive algorithm with steps. **10M-CO1**

or

2. a. Write the tower of Hanoi algorithm and steps for analysis of recursive algorithm. Show the analysis of above algorithm. **8M-CO1**
   b. Discuss fundamental data structures. **6M-CO1**
   c. What is an algorithm? Explain the criteria to be satisfied by algorithm. **6M-CO1**

3. a. Design an algorithm for performing sequential search and compute best case, wortcase and average case effiency. **8M-CO1**
   b. The factorial function n! has value 1 when n<=1 and value n*(n-1)! When n>1. Write a recursive algorithm to compute n!. **6M-CO1**
   c. Explain the General plan of recursive algorithm. **6M-CO1**

or

4. a. Outline an algorithm to find maximum of n elements and obtain its Time complexity. **10M-CO1**
   b. Explain the following problem types:
   (i) Sequencing (ii) Sorting (iii) Combinatorial problems. **10M-CO1**

Prof. Chethan M.S

Prof. C.V. Shanmukhaswamy
HoD, Dept of CSE

PRINCIPAL
SIET., TUMAKURU.

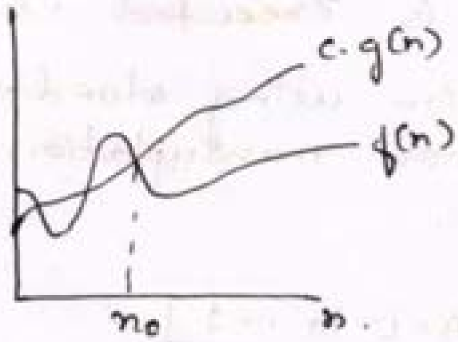
18CS42 - Design & Analysis of Algorithms:

I - Internal Assessment Test:

(1)(a). 3 asymptotic notations:

(1). Big-O notation: (O)

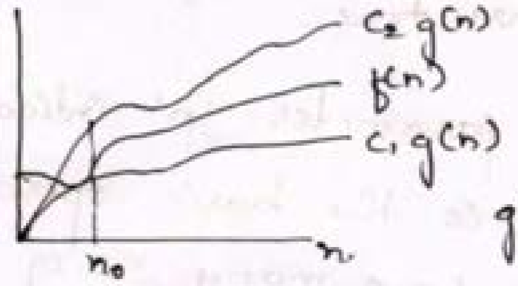
$O(g(n)) = \{f(n)$: there exist +ve constants c & n_0 such that $0 \leq f(n) \leq c.g(n)$ for all $n \geq n_0\}$



g(n) is an asymptotic upper bound for f(n).

(2). Theta notation: (θ)

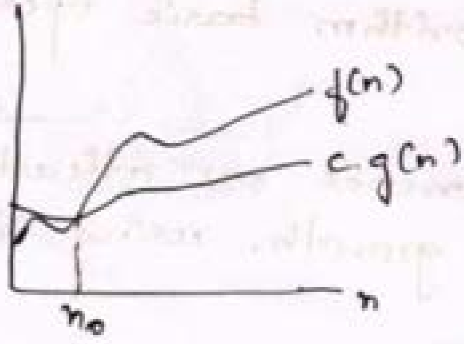
$\theta(g(n)) = \{f(n)$: there exist +ve constants c_1, c_2 & n_0 such that $0 \leq c_1 g(n) \leq f(n) \leq c_2 g(n)$ for all $n \geq n_0\}$



g(n) is an asymptotically tight bound for f(n).

(3). Omega notation: (Ω)

$\Omega(g(n)) = \{f(n)$: there exist +ve constants c & n_0 such that $0 \leq c.g(n) \leq f(n)$ for all $n \geq n_0\}$



g(n) is an asymptotic lower bound for f(n).

(1)(b). (1). Decide on parameters 'n' indicating the input size of the algorithm.

(2). Identify the basic operations of the algorithm.

(3). Check whether the no of times the basic operations is executed, depends only on the i/p size 'n', if it also depends on the type of the i/p then findout best, average & worst case efficiency.

(4). Set up a summation for expressing no of times basic operation is executed i.e, c(n)

(5). Simplify summation using standard formula & rules of summation manupulation establish the order of growth.

```
Algorithm unique [A=0 to n-1]
    for i ← 0 to n-2 do
        for j ← i+1 to n-1 do.
            if A[i] = A[j] return false.
        else
            return true.
```

(2)(a). (1). Decide on parameter 'n' indicating i/p size.

(2). Multiplication is the basic operation.

(3). Check whether how many no of times basic operations can be executed, it also depends on i/p size 'n'.

(4). Set up recurrence relations with an appropriate initial condition, for the no of times the algorithm basic operations can be executed.

(5). Solve the recurrence or atleast determine the order of growth. using substitution method.

(2)(b). Fundamental data structures:

- Stacks: Stacks work on the Last In First Out method. The last one you place on top of the stack is the first one you can remove.
- Queues: The difference is that queue uses the First In First Out method instead of LIFO method. The first person in line is the first person to exit.
- Linked list: Just like stacks and queues, a linked list is a linear data structure. A linked list is different. Think of a linked list as a sequence of elements where each element is linked to the next.
- Trees: Trees are structured so that there is one edge for each parent-child node relationship. There must be only one possible path from a root to any given node.

(2)(c). Algorithm is a set of steps to complete a task.

- Must take an input.
- Must give some output.
- Definitness - each instruction is clear and unambiguous.
- Finiteness - algorithm terminates after a finite number of steps.
- Effectiveness - every instruction must be basic i.e., simple instructions.

PRINCIPAL
SIET., TUMAKURU.

(3)(a). SequentialSearch (A[0...n-1], k)

```
i ← 0
while i<n and A[i] ≠ K do
    i ← i+1.
if i<n return i
else
    return -1.
```

- **Worst-case**: The input of size n for which the algorithm runs the Longest among all possible inputs of that size.

  $C_{worst}(n) = n.$

- **Best-case**: For sequential search best-case inputs will be lists of size n with their first element equal to a search key.

  $C_{best}(n) = 1.$

- **Average-case**: Let p be the probability of successful search.

  $C_{avg}(n) = \frac{p(n+1)}{2} + n(1-p).$

(3)(b). **Definition**: $n! = 1*2*\_*(n-1)*n$ for $n \geq 1$ and $0! = 1$.

Recursive defn: of n!:

$F(n) = F(n-1)*n$ for $n \geq 1$ and $F(0)=1$.

Algorithm:

Factorial (n).

// Input : A non-negative integer n.

// Output : The value of n!

```
if n == 0
    return 1.
else
    return Factorial (n-1)*n.
```

(3)(c). General plan:

(1). Decide on parameter 'n' indicating i/p size.

(2). Identify algorithm of basic operations.

(3). Check whether how many no of times basic operations can be executed, it also depends on i/p size 'n', Find out an operation, if it is also depends on type of i/p find best, worst & average case efficiency.

(4). Set up recurrence relations with an appropriate initial condition for the no of times the algorithm basic operations can be executed.

(5). Solve the recurrence (or) atleast determine the order of growth using substitution method.

(4)(a). Largest element:

Algorithm: MaxElement (A[0....n-1])

```
    MaxVal ⟵ A[0]
    for i ⟵ 1 to n-1 do
        If A[i] > MaxVal
            MaxVal ⟵ A[i]
    return MaxVal
```

Time complexity:

$$C(n) = \sum_{i=1}^{n-1} (1)$$

$$= (n-1) \cancel{-1} \cancel{+1}.$$

$$C(n) = n-1. \qquad \boxed{C(n) = O(n)}$$

(7)(b). (i) <u>Sequencing</u>:

* The sequencing of jobs on a single processor with deadline contraints is called as Job sequencing with deadlines.
* Each job has a defined deadline & some profit associated with it. The profit of a job is given only when that job is completed within its deadline.

(ii) <u>Sorting</u>:

* Sorting problem is to rearrange the items of a given list in non-decreasing order.
* In the case of records, we need to choose a piece of information to guide sorting.

(iii) <u>Combinatorial Problems</u>:

* Generally combinatorial problems are the most difficult problems in computing, from both a theoretical & practical standpoint.
* First, the <u>no</u> of combinatorial problem's objects typically grows extremely fast with a problem's size, reaching, unimaginable magnitudes even for modrate-sized instance.
* Second, there are no known algorithms for solving most such problems exactly in an acceptable amount of time.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(An ISO 9001-2015 Certified Institution)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: I

SUB : **18CS62 Computer Graphics And Visualization** (18CS62) MAX MARKS : 40
SEM : VI Sem
DATE& TIME : 20/5/22&90 min

NOTE : Answer any **TWO** full questions.

1. a) Define computer graphics. Explain the applications of Computer Graphic 8M [CO1]
   b) List and explain OpenGL primitives (functions) with example. 6M [CO1]
   c) Differentiate between Raster Scan Display and Random Scan Display. 6M [CO1]

OR

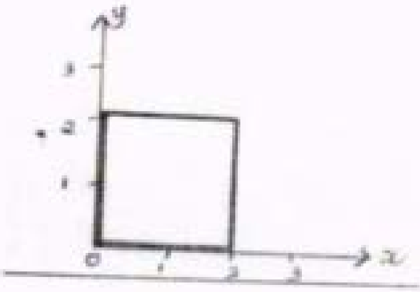
2. a) Write a note on Display window management system using GLUT 10M[CO1]
   b) Write the algorithm for Bresenham's line drawing algorithm; identify the points between the vertices of line segment given (0,0) to (9,4). 10M[CO1]

3. a) Define Transformation. Explain 2-D transformations in detail. 10M [CO2]
   b) Write the algorithm for midpoint circle algorithm(Bresenham's algorithm). Identify the pixel positions along a circle path centered on origin and with radius 10. 10M [CO2]

OR

4. a)Explain 2-D rotation with respect to pivot point. 8M [CO2]
   b) Prove the following i. Two successive translations are additive 6M [CO2]
   ii. Two successive rotations are additive

   b)Given the object with vertices (0,0),(2,0), (2,2), (0,2), scale the object given sx:1 and sy:2,also translate object with tx=3 and ty=4 6M [CO2]



Staff signature

PRINCIPAL
SIET., TUMAKURU.

HOD
H.O.D.
COMPUTER SCIENCE & ENGG.
SIET, TUMAKURU-06

Scheme of Solutions - IA1

SUB: Computer Graphics & Visualization
Code : 18CS62 Date: 20/5/22

1\. a) Definition of Computer Graphics - 1M

Applications of computer graphics

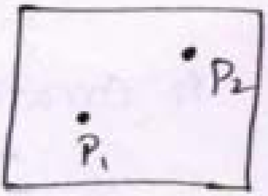
- i. Graphs & chart
- ii computer Aided design
- iii. Virtual Reality
- iv. Data Visualization
- v. Education & training
- vi. Entertainment
- vii. Image processing

+ Explanation - 7M

b)

Points - (GL_POINTS) 6X1M = 6M

```
glBegin(GL_POINTS)
    glVertex2i(10, 20);
    glVertex2i(20, 40);
glEnd();
```

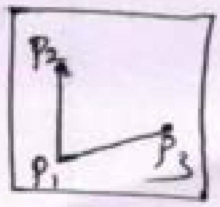


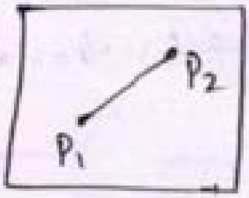
Lines

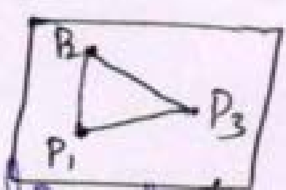
GL_LINES GL_LINE_LOOP GL_LINE_STRIP

```
glBegin(GL_LINES)
  glVertex2i(10,20)
  glVertex2i(20,40)
glEnd();
```

```
glBegin(GL_LINE_LOOP)
  glVertex2i(10,20)
  glVertex2i(10,50)
  glVertex2i(20,30)
glEnd
```



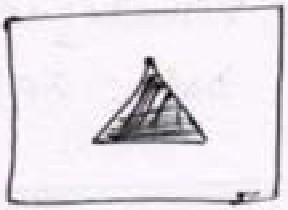




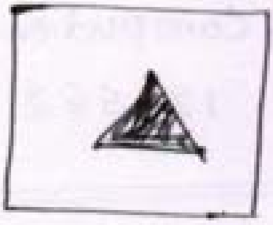
PRINCIPAL
SIET., TUMAKURU

H.O.D
COMPUTER SCIENCE & ENGG.
SIET. TUMAKURU-06

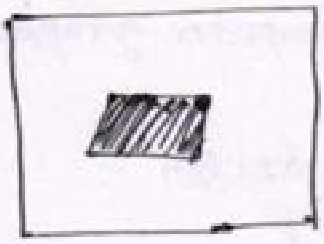
POLYGON (GL_POLYGON)



TRIAGLES (GL_TRIANGLES)



Quadrilaterals (GL_QUADS)



C. Any 6 differences 1X6 = 6M

2. a. Display window system using GLUT (10M)

i. Initialization of GLUT
glutInit (&argc, argv)

ii. Creating window display
glutCreateWindow ("An Example")

iii. Specifying content of display window
glutDisplayFunc (lineSegment) 5M

iv. Activate the display window
glutMainLoop()

v. Additional GLUT functions
glutWindowPosition (50, 100)
glutInitWindowSize (400, 300)
glutInitDisplayMode (GLUT_SINGLE | GLUT_RGB)

+ Explanation 5M

PRINCIPAL
SIET., TUMKURU

b.

i. Input the 2 line endpoints & store left endpoint in (x_0, y_0)

ii. Set color for frame buffer. position (x_0, y_0)

iii. $P_0 = 2\delta y - \delta x$

iv. if $(P_K < 0)$ next point (x_K+1, y_K) 5M

$P_{K+1} = P_K + 2\delta y$

else

next point is (x_K+1, y_K+1)

$P_{K+1} = P_K + 2\delta y - 2\delta x$

v. Repeat step $\delta x - 1$ times

Problem. 5M

3 a.

Definition of Transformation — 1M

Translation

$$P' = T \cdot P$$

$$\text{where } T = \begin{bmatrix} 1 & 0 & tx \\ 0 & 1 & ty \\ 0 & 0 & 1 \end{bmatrix}$$ 3M

$$x' = x + tx$$
$$y' = y + ty$$

Rotation

$$P' = R(\theta) \cdot P$$

$$R(\theta) = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$ 3M

$$x' = x\cos\theta - y\sin\theta$$
$$y' = x\sin\theta - y\cos\theta$$

PRINCIPAL
SIET., TUMAKURU.

Scaling

$$P' = S \cdot P$$

$$S = \begin{bmatrix} S_x & 0 & 0 \\ 0 & S_y & 0 \\ 0 & 0 & 1 \end{bmatrix}$$ 3M

$$x' = S_x \cdot x$$

$$y' = S_y \cdot y$$

b. Midpoint Circle Algorithm 5M

1. Input radius r & circle center (x_c, y_c) then set first coordinate $(x_0, y_0) = (0, r)$
2. Calculate the initial value of decision parameter $P_0 = 1 - r$ or $P_0 = 5/4 - r$
3. At each x_K position starting from $k = 0$ perform following test if $(P_K < 0)$ then

   next point (x_K+1, y_K)

   $P_{K+1} = P_K + 2x_K + 3$

   else

   next point (x_K+1, y_K)

   $P_{K+1} = P_K + 2x_K + 2y_K + 1$
4. Determine symmetry points in other 7 octants
5. Display all points

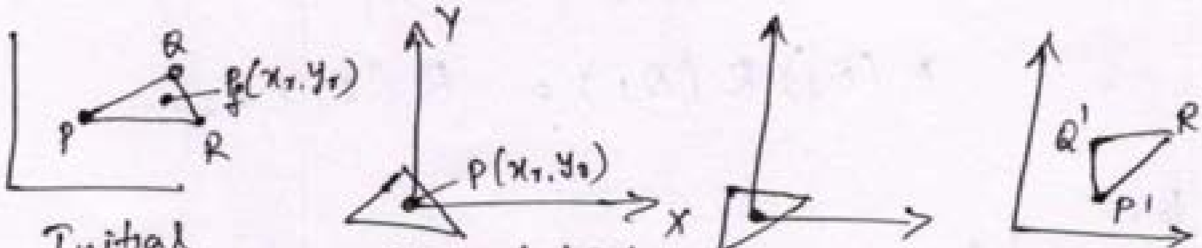
$r = 10$

$P_0 = 1 - 10 = -9$ 5M

K	P_K	(x_K+1, y_K+1)	$2x_{K+1}$	$2y_K+1$
0	-9	(1, 10)	2	20
1	-6	(2, 10)	4	20
2	-1	(3, 10)	6	20
3	6	(4, 9)	8	18
4	-3	(5, 9)	10	18
5	8	(6, 8)	12	16
6	5	(7, 7)	14	14

4

a) 2-D rotation w.r.t pivot point



Initial — Translate to origin — Rotate by θ angle — Retranslate back to original

1M

$$P' = T^{-1}(x_r, y_r)\ R(\theta).\ T^{-1}(x_r, y_r) . P \quad - 2M.$$

$$= \begin{bmatrix} 1 & 0 & x_r \\ 0 & 1 & y_r \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -x_r \\ 0 & 1 & -y_r \\ 0 & 0 & 1 \end{bmatrix} \quad 5M$$

$$= \begin{bmatrix} \cos\theta & -\sin\theta & x_r(1-\cos\theta) + y_r \sin\theta \\ \sin\theta & \cos\theta & y_r(1-\cos\theta) - x_r \sin\theta \\ 0 & 0 & 1 \end{bmatrix}$$

b. i. Two Successive translations

$$P' = T(t_{2x}, t_{2y}) . \{T(t_{1x}, t_{1y}) . P\} \quad 3M$$

$$= \{T(t_{2x}, t_{2y}) . T(t_{1x}, t_{1y})\} P$$

$$T(t_{2x}, t_{2y}) . T(t_{1x}, t_{1y}) = \begin{bmatrix} 1 & 0 & t_{1x} \\ 0 & 1 & t_{1y} \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & t_{2x} \\ 0 & 1 & t_{2y} \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 & t_{1x} + t_{2x} \\ 0 & 1 & t_{1y} + t_{2y} \\ 0 & 0 & 1 \end{bmatrix}$$

$$= T(t_{1x} + t_{2x},\ t_{1y} + t_{2y}$$

∴ Additive

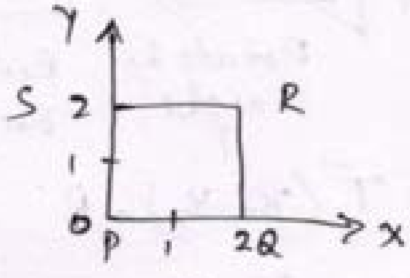
PRINCIPAL
SIET., TUMAKURU.

ii. Two Successive Rotations

$$P' = R(\theta_2) \cdot \{R(\theta_1) \cdot P\}$$
$$= \{R(\theta_2) \cdot R(\theta_1)\} P$$ 3M

$$R(\theta_2) R(\theta_1) = R(\theta_1 + \theta_2)$$

b.



Given
$P = (0,0)$ $R(2,2)$
$Q = (2,0)$ $S(0,2)$

Scale the object $S_x : 1$ $S_y : 2$ 3M

$$P' = S \cdot P$$
$$= \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0 & 2 & 2 & 0 \\ 0 & 0 & 2 & 2 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 0 & 2 & 2 & 0 \\ 0 & 0 & 4 & 4 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

$\therefore P'(0,0)$ $Q'(2,0)$ $R'(2,4)$ $S'(4.1)$

Translate the object $t_x = 3$, $t_y = 4$

$$P' = T \cdot P$$
$$= \begin{bmatrix} 1 & 0 & 3 \\ 0 & 1 & 4 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0 & 2 & 2 & 0 \\ 0 & 0 & 2 & 2 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$ 3M

$$= \begin{bmatrix} 3 & 5 & 5 & 3 \\ 4 & 4 & 6 & 6 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

$\therefore P' = (3,4)$ $Q'(5,4)$ $R'(5,6)$ $S'(3,6)$

Staff Incharge

PRINCIPAL
SIET, TUMAKURU

HOD

Sri Shridevi Charitable Trust (R.)

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org

INTERNAL ASSESMENT TEST: I
SUB : OOMD (18CS642)
SEM : VI

Date: 23/05/2022
MAX MARKS : 40
TIME : 90 min

NOTE: Answer TWO full questions

1 a) Define the following terms with example: i) Enumerations ii) Multiplicity iii) Visibility iv) N-ary associations v) Aggregation versus Association 10M [CO1]
b) What is an event? Explain different types of events, with an example? 10M [CO1]

OR

2 a) Explain workarounds with example 10M [CO1]
b) Explain nested states and nested state diagrams, with telephone line example? 10M [CO1]

3 a) What is UseCase and Actor? Explain UseCase diagram of the order-entry sub system for RMO showing a system boundary? 10M [CO2]
b) Explain brief and fully developed description of the web order scenario? 10M [CO2]

OR

4 a) Explain brief and intermediate use case description of the telephone order scenario? 10M [CO2]
b) Explain brief and intermediate use case description of the web order scenario? 10M [CO2]

Sri Shridevi Charitable Trust (R.)

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
An ISO 9001:2015 Certified Institution
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org

INTERNAL ASSESMENT TEST: I
SUB : OOMD (18CS642)
SEM : VI

Date: 23/05/2022
MAX MARKS : 40
TIME : 90 min

NOTE: Answer TWO full questions

1 a) Define the following terms with example: i) Enumerations ii) Multiplicity iii) Visibility iv) N-ary associations v) Aggregation versus Association 10M [CO1]
b) What is an event? Explain different types of events, with an example? 10M [CO1]

OR

2 a) Explain workarounds with example 10M [CO1]
b) Explain nested states and nested state diagrams, with telephone line example? 10M [CO1]

3 a) What is UseCase and Actor? Explain UseCase diagram of the order-entry sub system for RMO showing a system boundary? 10M [CO2]
b) Explain brief and fully developed description of the web order scenario? 10M [CO2]

OR

4 a) Explain brief and intermediate use case description of the telephone order scenario? 10M [CO2]
b) Explain brief and intermediate use case description of the web order scenario? 10M [CO2]

[Renukaradhya R C]

PRINCIPAL
SIET., TUMAKURU.

H.O.D.
COMPUTER SCIENCE & ENGG.,
SIET, TUMAKURU-06.

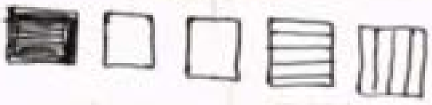
Internal Assessment Test : 1 OOMD - (18CS642)

Answer Two full questions

1 a) Define following terms with example:

i) Enumerations :- A datatype is a description of values. Datatypes include numbers, strings and Enumeration

Eg:- Two Dimensional filltype



ii) Multiplicity :- multiplicity is a constraint on the cardinality of a set

eg:-

iii) Visibility :- visibility refers to the ability of a method to reference a feature from another class and has the possible values of public protected, private and package.

eg:-

iv) N-array Associations :- A Non atomic n-array association a person makes the purchase of stock in company.

eg:-

v) Aggregation versus Association :- Aggregation is a strong form of associations in which an aggregate object is made of constituent parts

eg:-

5×2M

1 b) what is Event? explain different types of events with one example?

1 signal event :- A signal is an explicit one-way transmission of information from one object to another

eg:-

2 change Event :- A change event is an event that is caused by the satisfaction of a boolean expression.

eg:-

3 Time Event :- A Time event is an event caused by the occurrence of an absolute time or elapse of a time interval

eg:-

4+3+3

PRINCIPAL
SIET., TUMAKURU.

2] a] explain workarounds with example

Workaround:- Dealing with lack of multiple inheritance is really an implementation issue, but early restructing of a model is often the easiest way to work around its absence. 5M+5M

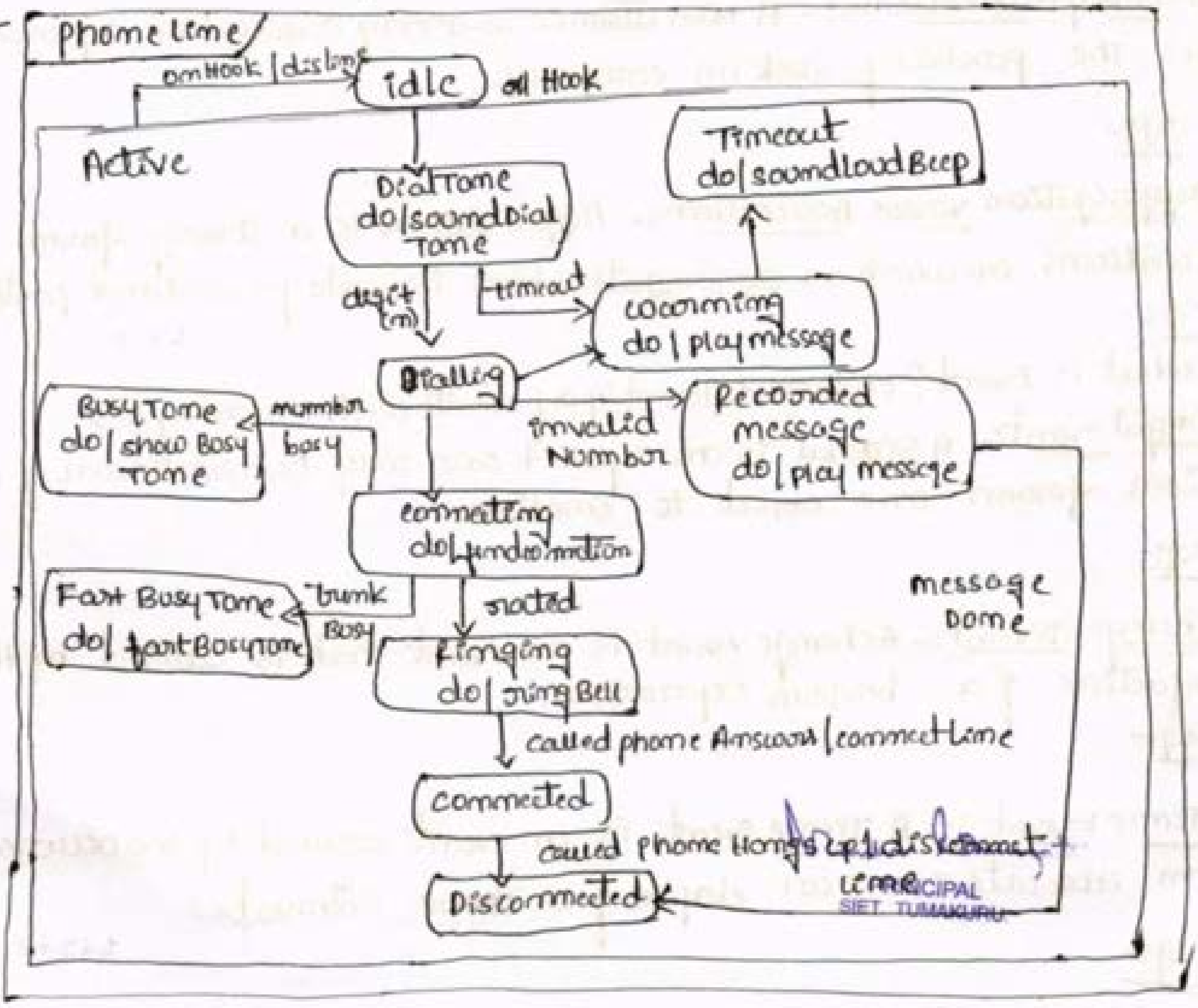
eg:-

2] b] explain nested states and nested state diagrams. with telephone line example?

Nested states:- Nested states, is a deeper alternative to Expanding states. when states has multiple sub states then they could be nested and Enclosed.

Nested state diagrams:- The nested state diagram is the concept advanced state modelling. conventionally a complex system has much redundancy. 5M+5M

eg:-



3 a what is Usecase and Actor? explain UseCase diagram of the order-Entry sub system for RMO.

→ Use case :- A use case is a coherent piece of functionality that a system can provide by interacting with actors called usecase.

→ Actor:- An actor is direct external user of system - an object or set of objects that communicates directly with the system but that is no part of the system.

2+8m

diagram :-

3 b explain brief and fully developed description of the web order scenario?

Brief description :- customer logs in and requests the new order from the customer searches the catalog online & purchases items from the catalog

fully developed description

4+6m

Use case name	create new order	
Sceonario	create new web order	
Actors	customer	
Stakeholders	sales department to provide primary definition	
pre conditions:	catalog, products & inventory items	
post conditions	order and order line items must be created	
Flow of events	Actor 1. customer connects to the RMO home pages and then links to the order page	System create new customer record

4 a explaim brief and intermediate use case description of the telephone order.

Brief description:- when customer calls to order the order clerk and system verify customer information, creat a new order add items to the order.

4+6m

Intermediate description

Flow of activities for Scenario of clerk creats telephone order.
main Flow
1. customer calls RMO and gets orderclerk 2. orderclerk verifies customer information
Exception condition
1. if an item is not in stock that customer can a choose not to purchase item

4 b explain brief and intermediate use case description of the web order Senario.?

Brief description:- customer logs in and requests the new order form the customer searches The catalog device online and purcha item from the catalog

Intermediate description

Flow of activities for Scenario of customer creats web order, main flow
1. customer connects to the RMO home page and then looks to the order 2. if existing customer customer login
Exception condition
1 if existing customer forgets password Then 2. customer can provide logform password procuring

4+6m

PRINCIPAL
SIET, TUMAKURU

A
[Kamalaradhya P C]

H.O.D.
COMPUTER SCIENCE & ENGG.,
SIET, TUMAKURU-06.

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
TUMAKURU-572106
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

An ISO 9001:2015 Certified Institution

INTERNAL ASSESMENT TEST: II
COURSE: Design and Analysis of Algorithms (18CS42)
SEM: IV

DATE: 04/07/2022
MAX MARKS: 40
TIME: 90 min

NOTE: Answer any TWO full questions

1. a. Design an algorithm for performing merge sort. Analyze its time efficiency. Apply the same to sort the following set of numbers. 4, 9, 0, -1, 6, 8, 9, 2, 3, 12 **10M-CO2**

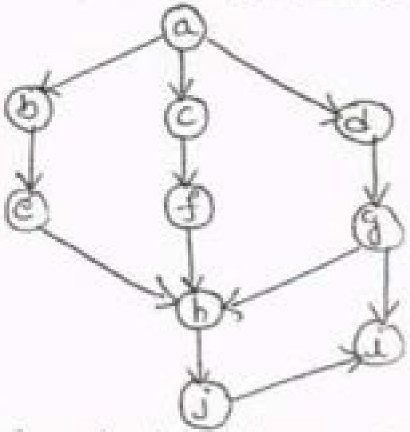
   b. Apply Strassen's Multiplication to multiply the following matrices. Show the details of the computation.

$$A=\begin{bmatrix}1&3&4&7\\3&2&4&5\\3&1&2&1\\3&1&3&6\end{bmatrix}\qquad B=\begin{bmatrix}1&4&3&7\\1&3&4&5\\3&2&0&1\\1&3&4&6\end{bmatrix}$$

10M-CO2

or

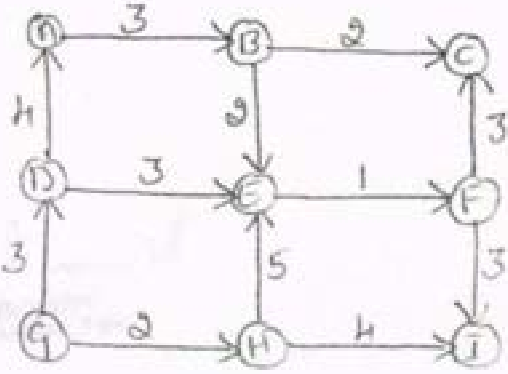
2. a. Apply topological sort on the following graph using source removal and DFS based Method. **10M-CO2**



   b. Design an algorithm for performing quick sort, apply the same to sort the following set of numbers 5, 3, 1, 9, 8, 2, 4, 7 **10M-CO2**

3. a. Write an algorithm to solve the knapsack problem using greedy approach and apply the same to find an optimal solution to the knapsack instance, n=5, m=6.
   (p1, p2, p3, p4, p5)= (25, 20, 15, 40, 50) and
   (w1, w2, w3, w4, w5)= (3, 2, 1, 4, 5) using greedy approach. **10M-CO3**

   b. What is Dijkstra's algorithm used for? Apply Dijkstra's algorithm on the following graph. Initial node is G

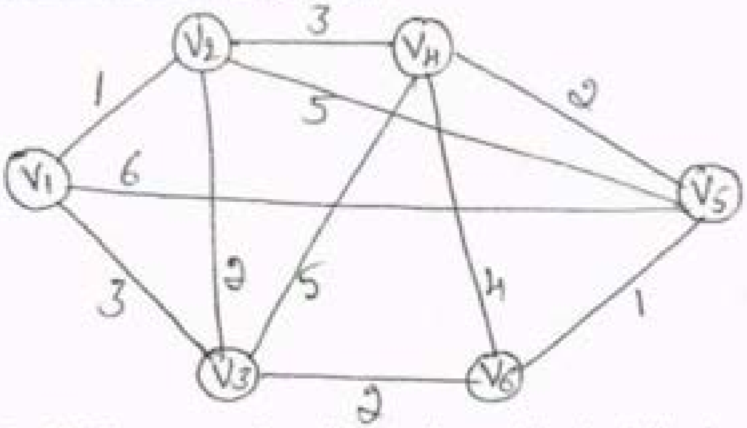


10M-CO3

PRINCIPAL
SIET., TUMAKURU.

Or

4. a. Define minimum spanning tree. Write Prim's algorithm to find minimum spanning tree. **08M-CO3**
Apply the same on the following graph:



b. Construct the Huffman tree and resulting code word for the following set of values? **06M-CO3**

Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

Encode Text DAD

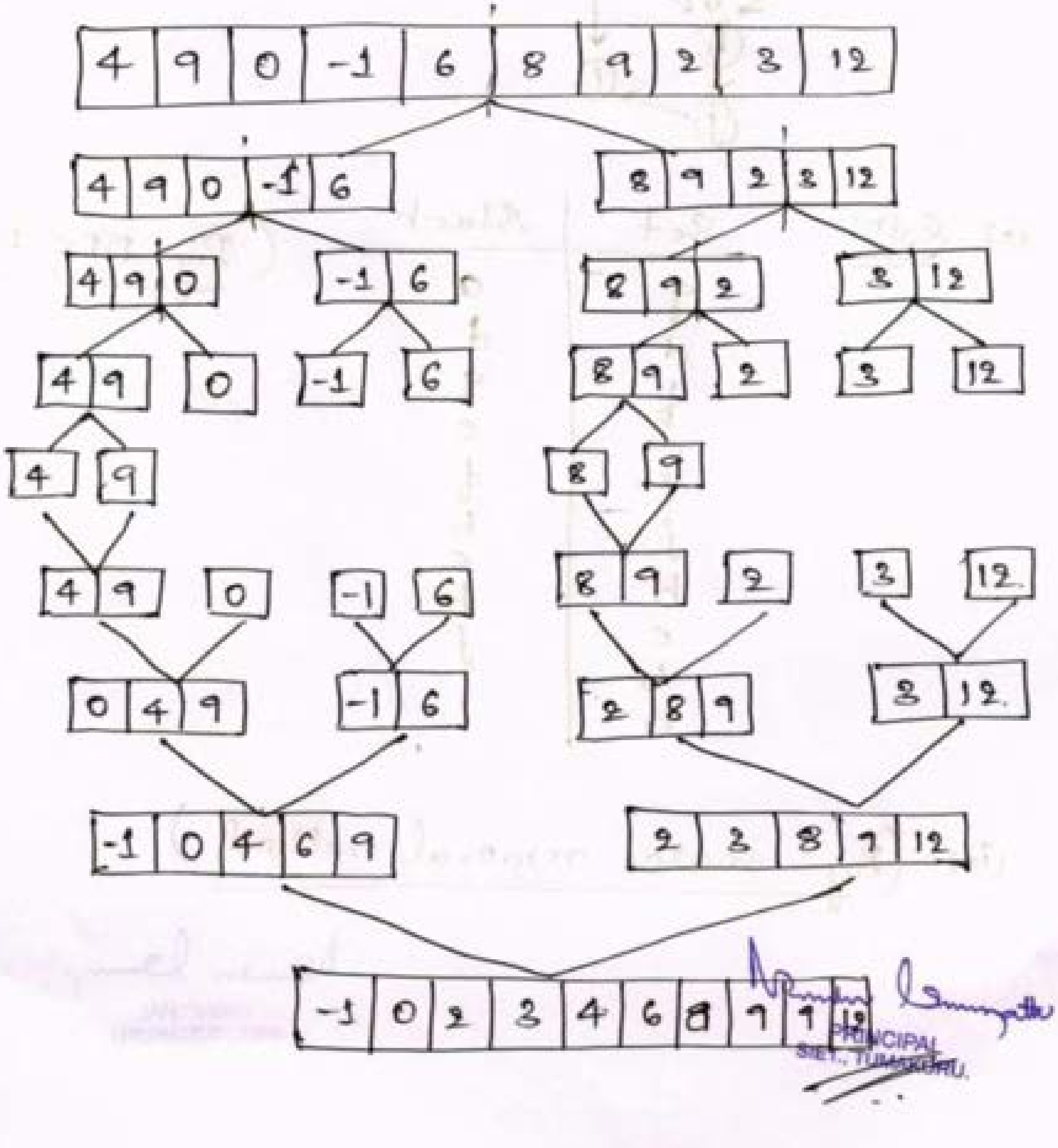
c. Find the optimal solution using greedy for the job sequencing with dead line problem with following values? n=5.
Profit= {10, 3, 33, 11, 40}
Dead line= {3, 1, 1, 2, 2} **06M-CO3**

PRINCIPAL
SIET., TUMAKURU

II - Internal Assessment Test :

(1)(a).

```
Algorithm: Mergesort (l, h)
{
    if(l<h)
    {
        mid = $\frac{l+h}{2}$
        mergesort (l, mid) ;
        mergesort (mid+1, h) ;
        merge (l, mid, h) ;
    }
}
```

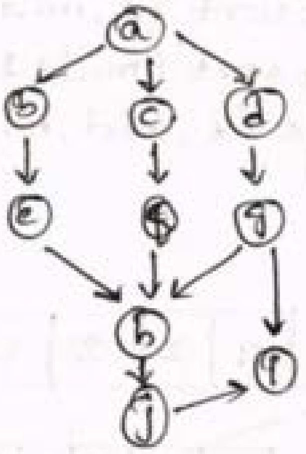


(1)(b).

$$A = \begin{bmatrix} 1 & 3 & 4 & 7 \\ 3 & 2 & 4 & 5 \\ 3 & 1 & 2 & 1 \\ 3 & 1 & 3 & 6 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & 4 & 3 & 7 \\ 1 & 3 & 4 & 5 \\ 3 & 2 & 0 & 1 \\ 1 & 3 & 4 & 6 \end{bmatrix}$$

$$A \times B = C = \begin{bmatrix} 23 & 42 & 43 & 60 \\ 22 & 41 & 37 & 65 \\ 11 & 22 & 17 & 34 \\ 19 & 39 & 37 & 65 \end{bmatrix}$$

(2)(a).



(i) Solⁿ: (By DFS Method).

Set	Stack
g	a
d	d
f	g
c	c
i	f
j	b
h	e
e	h
b	j
a	i

(ii) (By source removal method)

PRINCIPAL
SIET., TUMAKURU.

(2)(b). Quick sort :

Solution → 1 2 3 4 5 7 8 9.

Algorithm:

```
Partition (l, h)
{
    pivot = A[l];
    i = l ; j = h;
    while (i < j)
    {
        do {
            i++;
        }
        while (A[i] ≤ pivot)
        do {
            j--;
        }
        while (A[j] > pivot)
        if (i < j)
            swap (A[i], A[j]);
    }
    swap (A[l], A[j]);
    return j;
}
```

```
Quicksort (l, h)
{
    if (l, < h)
    {
        j = partition (l, h)
        quicksort (l, j);
        quicksort (j+1, h);
    }
}.
```

(3) (a). $n = 5$, $m = 6$.

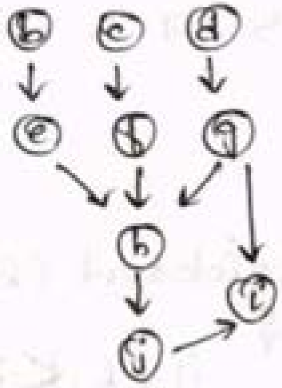
$(p1, p2, p3, p4, p5) = (25, 20, 15, 40, 50)$

$(w1, w2, w3, w4, w5) = (3, 2, 1, 4, 5)$.

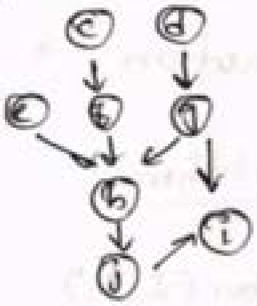
$\boxed{\text{Profit} = 65}$

PRINCIPAL
SIET., TUMAKURU.

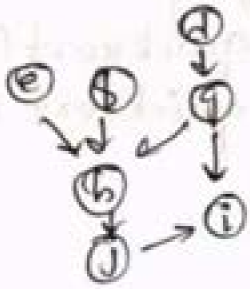
Step 1 : Remove a



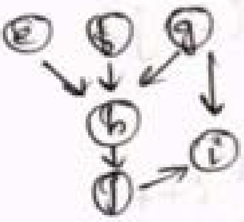
Step 2: Remove b.



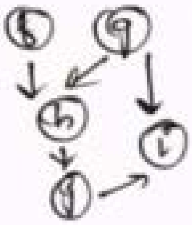
Step 3: Remove c



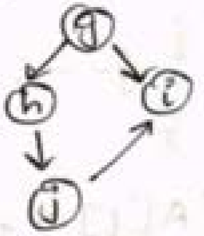
Step 4: Remove d



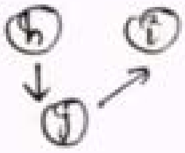
Step 5: Remove e



Step 6: Remove f



Step 7: Remove g



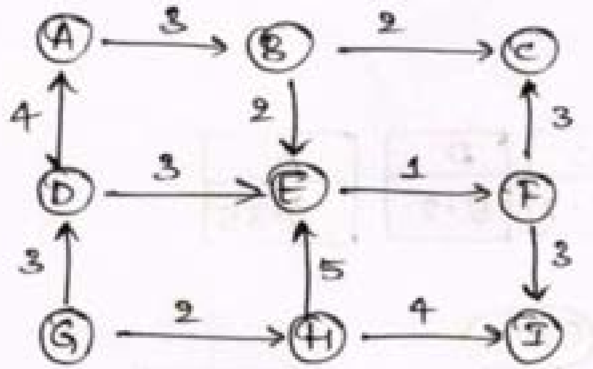
Step 8: Remove h

Step 9: Remove j

Step 10: Remove i

Sorted array: a b c d e f g h j i

(3)(b).



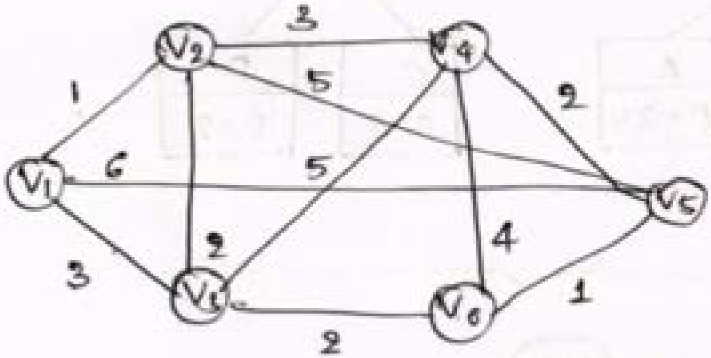
	cost	vertex
A	7	4
B	10	3
C	10	2
D	3	3
E	6	2
F	7	1
G	2	
H	2	2
I	6	3

If $(d[u] + c(u,v) < d[v])$

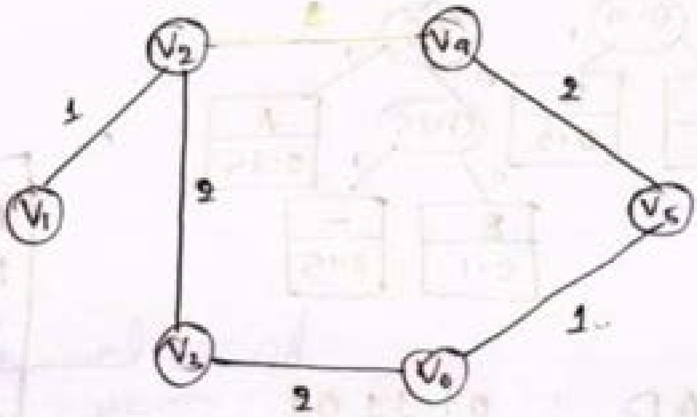
modify

$d[v] = d[u] + c(u,v)$.

(4)(a).



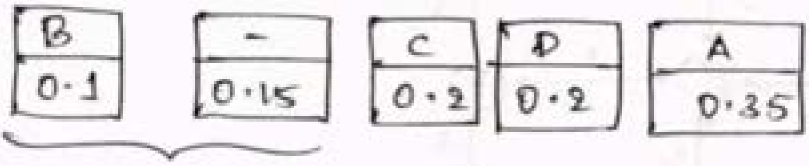
Soln:

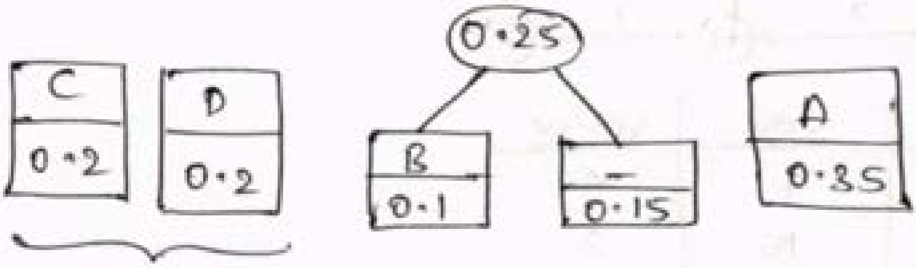


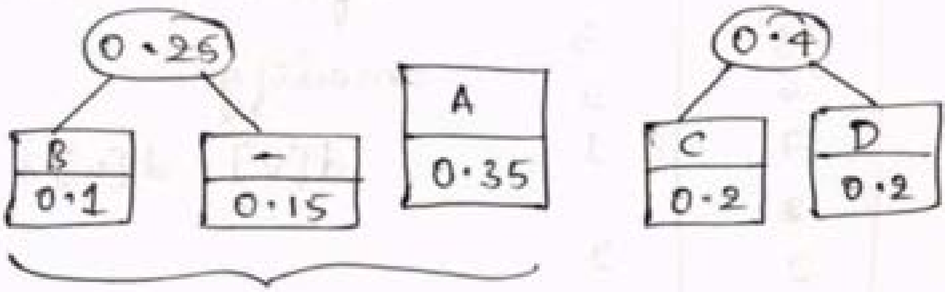
$$\boxed{\text{Minimum cost} = 8}$$

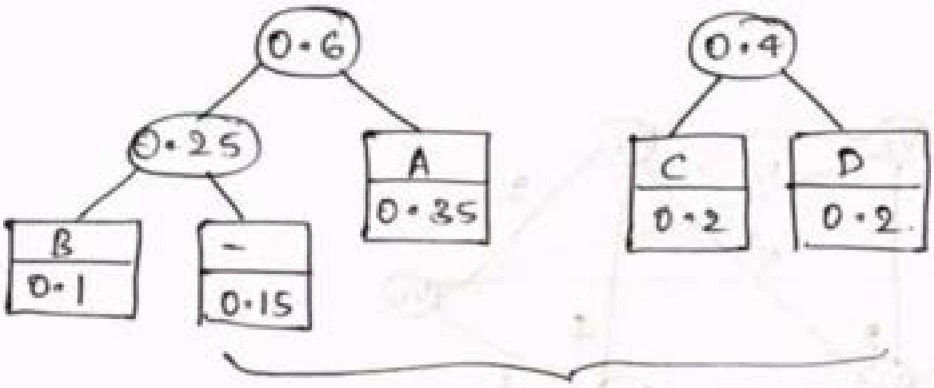
PRINCIPAL
SIET., TUMAKURU.

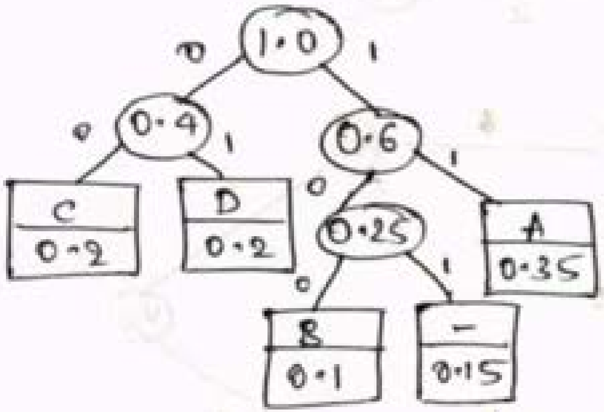
(4)(b).











code.

A = 11.
B = 100
C = 00
D = 01.
⊖ =101

<u>Encode</u>: DAD : 011101.

PRINCIPAL
SIET., TUMAKURU.

(4)(c). $\quad \text{Profit} = \{ \overset{J_1}{10}, \overset{J_2}{3}, \overset{J_3}{33}, \overset{J_4}{11}, \overset{J_5}{40} \}.$

Deadline = {3, 1, 1, 2, 2}.

Profit: $J_5 + J_3 + J_2$.

$= 40 + 33 + 11$

$= 84$

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
SHRIDEVI
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org

DEPT. OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: I

DATE: 28/06/2022

Course Name with code: Microcontroller and Embedded Systems (18CS44) **MAX MARKS**: 40

Class : 4th Sem (CSE and ISE)Duration :90 Min

NOTE: Answer TWOfull questions.

1 a) i) Give the Comparison between Microprocessor and Microcontroller. 04M [CO1]
ii) Give the comparison between RISC and CISC. 04M [CO1]
b) List the features of RISC processor accepted and rejected by ARM processor. 08M [CO1]
c) Write a note on Embedded system software. 04M[CO1]

OR 08M [CO1]

2 a) Explain the architecture of a typical embedded device based on ARM core with a neat diagram.
b) Explain ARM core data flow model with a neat diagram. 08M [CO1]
c) Explain the concept of pipeline used in ARM Processor. 04M[CO1]

3 a)Explain different processor modes of ARM processor. 08M [CO1]
b)Explain the various fields in Current Program Status Register (CPSR) with diagram. 08M [CO1]
c) Explain registers used under various modes. 04M[CO1]

OR

4 a) Explain various exceptions / interrupts supported by ARM processor. 08M [CO1]
b)Discuss the following with diagrams 08M [CO1]
i) Von Neumann architecture with cache. ii) Harvard architecture with TCM.
c)Discuss briefly how coprocessors can be attached to ARM processor. 04M[CO1]

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
SHRIDEVI
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org
DEPT. OF COMPUTER SCIENCE AND ENGINEERING
INTERNAL ASSESMENT TEST: I
DATE: 28/06/2022
Course Name with code: Microcontroller and Embedded Systems (18CS44) MAX MARKS: 40
Class : 4th Sem (CSE and ISE)Duration :90 Min
NOTE: Answer TWOfull questions.
1 a) i) Give the Comparison between Microprocessor and Microcontroller. 04M [CO1]
ii) Give the comparison between RISC and CISC. 04M [CO1]
b) List the features of RISC processor accepted and rejected by ARM processor. 08M [CO1]
c) Write a note on Embedded system software. 04M[CO1]
OR 08M [CO1]
2 a) Explain the architecture of a typical embedded device based on ARM core with a neat diagram.
b) Explain ARM core data flow model with a neat diagram. 08M [CO1]
c) Explain the concept of pipeline used in ARM Processor. 04M[CO1]
3 a)Explain different processor modes of ARM processor. 08M [CO1]
b)Explain the various fields in Current Program Status Register (CPSR) with diagram. 08M [CO1]
c) Explain registers used under various modes. 04M[CO1]
OR
4 a) Explain various exceptions / interrupts supported by ARM processor. 08M [CO1]
b)Discuss the following with diagrams 08M [CO1]
i) Von Neumann architecture with cache. ii) Harvard architecture with TCM.
c)Discuss briefly how coprocessors can be attached to ARM processor. 04M[CO1]

PRINCIPAL
SIET., TUMAKURU.

Assignment Questions
for
MICROCONTROLLER AND EMBEDDED SYSTEMS (18CS44)
Module-1

Q1. Explain briefly the ARM design philosophy.

Q2. With neat sketch, Explain briefly the ARM processor based embedded system hardware.

Q3. a. Explain briefly the ARM processor based embedded system software.

b. Explain ARM core dataflow model.

c. ARM bus technology.

Q4. a. Explain briefly the current program status register (CPSR).

b. Banked registers.

Q5. Give the Comparison between Microprocessor and Microcontroller.

Q6. Give the comparison between RISC and CISC.

Q7 Write a note on Embedded system software.

Q8. Explain briefly the processor modes for ARM processor.

Q9. Explain detail, the pipeline concept for ARM processor.

Q10. List the features of RISC processor accepted and rejected by ARM processor.

PRINCIPAL
SIET., TUMAKURU.

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
INTERNAL ASSESMENT TEST: III

DATE:
15/07/2022

Course Name with code: System Software and Compilers (18CS61) **MAX MARKS**: 40
Class : 6th Semester

NOTE: Answer TWO full questions.

1) a) Explain The SIC or XE Architecture. 10 M [CO1]
b) Write a SIC program to Copy the String "COMPUTER SCIENCE and ENGINEERING" From STR1 to another string STR2 and List the difference between System Software and Application Software. 10 M [CO1]

OR

2a) Explain The Types of Three Adress Code .Write Three Adress Code for the Statements Given Below.
Do i=i+1; while(a[i]<v); S10 M [CO5]
b) Explain Following Datastructres:(i)Quadruples (ii)Triples (iii)Indirect Triples 10M [CO]

3 a) List The Function of Pass1 and Pass2 of two Pass Assembler and write an Algorithm of The Pass1 Of Two Pass Assembler. 10 M [CO1]

b) List the Various Data Structures used in an Assembler and List the Various Machine Independent Assembler Features. 10 M [CO1]

OR

4 a) Explain Issues in Design of a Code Generation . 10 M [CO5]
b) Explain Optimization of Basic Blocks with an Example. 10 M [CO5]

****

PRINCIPAL
SIET., TUMAKURU

3 a) List The Function of Pass1 and Pass2 of two Pass Assembler and write an Algorithm of The Pass1 Of Two Pass Assembler. 10 M [CO1]

b) List the Various Data Structures used in an Assembler and List the Various Machine Independent Assembler Features. 10 M [CO1]

OR

4 a) Explain Issues in Design of a Code Generation . 10 M [CO5]

b) Explain Optimization of Basic Blocks with an Example. 10 M [CO5]

****

PRINCIPAL
SIET., TUMAKURU

Sri Shridevi Charitable Trust (R.)
SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106, Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
INTERNAL ASSESMENT TEST: III DATE:
15/07/2022

Scheme of Evaluation

Course Name with code: System Software and Compilers (18CS61) **MAX**
MARKS: 40
Class : 6th Semester

NOTE: Answer TWO full questions.

1) a) The SIC or XE Architecture. 10 M
b) Write a SIC program to Copy the String "COMPUTER SCIENCE and ENGINEERING" From STR1 to another string STR2 and any 5 differences between System Software and Application Software. 10 M

2a) Types of Three Adress Code . Three Adress Code for the Statements Given Below. 10 M
Do i=i+1; while(a[i]<v);
b) Data structres: (i)Quadruples—3M (ii)Triples----3M (iii)Indirect Triples----4M S10M

3 a) Function of Pass1 and Pass2 of two Pass Assembler---5M 10 M
Algorithm of The Pass1Of Two Pass Assembler. -----------5M

b) Data Structures used in an Assembler-----5M 10 M
List the Various Machine Independent Assembler Features.---5M

4 a) ANY 5 Issues in Design of a Code Generation –5*2=10 10 M
b) ANY 5 Optimization of Basic Blocks with an Example. --5*2=10 10 M

****

PRINCIPAL
SIET., TUMAKURU.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
TUMKUR-572106
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

II Semester ['A' and 'B' section] : CIE I Internal Assessment Test : 18/07/22
21PSP23 :PROBLEM-SOLVING THROUGH PROGRAMMING

TIME : 90 Minutes **MAX MARKS** :40

Note:1. Answer any TWO full Questions choosing ONE full question from each module.
2.All questions carry equal marks

1. a. With a neat Block diagram explain different functional units of a Computer. .. [CO1] 8M
   b. Write the difference between primary memory and secondary memory. [CO1] 5M
   c. Explain bitwise operators with example for each. [CO2] 7M

OR

2a. What is an operator? Explain the arithmetic, relational &logical operators in C language. [CO2] 8M
b. Define Computer. Explain the generation of computer. [CO1] 6M
c. write a C program to find area of a triangle when we know the lengths of all three of its sides. [CO2] 6M

3. a. Write a General structure of C. Explain with an example [CO2] 8M
   b.. Evaluate the following expressions. [CO2]
   i)200 % 20 <= 20 – 5 + 305 % 10 – 20 = = 5 >= 1 != 20
   ii) a += b* = c -= 5 where a=3 b=4 and c=6
   c. What are the rules to be followed to form a variable name . Write valid and invalid variablenames. [CO2] 6M

OR

4. a .What are data types? Mention the different data types supported by C with their size & range. [CO2] 7M
   b. What is the purpose of a **printf() & scanf()** statement? Explain with the examples. [CO2] 6M
   c. Write a c program to find and output all the roots of a quadratic equation for non zero coefficients. [CO2] 7M

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
TUMKUR-572106
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

II Semester ['A' and 'B' section] : CIE I Internal Assessment Test : 18/07/22
21PSP23 :PROBLEM SOLVING THROUGH PROGRAMMING

TIME : 90 Minutes MAX MARKS :40

Note:1. Answer any TWO full Questions choosing ONE full question from each module.
2.All questions carry equal marks

1a. With a neat Block diagram explain different functional units of a Computer. .. [CO1] 8M
b. Write the difference between primary memory and secondary memory. [CO1] 5M
c. Explain bitwise operators with example for each. [CO2] 7M

OR

2a. What is an operator? Explain the arithmetic, relational &logical operators in C language. [CO2] 8M
b. Define Computer. Explain the generation of computer. [CO1] 6M
c. write a C program to find area of a triangle when we know the lengths of all three of its sides. [CO2] 6M

3. a. Write a General structure of C. Explain with an example [CO2] 8M
b.. Evaluate the following expressions. [CO2] 6M
i)200 % 20 <= 20 – 5 + 305 % 10 – 20 = = 5 >= 1 != 20
ii) a += b* = c -= 5 where a=3 b=4 and c=6
c. What are the rules to be followed to form a variable name . Write valid and invalid variablenames. [CO2] 6M

PRINCIPAL
SIET., TUMAKURU

OR

4. a .What are data types? Mention the different data types supported by C with their size & range. [CO2] 7M
b. What is the purpose of a printf() & scanf() statement? Explain with the examples. [CO2] 6M
c. Write a c program to find and output all the roots of a quadratic equation for non zero coefficients. [CO2] 7M

Rakshitha. P.B
1SV21CS062
A-58 2nd Sem
①

II-Internal Assessment Test paper:

①a. Explain the syntax of do-while statement. Write a C program to find the sum of even and sum of odd numbers from 1 to n natural numbers using while loop.

→ Do-while:

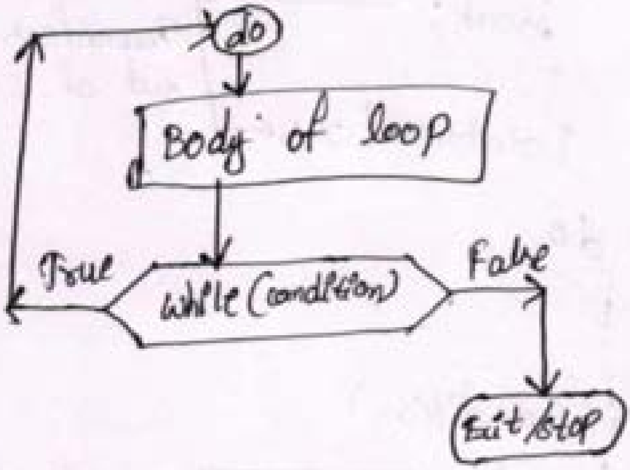
> It is a post-test loop (also called exit controlled loop) it has two keywords do and while.

> In this loop, the body of the loop is executed first and then the test condition is evaluated.

> If the condition is true, then the body of the loop will be executed once again. This process continues as long as the condition is true.

> when the condition becomes false, the loop will be terminated and control comes out of the loop.

```
Do
{
statement-block;
}while(condition);
```



```
#include<stdio.h>
void main()
{
 int i, num, odd_sum=0, even_sum=0;
 printf("Enter the value of num\n");
 scanf("%d", &num);
 for (i=1;i<=num;i++)
 {
  if (i%2==0)
 even_sum=even_sum+i;
 else
 odd_sum = odd_sum+i;
 }
printf("sum of all odd numbers = %d\n", odd_sum);
```

PRINCIPAL.
SIET., TUMAKURU.

```
printf("sum of all even numbers = %d \n", even-sum);
}
```

⑥ Explain break and continue statements/jumps in loops with example.

→ (i) break statement:

*It is jump statement which can be used in switch statements and loops.

*It is used to break the iteration.

break working

a)
```
while(condition)
{
-------
-------
if(condition)
break;
-------
-------
} statement x;
```

Transfers the control out of for loop

b)
```
do
{
-------
-------
if(condition)
break;
}while(condition);
statement x;
```

transfers the control out of the do-while loop

c)
```
for(initialization; condition: inc/dec variable)
{
-------
-------
if(condition)
break;
-------
-------
}statement x;
```

Transfers the control out of the for loop.

Eg:- write a program to print 1 to n using break statement

```
#include<stdio.h>
main()
{
int n,i;
printf("Enter the value of n\n");
scanf("%d",&n);
for(i=1;i<=n;i++)
{
 if (i==3)
 {
 break;
 }
}
 printf("%d\n",i);
}
```

2) <u>continue</u> <u>statement</u>:

The continue statement is used only in the loops to terminate the current iteration.

continue working

```
a) while (condition)<-
 {
 if (condition)
 continue;-
 -------
 -------
 }
 statment x;
```

Transfer the control to the condition expression of the while loop

```
b) do
 {
 -----
 -----
 continue;
 -------
 -------
 } while (condition);<-
 statement x;
```

Transfers the control to the condition expression of the do-while loop.

```
c) for(initialization; condition: inc/dec variable)<-
   {
   -------
   -------
   if(condition)
   continue; ----
   -------
   -------
   }
   statementx;
```

Transfers the control to the condition Expression of the for loop.

Eg:- write a C-program to print 1 to n using continue statement.

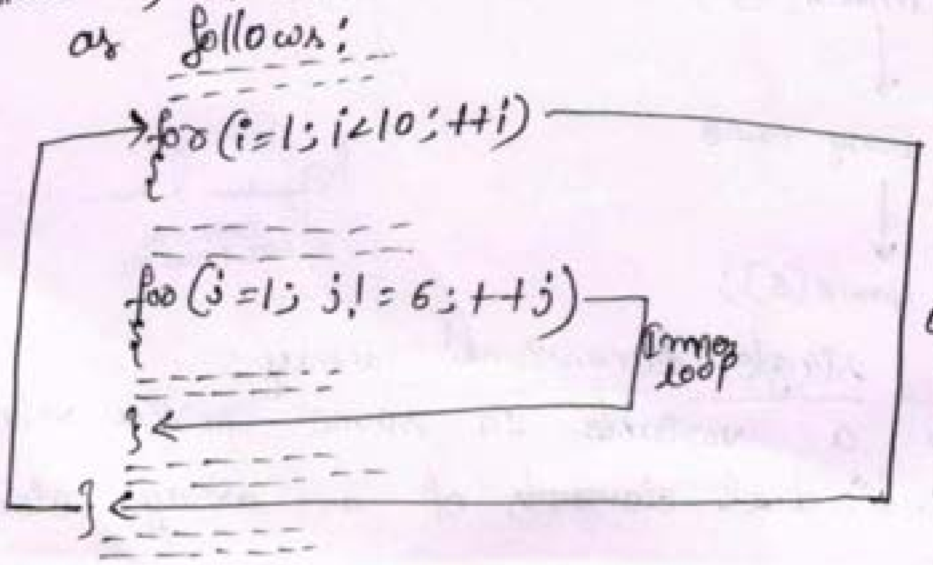
```
#include<stdio.h>
main()
{
int n, i;
printf("Enter the value of n\n");
scanf("%d", &n);
 for(i=1; i<=n; i++)
 {
  if (i==3)
 {
  continue;
 }
  printf("%d \n", i)
 }
}
```

ⓒ Write a C program to check the given number is a palindrome or not.

```
→ #include <stdio.h>
  main()
  {
 int temp, n, rev=0, digit;
 printf ("Enter the value of n");
 scanf ("%d", &n);
  temp=n;
  while (n>0)
  {
   digit=n%10;
   rev=rev*10+digit;
   n = n/10;
  }
  if (temp==rev)
 printf ("It is a palindrome\n");
 else
 printf ("It is not a palindrome\n");
  }
```

2. b. Explain nesting of loop structures with an example.

→ Nesting of loops, that is, one for statement within another for statement, is allowed in C. for example, two loops can be nested as follows:



```
   - - - - - - - -
→for(i=1; i<10; ++i)
 {
   - - - - - - - -
   - - - - - - - -
 for(j=1; j!=6; ++j)
 {
   - - - - - - -
 }←
   - - - - - - -
 }←
   - - - - - - -
```

```
for (row = 1; row < = ROWMAX; + +row)
{
 for(column=1; column <= COLMAX; ++column)
 {
   y= row* column;
   printf (" %4d", y);
 }
 printf(" \n");
}
```

- - - - - - -

3a. What is an array? Explain the declaration and Initialization of single dimensional array with example.

→ An array is a collection of similar type of item stored sequentially one after the other in memory.

Eg:- array of 5-integers

a[0]	a[1]	a(2)	a[3]	a[4]
10	20	30	40	50

Syntax:-
type array - name[int - expression];
type: data type such as int, float, char etc.
array_name: name of the array.
Expression: - expression must be evaluated to integer. semicolon is must at the end.

Eg:- int marks[5];
↓ ↓
type array name
↓ ↓
Char Name[5];

Initialization of single dimensional array:

→ As we initialize a variable to some initial value, we can initialize the individual elements of an array. elements can be initialized at the time of declaration.

Syntax:

type array_name[expression] = {v, , v2 , ------ vn};

→ type can be a data type such as int, float, char, etc.

→ array-name is the name of the array.

→ Expression must be evaluated to a positive integer.

→ v, , v2, ------ vn are the values and should be enclosed within '{' and '}' seperated by commas.

Eg-1:- int a[5] → { 10 , 20 , 30 , 40 , 50 };

10	20	30	40	50
a(0)	a[1]	a[2]	a[3]	a[4]

~~compiler initializes the~~

Eg-2:- int a[5] → {10 , 20}

10	20	30	40	50
a[0]	a(1)	a[2]	a[3]	a[4]

compiler initializes the first 2 locations and next set of memory locations are automatically initialized to 0's

It is 'partial array initialization'.

Eg 3:- int a[ ] = {10, 20, 30, 40, 50};
size not specified

If we have not specified the size then the compiler will calculate the size of the array based on the number of initial values.

Eg 4:- char a[5] = {'A', 'r', 'r', 'a', 'y'};

A	r	r	a	y
a[0]	a(1)	a[2]	a[3]	a[4]

write a c-programm to read n-items from the keyboard and display them on the monitor.

```
#include<stdio.h>
main()
{
int n,i, a[10];
printf("Enter the value of n\n");
scanf("%d",&n);
printf("Enter %d elements", n);
for (i=0; i<n;i++)
{
scanf("%d", &a[i]);
}
printf("The n elements are");
for (i= 0; i< n;i++)
{
printf("%d", a[i]);
}
}
```

ⓑ Write a C program to generate fibonacci series up to n terms.

```
→ #include<stdio.h>
main()
{
int n, f1, f2, f3, i;
   f1= 0;
   f2=1;
 printf("Enter the value of n\n");
 scanf("%d", &n);
   if (n==1)
  printf("%d ", f1);
   else
  {
  printf("%d\t%d\t", f1, f2);
   for (i=3; i<=n; i++)
```

```
{
f3 = f1 + f2;
printf("%d\t", f3);
   f1 = f2;
   f2 = f3;
  }
 }
}.
```

©. Write a cprogram to read a Matrix A of size MXN and compute the transpose of A matrix.

```
→ #include<stdio.h>
  int main()
  {
   int a[10][10], i, m, b[10][10], n, j;
  printf("\n Enter the size");
  scanf("%d%d", &m, &n);
  printf("\n Enter the elements");
  for (i=0; i<m; i++)
  for (j=0; j<n; j++)
 scanf("%d", &a[i][j]);
  for (i=0; i<m; i++)
  for (j=0; j<n; j++)
     b[j][i] = a[i][j];
 printf("\n Given matrix A\n");
  for (i=0;i<m;i++)
  {
  for (j=0;j<n;j++)
 printf("%d", a[i][j]);
 printf("\n");
```

```
   }
 printf ("\n Transpose of A \n");
  for (i=0;i<n;i++)
  {
  for (j=0;j<m;j++)
  printf ("%d",b[i][j]);
   printf ("\n");
  }
  }
```

4ⓔ. Write a C program to read n floating point numbers and sort them using selection sort.

```
→ #include <stdio.h>
 main()
 {
 int a[10], n, i, j, temp, min;
 printf("enter the value of n\n");
 scanf ("%d", &n);
 printf ("enter %d elements in an array\n");
 for (i=0;i<n;i++)
 {
  scanf ("%d",&a[i]);
 }
 printf("The array elements are \n");
 for (i=0;i<n;i++)
  printf ("%d", a[i]);
  for(i=0;i<n;i++)
  {
   min=i;
 for (j=i+1;j<n;j++)
  {
   if (a[j]<a[min])
  min=j;
```

```
}
temp = a[i];
 a[i] = a[min];
 a[min] = temp;
}
printf("The sorted elements are \n");
for(i=0; i<n; i++)
printf("%d", a[i]);
}.
```

⑥ Write a C program to generate prime numbers between the given range M&N.

```
→ #include<stdio.h>
   int main()
   {
    int m,n,k,j, count=0, prime;
   printf("\n Enter two numbers(Range): \n");
   scanf("%d %d", &m, &n);
   for(k=m; k<=n; k++)
   {
     prime=1;
     for(j=2; j<=k/2; j++)
       if(k%j==0)
      {
       prime=0;
       break;
      }
    if(prime==1)
    {
     printf("%d", k);
     count=1;
    }
```

```
}
printf("\n Total numbers between range %d and %d=%d\n",
        m,n, count);
}
```

©. Explain initialization of 2D array. Write a C program to read a matrix A of size MxN and check whether it is symmetric or not.

→ Initialization of 2-D Array:

As we initialize a variable to the required value we can initialize the individual elements of the array during initialization.

data-type array_name[exp$_1$][exp$_2$]={{a$_1$,a$_2$,--- a$_n$},{b$_1$,b$_2$,---b$_n$},
------ {z$_1$,z$_2$,----z$_n$}}

Eg:- int a[4][3]={{11,22,33},{44,55,66},{77,88,99},
{10,20,30}}:

The array has 4-rows and 3-columns

rows	0	1	2
0	11	22	33
1	44	55	66
2	77	88	99
3	10	20	30

column

Symmetric matrix

```
#include<stdio.h>
 int main()
 {
  int a[10][10],i,j,m,n,Symm=1;
  printf("\n Enter the size");
  scanf("%d%d",&m,&n);
  printf("\n Enter the elements");
```

```
for(i=0; i<n; i++)
for(j=0; j<n; j++)
Scanf("%d", &a[i][j]);
for (i=0; i<n; i++)
for (j=i+1; j<n; j++)
if (a[i][j]! = a[j][i])
 {
 printf("Not Symmetric");
  return 0;
 }
printf("\n Given matrix is symmetric");
}.
```

② ⓒ Write a C program to find the sum of the sin(x) using series. $\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} + \text{-----}$

→
```
#include <stdio.h>
#include <math.h>

double factorial(int);
void calc(float, float*);

int main()
{
 int x;
 float radian, result=0;

 printf(" Enter value of x in degrees\n");
 Scanf("%d", &x);
 radian=x * (3.14159 /180.0); // convert degree to radian
  calc (radian, &result);
```

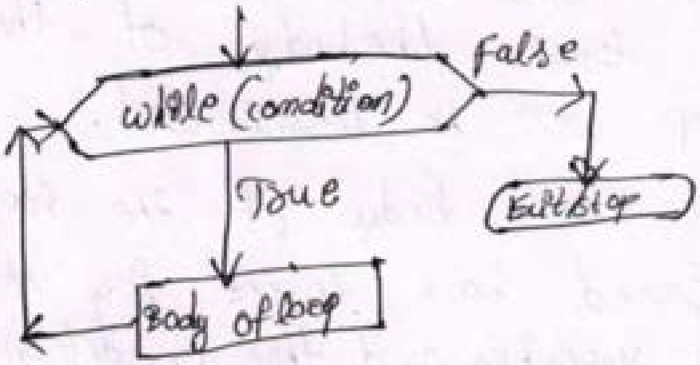
```
printf("sin(%d) = %f \n", x, result);
  return 0;
}
void calc(float num, float* res)
 {
 int count, n=1, sign=1;
  for(count=1; (n<=10); count +=2)
  {
    *res += sign * (pow(num, count)/factorial(count));
       n +=1;
       sign*=-1;
    }
  }
 double factorial(int num)
 {
   int count;
  double sum=1;
  for (count=1; count<= num; count++)
  {
    sum*= count;
  }
  return(sum);
  }
```

④ Explain looping statements with examples.

→ **While:**

- It is a pre-test loop (also known as an entry controlled loop).
- In the syntax given above 'while' is a key word and condition is at beginning of the loop.
- If the test condition is true the body of while loop will be executed.
- After execution of the body, the test condition is once again evaluated and if it is true, the body is executed once again.
- This process is repeated until condition finally becomes false and control comes out of the body of the loop.

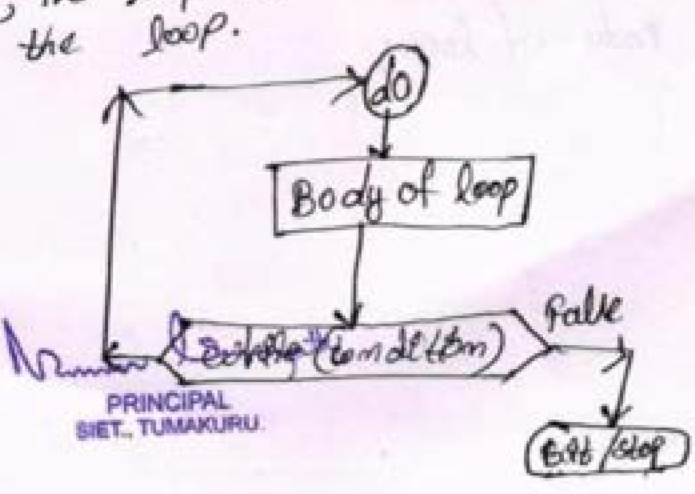
```
while (condition)
{
statement-block;
}
```



Do while:

- It is a post test loop (also called exit controlled loop) it has two keywords do and while.
- In this loop, the body of the loop is executed first and then the test condition is evaluated.
- If the condition is true, then the body of the loop will be executed once again. This process continues as long as the condition is true.
- when the condition becomes false, the loop will be terminated and control comes out of the loop.

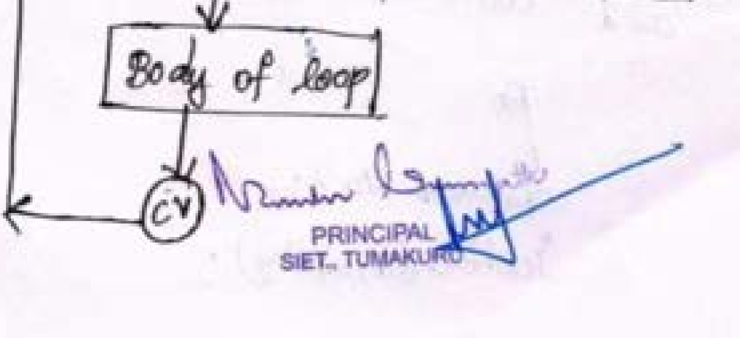
```
Do
{
statement-block;
}while (condition);
```



for:

- It is another pre-test loop (also called entry controlled loop) that provides a concise loop control structure. It has one keyword called for.
- One important aspect of for loop is all the three components of a loop (viz, initializing, testing condition, and updating (increment /decrement)) is given in the head of for loop.
- In this loop first initialization of control variable is done first, using assignments such as i=1, count=0. The variable i count are called loop control variable.
- The value of control variable is tested using the test condition. The test condition is evaluated. If the condition is true, the body of the loop is executed; otherwise loop will be terminated.
- when the body of the loop is executed, the control transfered back to the for statement to update the loop variable. And then condition is checked once again, if condition is true once again body will be executed once again. This process continues till the value of the control variable fails to satisfy the test condition.

```
for(initialization;test-condition;updation)
{
Body-of loop;
}
```



SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY
TUMKUR-572106
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: I

DATE: 29/06/2022

Course Name with Code: Object Oriented Concepts (18CS45)
Class: 4th Sem [CSE/ISE]

MAX MARKS: 40
TIME: 90 mins

NOTE: **Answer Two full Questions(1 OR 2 and 3 OR 4)**

1a . State the important feature of Object Oriented Programming paradigm 06M [CO1]

b. List out the difference between Procedure Oriented Program and Object Oriented Program 06M [CO1]

c. Explain **this** pointer with an example. 08M [CO1]

OR

2 a. What is friend function? Explain with an example. 08M [CO1]

b. what is inline function? Write a C++ program to find the cube ( ) of a number by using inline function. 08M [CO1]

c. What is Ambiguity error? Explain with an example. 04M [CO1]

3.a. What is reference variable? Write a C++ program to swap two int values & display the values before & after swapping using reference variable. 10M [CO1]

b. Explain Function overloading and function prototyping with an example 10M [CO1]

OR

4 a. What is **static** member of a Class? Explain 06M [CO1]

b. What is constructor? Mention Types and explain with example. 10M [CO1]

c. Develop a C++ inline function to find maximum of two numbers 04M [CO1]

Course Outcomes: The student will be able to :

1. Explain the object-oriented concepts and JAVA.
2. Develop computer programs to solve real world problems in Java.
3. Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings.

Staff Signature
Prof.Shanmukaswamy CV

HOD Signature

PRINCIPAL
SIET., TUMAKURU.

Object oriented Concepts
I - Internal Assessment
Test paper Answers

① a) State the important feature of object oriented programming paradigm.

Ans:- i) Objects and classes:- 1 mark each 6M

* Classes are user defined data types on which objects are created

* Objects with similar properties and methods are grouped together to form class.

* So class is a collection of objects.

* Objects is an instance of a class.

ii) Data abstraction:-

* Abstraction refers to the act of representing essential features without including the background details or explanation.

iii) Data encapsulation:-

* Information hiding

* Combining of data and functions into a single unit (class) is known as data encapsulation.

iv) Inheritance:-

* Acquiring qualities

* Process of deriving a new class from an existing class.

v) Polymorphism:-

* The dictionary meaning of polymorphism is "having multiple forms".

* Ability to take more than one form

PRINCIPAL
SIET., TUMAKURU

vi) Binding

* Binding means connecting the function call to the function code to be executed in response to the call.

vii) Message passing:.

* objects communicate with one another by sending and receiving information.

① b) List out the difference b/w procedure oriented program and objected oriented program.

(6M)

Ans:

Procedure oriented Program	object oriented Program
* It is known as POP	* It is OOP
* It deals with algorithm	* Deals with data
* Programs are divided into functions	* Programs are divided into objects.
* Data move from function to function	* Function that operate on date are bind to form classes.
* Most of the function share global data	* Data structure characterizes objects.
* It is top down approach	* Bottom-up approach
* Less memory	* memory more
* Access specifier Don't having	* Access specifiers

① c) Explain this pointer with an example

Ans:- * Pointer refers to a variable that holds the address of another variable.

* Pointer have a data type
* Implicit the parameter to, all member functions.

Pointer is a object in many language that stores

```
void set feet (Distance * const this, int x)
  {
   this -> iFeet = x;
  }
```

8M

```
ex:- class Test
      {
       private:
        int x;
       public:
         void set x(int x)
         {
          this -> x = x;
         }
      void print() {cout << "x = " << x << endl;}
       };
 int main()
   {
   Test obj;
   int x = 20;
   obj. set x(x);
   obj. print ();
   return 0;
   }
```

PRINCIPAL
SIET., TUMAKURU.

② a) What is friend function? Explain with an example.

Ans:- In C++ is defined as a function that can access private, protected & public members of a class.

* The friend function is declared using the friend keyword inside the body of the class.

Ex:-
```
class abc
 {
  ------
  ------
  Public;
  ------
  ------
  friend void xyz(void);
  };
class Add
 {
 int x,y,z;
 public.
 Add(int, int);
 friend int calculate (Add P);
 };
 Add:: Add(int a, int b)
  {
  x=a;
   y=b;
  }
```

② b) What is inline function? Write a C++ program to find the cube ( ) of a no by using inline function.

Ans:- Functions are defined inside the class body in an interface file. (24)

* keyword incline before function

* Ask the compiler to copy code int program instead of making function call.

```
#include <iostream.h>
inline int cube(int r)
{
return r*r*r;
}
void main()
{
 int a,c;
 cout << "Enter the value to compute the
              cube" << endl;
 cin >> a;
 c=cube(a)
 Cout << "the cube of the no is << c << endl;
 }
```

Prgm (4M) (8M)

<u>O/P:-</u>

```
Enter the value to compute the cube 3
the cube of the no is 27.
```

② c) what is Ambiguity error? Explain with an example. (04M)

Ans:- It occurs when erasure causes two seemingly distinct generatic declarations to resolve to the same erased type, causing a conflict.

<u>Ex:-</u>

```
Public class Test {
    Public void foo(object o) {
    System.out.println("object");
    }
   Public void foo(String s) {
    System.out.println("String");
  }
 Public void foo(Integer i) {
   System.out.println("Integer");
  }
 Public static void main(String args[]{
  new Test().foo(null);
  }
 }
```

PRINCIPAL
SIET., TUMAKURU.

③ a) what is reference variable? write a C++ program to swap in two int values & display the values before & after swapping using reference variable.

Ans: * They are used as aliases for other variables within a function.

2M

* All operations supposedly ~~pro~~ performed on the alias are actually performed on the original variable
* Must be initialized at the time of declaration.
* Reference variable can be a function argument & thus change the value of the parameter that is passed to it in the function call.

Ex:-

```
#include <iostream.h>
void main()
{
 int x = 3;
 int& y = x;
 count<<"x = "<<xend1<<"y = "<<y<<end1;
 y = 7;
 count<<"x = "<<x<<end1<<"y = "<<y<<
                                   end1;
}
```

ans → 4

output

```
x = 3
y = 3
x = 7
x = 7
```

program; 4M

10M

```
#include<iostream>
using namespace std;
void swap (int & x,int & y);
int main(){
 int a = 100;
 int b = 200;
cout<<" Before swap, value of a :"<<a<<endl;
```

```
couht << " Before swap, value of b: "<<b<<endl;
swap (a, b);
count << " After swap, value of a: "<<a<<endl;
count << "After swap, value of b:" <<b<<endl;
return();
 }
void swap(int &x, int &y) {
int temp;
 temp = x;
   x = y;
   y = tem;
  }
```

③ b) Explain Function overloading and function prototyping with an example. (10M)

Function overloading in C++ (05M)

C++ allows you to specify more than one function name or an operator in the same scope. which is called function overloading. However to achieve this they must have d/f signatures.

ways to overload a function
- By changing no of Agreemnts
- By having d/f types of arguments.

```
#include <iostream>
using name space std;
void display (int);
void display (float);
void display (int, float);
int main() {
int a = 5;
float b = 5.5;
display (a);
display (b);
display (a, b);
}
```

```
void display (int var) {
count << "Integer number": << var<< endl;
}
void display (float var2) {
count << " Integer number:" << var1;
count << " and float number:" var2;
}
```

Function prototyping; 5M

* C++ strongly supports function prototypes
* Prototype describes the function interface to the compiler.

Tells the compiler the return type of function number, type and sequence of its formal arguments.

Syntax:- return_type function_name (argument_list);

ex:- int add (int, int);

with prototyping, compiler ensures following the return value of a function is handled correctly.

Correct nor and type of arguments are passed a function, since C++ programming requires function prototype is provided to resolve the function call.

Prototyping gurantee's protection from errors arising out of incorrect function calls. A function heading without body.

---

④ a) what is static member of a class? Explain. 6M

Ans:- No matter how many objects of the class are created. there is only one copy of the static members.

* static member is shared by all objects of the class.

PRINCIPAL
SIET., TUMAKURU.

* All static data is initialized to zero when the first object is created if no other initialization is present.
* Shares single copy of the member function
* It remain the same regardless of where & how they are used.
* These stored in data segment of the memory.

---

④ b) what is Constructor? Mention Types and explain with example Defn 2M, Types (8 M) with example (10M)

Ans:- Constructor is a special type of member function that is called automatically when an object is created.

* constructors has the same name as that of class & it does not have return type.

Types of constructors

1. Default constructors
2. Parametrized constructors
3. copy constructor

1. Default constructor:-

Default constructor is the constructor which doesn't take any argument. it has no parameter.

Syntax:

```
class_name()
{
 constructor definition
}
```

Ex:-

```
class cube
{
 int side;
```

PRINCIPAL
SIET., TUMAKURU.

```
public: cube()
  {
   side = 10;
  }
};
int main()
 {
 cube c;
 Cout << c.side;
 }
```

output

```
 10
```

2) Parametrized Constructor:-

These are the constructors with parameter. using this constructor you can provide different values to data members of objects, by passing the appropriate values as argument.

Example:

```
class cube
 {
  int side;
   public:
  cube (int x)
  {
   side = x;
  };
 }
int main()
 {
 cube c1(10);
 cube c2(20);
 cube c3(30);
 Cout << c1.side;
```

```
cout << c2.side;
cout << c3.side;
}
```

output

```
10 20 30
```

3) copy constructor

A copy constructor in c++ programing language used to reproduce an identicall copy of an original existing object. it is used to initialize one object from another of the same type.

Ex:-

```
#include <iostream>
using namespace std;
class copy con
{
int copy-a, copy-b; // variable declaration
Public:
copy con(int x, int y)
{
 // constructor with argument
  copy-a = x;
  copy-b = y;

}
void display()
{
cout << "\n values :" << copy-a << "\t" <<
      copy-b;
}
};
```

```
int main()
{
copy con obj(10,20);
copy con obj2 = obj;
cout << "\n I am constructor";
obj.display(); // constructor invoked
cout << "\n I am copy Constructor";
obj2.display();
return0;
}
```

Result:

```
I am constructor
values: 10 20
I am copy constructor
values: 10 20
```

---

c) Develop a C++ inline function to find maximum of two number (4M)

Ans:- * first control will move from calling to called function then argument will be pushed on to the stack, then control will move back to the calling from called function.

* This process takes extra time in executing.

* To avoid this, we use inline function.

* when a function is declared as inline, compiler replaces function call with function code.

program to find Maximum of two numbers

```
#include< iostream.h>
void main()
{
cout << max (10, 20);
cout << max (100, 90);
 getch();
}
inline int max (int a, int b)
{
 if (a > b)
  return a;
 else
return b;
}
```

output

```
 20
 100
```

PRINCIPAL
SIET., TUMAKURU

Sri Shridevi Charitable Trust (R.)

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org
An ISO 9001:2015 Certified Institution

INTERNAL ASSESMENT TEST: II **Date: 28/06/2022**
SUB : OOMD (18CS64) **MAX MARKS** : 40
SEM : VI **TIME** : 90 min

NOTE: Answer TWO full questions

1a) Explain nested states and nested state diagrams, with example? 10M[CO3]
b)Explain activity diagram, with the UML notation. Give an example? 10M[CO3]

OR

2a)Explain briefly Domain class model? 10M[CO3]
b)Write and explain the steps performed in constructing a domain state model, with an example? 10M[CO3]
3a)What is software development process? Explain the stages of software development process? 10M[CO4]
b)Describe application analysis, with an example of ATM case study? 10M[CO4]

OR

4a)Explain the various software control strategies that can be applied in the system design? 10M[CO4]
b)Explain the overview of object oriented programs with neat diagram? 10M[CO4]

Sri Shridevi Charitable Trust (R.)

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(Recognised by Govt. of Karnataka, Affiliated to VTU, Belagavi and Approved by AICTE, New Delhi)
Sira Road, Tumakuru - 572 106. Karnataka.
Phone: 0816-2212629 | Fax: 0816-2212628 | Email: info@shrideviengineering.org | Web: http://www.shrideviengineering.org
An ISO 9001:2015 Certified Institution

INTERNAL ASSESMENT TEST: II **Date: 28/06/2022**
SUB : OOMD (18CS64) **MAX MARKS** : 40
SEM : VI **TIME** : 90 min

NOTE: Answer TWO full questions

1a) Explain nested states and nested state diagrams, with example? 10M[CO3]
b)Explain activity diagram, with the UML notation. Give an example? 10M[CO3]

OR

2a)Explain briefly Domain class model? 10M[CO3]
b)Write and explain the steps performed in constructing a domain state model, with an example? 10M[CO3]
3a)What is software development process? Explain the stages of software development process? 10M[CO4]
b)Describe application analysis, with an example of ATM case study? 10M[CO4]

OR

4a)Explain the various software control strategies that can be applied in the system design? 10M[CO4]
b)Explain the overview of object oriented programs with neat diagram? 10M[CO4]

PRINCIPAL
SIET., TUMAKURU

Internal Assesment-2

SUB:- OOMD (18CS64)

SEM:- VI

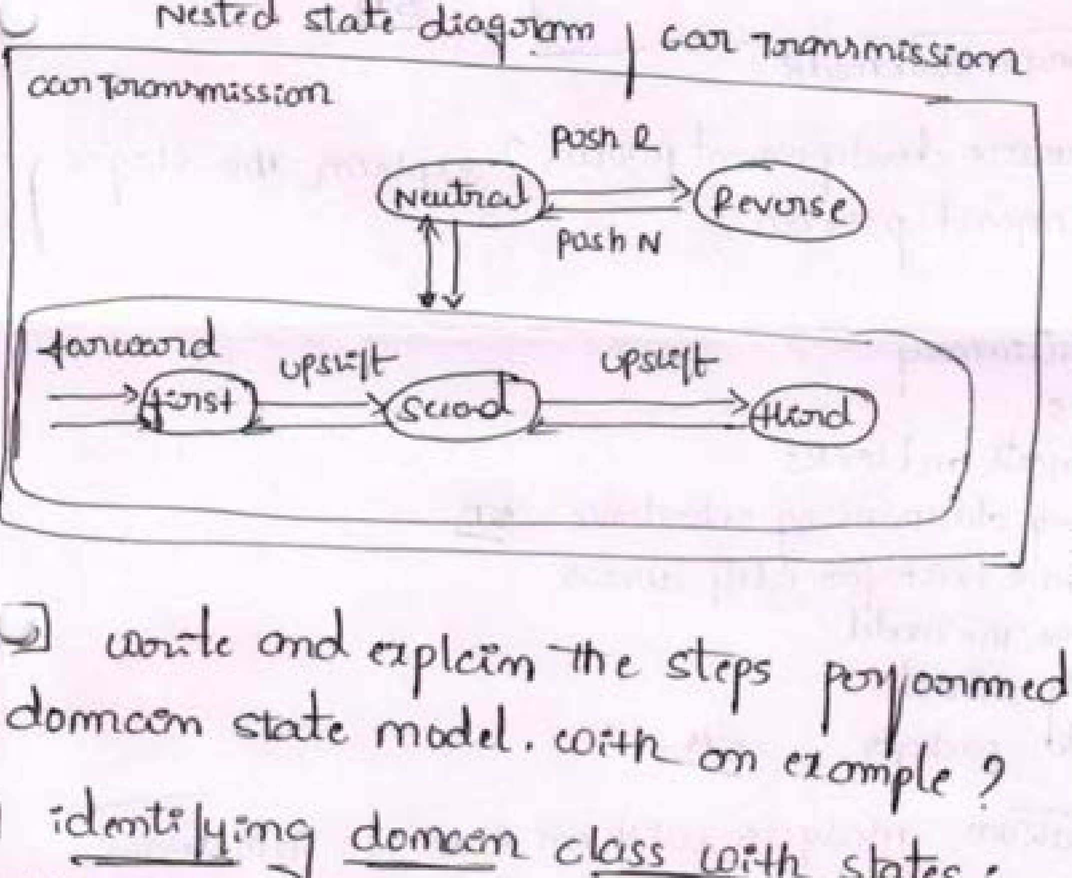
1 a] explain nested states and nested state diagram-s. with example?

Nested state

→ Nested state is a deeper alternative to expanding stats 5M

Nested state diagram:- it is used to model the complex, system.

Nested state diagram | car transmission



5M

2 a] write and explain the steps performed in constructing a domain state model. with an example?

1 identifying domain class with states:
→ examine the list of domain classes for those that have a definite lifecycle

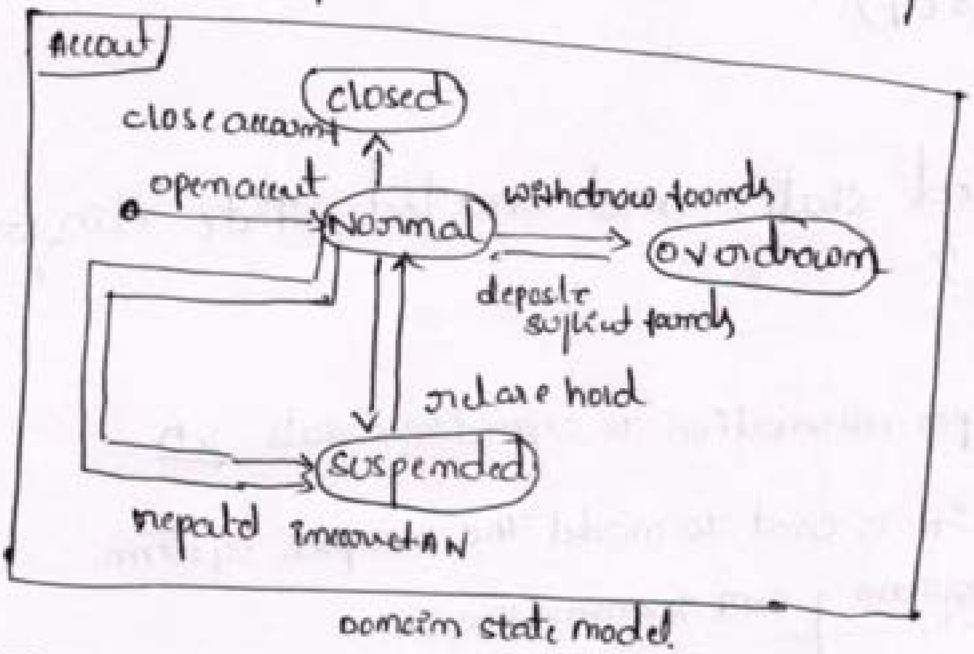
2 Finding states: Each states characterize the objects in each class on basics of attribute value that object may have.

3 Finding events: finding events that cause transition among the stats and think about stimulate 5M

PRINCIPAL
SIET, TUMAKURU

Building state digrams

note - the stats which each events applis & add transitions to show the change in state that caused by occurrence of object



5M

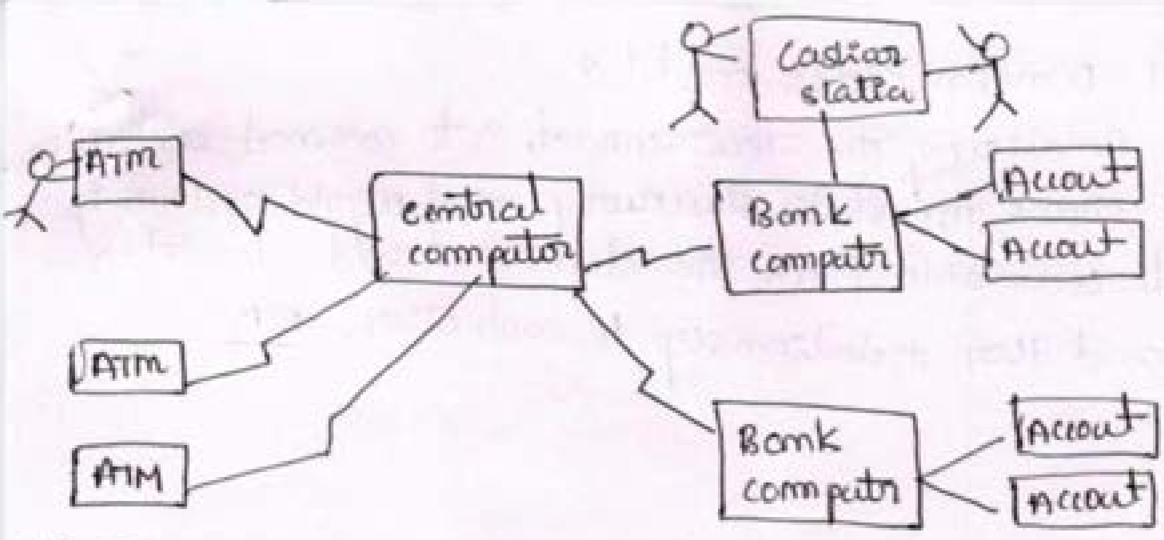
domein state model

3 a] what is software development process? expleen the stages of software development process?

1] findingclass
2] purpose a data dictionary
3] Find Associations
4] find attributs of objects and links
5] organize and simply classes using inheritence 5M
6] verify that acces paths exist for likely queris
7] Iterate and refene the model
8] Reconsider the level of obstracte
9] Group classes into packages. 5M

3 b] Describe application analysis with an example Atm careeat

1] who is the application for
2] what problems will it solve?
3] where will it be used?
4] when is it needed?
5] why is it needed?
6] How it will work? 5M



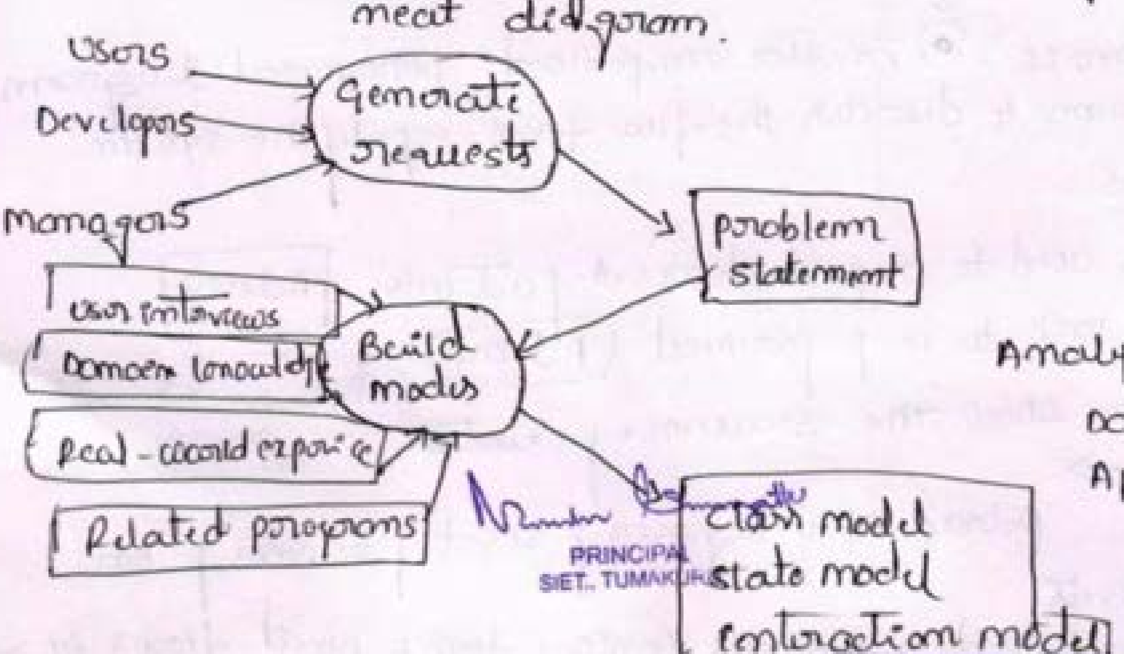
5M

4] a] explcim the various sofware control stratgies that can be applic im the system design.

Software Control Strategies - 5M

Explanation - 5M

4] b] explcim the overview of object oriented programs with a neat diagram.



Analysis
Domain Analysis
Applicati Analysis
- 5M
Explanation - 5M

3 a] explain Brielly Domain class model?

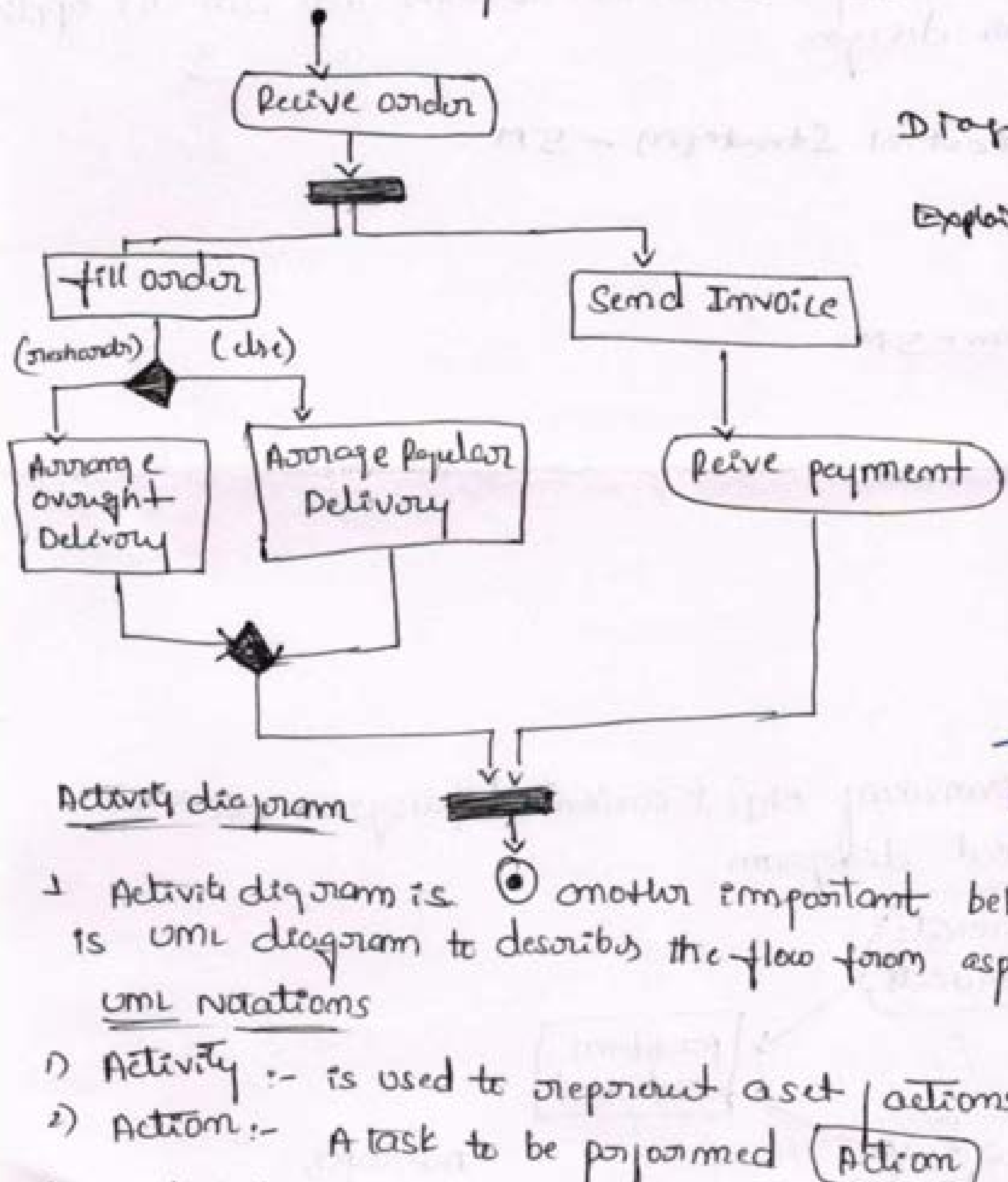
the first step is Analysizg the reairement is to connect a domain model. the model shows the static structure | real-world system & organizes it into workable piecs. the domain model describes real world class and their relationship to each other, 5M

Diagram - 5M

1 b] explain activity diagram, with UML notation. give an example.

Diagram - 5M

Explaination - 5M



HOD,
COMPUTER SCIENCE & ENGG.,
SIET, TUMAKURU-06.

Activity diagram

1 Activiti diagram is another important behavioral diagram is UML diagram to describs the flow from aspects | the system

UML Notations

1) Activity :- is used to represent a set | actions Activity
2) Action :- A task to be performed Action
3) Control flow :- show the seauence | exution →

PRINCIPAL
SIET., TUMAKURU.

4) Initial Node :- potrays The begineng | a set | actions | or activits
5) Activity final Node :- stop all control flow & object flows in an activit (or action)

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(An ISO 9001-2015 Certified Institution)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: II

SUB :Web Technology and Its Application(18CS63) **MAX MARKS** : 40

SEM : VI Sem **DATE& TIME** : 28/06/22&90 min

NOTE : Answer any **TWO** full questions.

1 .a) Identify the approaches to CSS layout and explain them in detail? 7M[CO1]

b) What is Responsive design ?why its important explain in detail? 7M[CO1]

c) What does floating an element do in CSS ? how do you float an element? 6M[CO1]

OR

2. a) What is Java script ?Discuss the advantage and disadvantage of client side scripting. 7M[CO1]

b) Briefly describe the Document object model (DOM)? 7M[CO1]

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? 6M[CO1]

3. a) Explain two approaches for event handling in JS with suitable code segment? 7M[CO1]

b) With suitable Diagram explain PHP Model in Apache .Describe the role of Apache in web Application Execution? 7M[CO1]

c) Write a PHP program to demonstrate the session ,program :Store page view count or refresh? 6M[CO1]

OR

4. a) Define PHP explain the PHP Quote usage and concatenation approaches? 7M[CO2]

b) With relevant code segments ,Explain two approaches to embed PHP script in HTML? 7M[CO2]

c) With a neat Diagram explain client and server script execution ? 6M[CO2]

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(An ISO 9001-2015 Certified Institution)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: II

SUB :Web Technology and Its Application(18CS63) MAX MARKS : 40

SEM : VI Sem DATE& TIME : 28/06/22&90 min

NOTE : Answer any TWO full questions.

1 .a) Identify the approaches to CSS layout and explain them in detail? 7M[CO1]

b) What is Responsive design ?why its important explain in detail? 7M[CO1]

c) What does floating an element do in CSS ? how do you float an element? 6M[CO1]

OR

2. a) What is Java script ?Discuss the advantage and disadvantage of client side scripting. 7M[CO1]

b) Briefly describe the Document object model (DOM)? 7M[CO1]

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? 6M[CO1]

3. a) Explain two approaches for event handling in JS with suitable code segment? 7M[CO1]

b) With suitable Diagram explain PHP Model in Apache .Describe the role of Apache in web Application Execution? 7M[CO1]

c) Write a PHP program to demonstrate the session ,program :Store page view count or refresh? 6M[CO1]

OR

4. a) Define PHP explain the PHP Quote usage and concatenation approaches? 7M[CO2]

b) With relevant code segments ,Explain two approaches to embed PHP script in HTML? 7M[CO2]

c) With a neat Diagram explain client and server script execution ? 6M[CO2]

Staff Name : Mr Basavesha D

Signature: 28/6/22 **HOD Signature**

PRINCIPAL
SIET., TUMAKURU.

Web Technology & its applications (18CS63)

IInd. I.A Scheme & Solutions

1) a) Approaches to CSS layout. → 1M.

- Fixed layout
- Liquid layout
- Hybrid layout

Explanations of above 3 approaches → 2M×3 ⇒ 6M
with advantages & disadvantages.

7M.

b) Responsive Design is a key technique in creating responsive layouts makes use of the ability of current mobile browsers to shrink or grow the web page to fit the width of the screen → 2M

4 key components to make responsive Design work & Explanation in detail → 5M

7M

c) Explanation of floating an element in CSS → 2M

Floating multiple items side by side → 2M.

Example code → 2M

6M

2. a) Defination of JavaScript → 1M

JavaScript is an object-oriented, dynamically typed scripting language.

Client side scripting advantages → 3M

Disadvantages of client side script → 3M

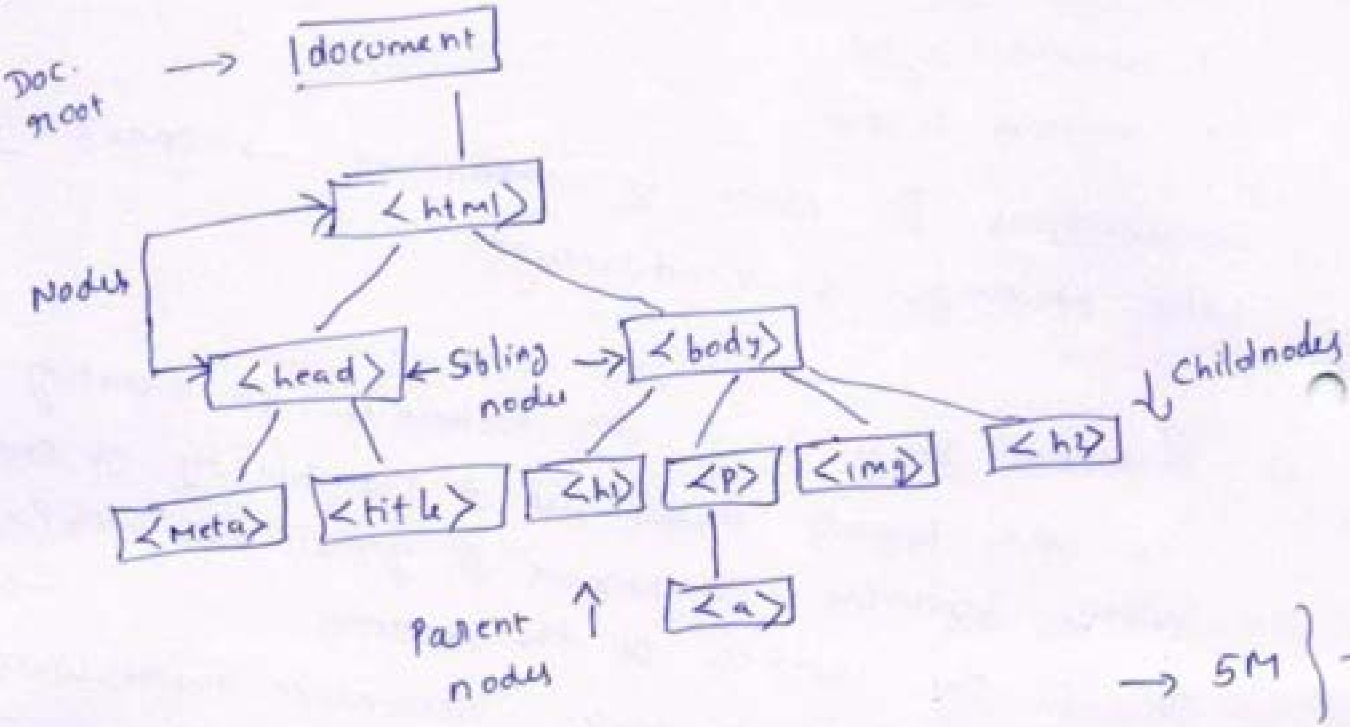
7M

PRINCIPAL
SIET., TUMAKURU

2.
b) Explanation of Document object Model (DOM)

Explanation of DOM i.e. it is used to access Elements & attributes of HTML → 2M

DOM tree construction



→ 5M } 7M.

with coding

c) Javascript code to display text "VTU BELAGAVI" → 6M

writing code

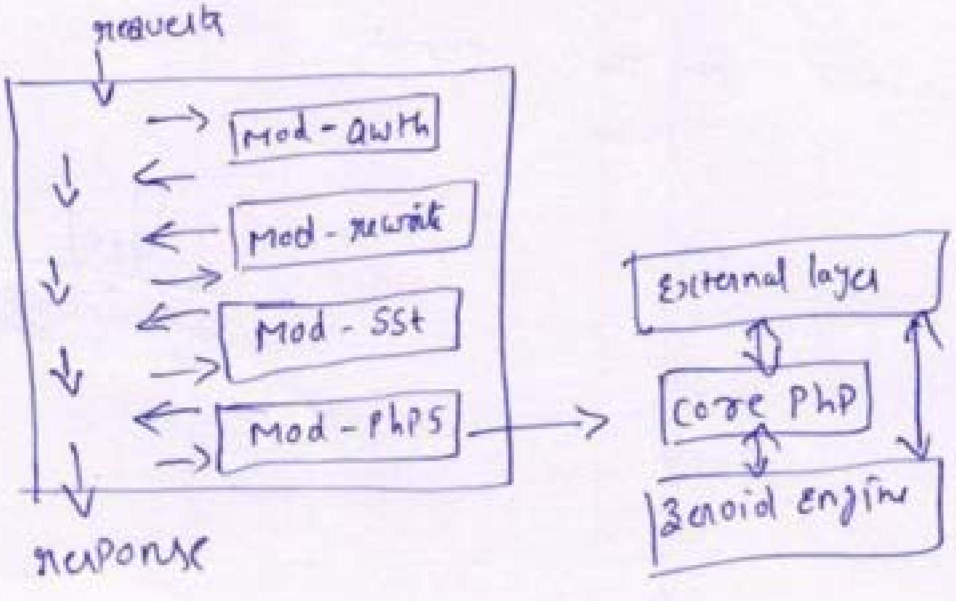
```
<html>
function inTimer {
    idi.inner HTML = "VTU BELAGAVI"
  idi. setAttribute (style: "font-size : " + size + " px : colo : blue);
        }
```

3. a) Java script event handling in JS → 2M } 7M.

a) inline event handler. example. → 5M

b) listner event example.

b) PHP Modl in Apache Diagram → 2M.



7M.

Apache runs in two modes → 5M

→ Multi process → Multithread

Explanation

c) PHP program to demonstrate Page view count & refresh.

```
<?php  start-session ()
  if (isset ($_SESSION ['count'])
  {
  echo "your session count", $_SESSION ['COUNT']
        $_SESSION ['count'] ++;

   }
  else {   $_SESSION ['COUNT'] = 1;
      echo " NO session count
     }  ?>
```

4 a) Defination of PhP → 1M.
PHP Quote usage. & concatenation approaches → 6M
7M

b) Neat Diagram of client + server script → 2M
Execution → 4M
6M.
Explanation of the concept

H.O.D.
COMPUTER SCIENCE & ENGG.,
SIET, TUMAKURU-06.

PRINCIPAL
SIET., TUMAKURU

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY

(An ISO 9001-2015 Certified Institution)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INTERNAL ASSESMENT TEST: II

SUB : **Computer Graphics And Visualization** (18CS62)
SEM : VI Sem **"A"&"B"**

MAX MARKS : 40
DATE& TIME : 27/6/22&90 min

NOTE : Answer any **TWO** full questions.

1. a)Design a matrix for windows to viewport transformation. 10M [CO4]

   b) Define Clipping. With suitable example explain Cohen Sutherland algorithm for line. 10M [CO3]

OR

2. a) Obtain matrix representation for rotation of object about an arbitrary axis. 12M[CO3]

   b) With the help of diagram explain RGB & CMY color models. Also explain transformation between them. 08M[CO5]

3. a) Explain Sutherland Hodgeman polygon clipping with example. 10M [CO3]

   b) Define rigid body transformation. Derive the matrices for rigid body transformation. 10M [CO4]

OR

4. a) Explain 2-D Reflection with neat diagram. 06M [CO4]

   b) Explain the basic illumination or lighting model. 08M [CO5]

   c) Given the reason to convert transformation matrix to homogeneous co-ordinate representation & show the process of conversion. Shear the polygon **A(1,1),B(3,1), C(3,3), D(2,4),E(1,3)** Along X axis with a shearing factor of **2.** 06M[CO4]

Staff signature

HOD

H.O.D.
COMPUTER SCIENCE & ENGG.,
SIET, TUMAKURU-06.

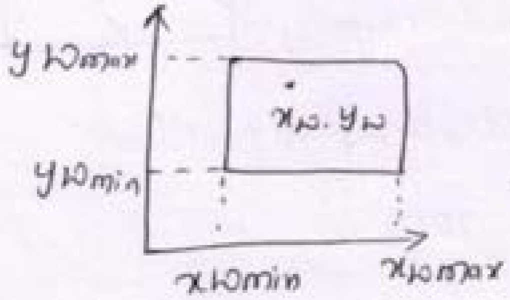
PRINCIPAL
SIET., TUMAKURU

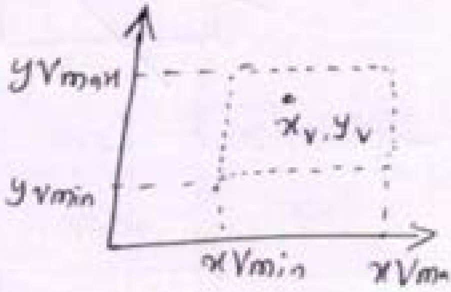
Scheme & Solutions

IA - II

1

a. window to viewport Transformation





2M

$$\frac{x_w - xw_{min}}{xw_{max} - xw_{min}} = \frac{x_v - xV_{min}}{xV_{max} - xV_{min}}$$

To compute viewport coordinates x_v & y_v 4M

$$x_v = xV_{min} + \frac{x_w - xw_{min}}{xw_{max} - xw_{min}} \times (xV_{max} - xV_{min})$$

$$x_v = xV_{min} + (x_w - xw_{min}) S_x$$

where $S_x = \dfrac{xV_{max} - xV_{min}}{xw_{max} - xw_{min}}$

IIIly $y_v = yV_{min} + (y_w - yw_{min}) S_y$

where $S_y = \dfrac{yV_{max} - yV_{min}}{yw_{max} - yw_{min}}$

$$S = \begin{bmatrix} S_x & 0 & xw_{min}(1-S_y) \\ 0 & S_y & yw_{min}(1-S_y) \\ 0 & 0 & 1 \end{bmatrix}$$ 2M

$$T = \begin{bmatrix} 1 & 0 & xV_{min} - xw_{min} \\ 0 & 1 & yV_{min} - yw_{min} \\ 0 & 0 & 1 \end{bmatrix}$$ 2M

PRINCIPAL
SIET., TUMAKURU

H.O.D.
COMPUTER SCIENCE & ENGG.,
SIET, TUMAKURU-06.

b. Clipping Definition 1M

Ex

1M

Cohen Sutherland Line clipping Algorithm

1001	1000	1010
0001	0000 Clipping window	0010
0101	0100	0110

2M

8M

i. Nine Binary region codes for identifying the position of a line endpoint. relative to the clipping window

ii. Bit values in a region code are determined by comparing the coordinate values of (x, y)

iii. Bit 1 is set to 1 if $x < xwmin$ & the other 3 bit values are determined Simillary

iv) y values are computed as 6M

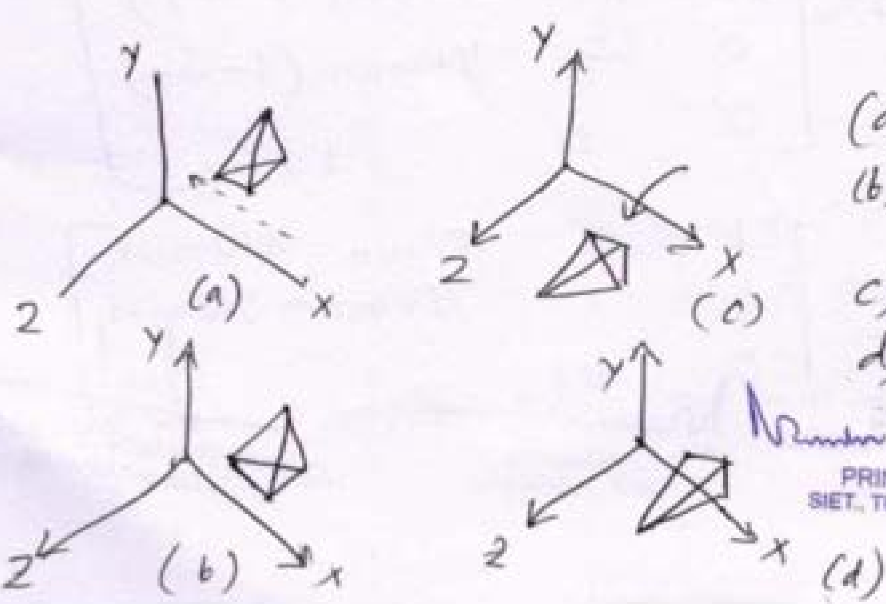
$$y = y_0 + m(x - x_0)$$

v) x values are computed as

$$x = x_0 + y - y_0/m$$

2)

4M



(a) original position

(b) Translate rotation axes onto x axis

c) Rotate object θ angle

d) Translate rotation axes to original position

$V = P_2 - P_1$

$= (x_2 - x_1,\ y_2 - y_1,\ z_2 - z_1)$

$u = \frac{V}{|V|} = (a, b, c)$

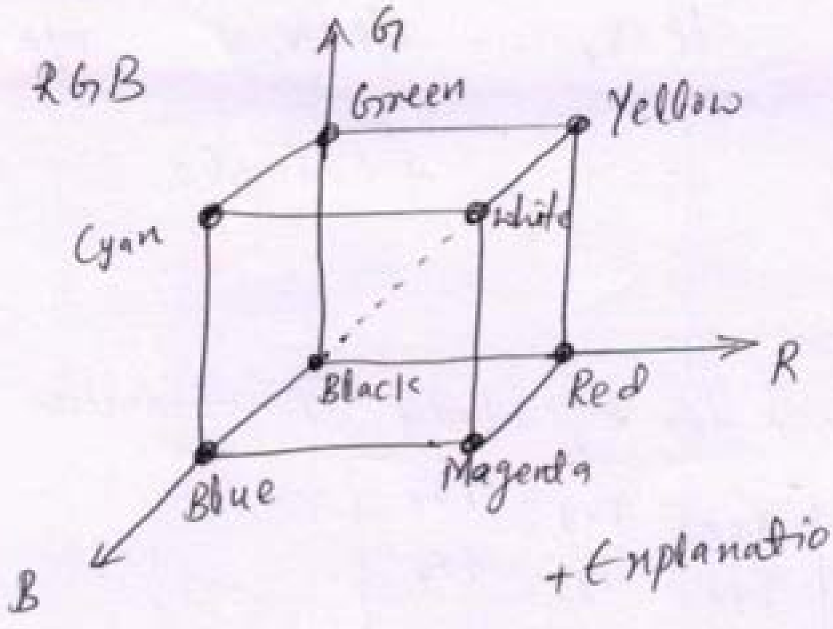
$a = \frac{x_2 - x_1}{|V|} \quad b = \frac{y_2 - y_1}{|V|} \quad c = \frac{z_2 - z_1}{|V|}$

$$T = \begin{bmatrix} 1 & 0 & 0 & -x_1 \\ 0 & 1 & 0 & -y_1 \\ 0 & 0 & 1 & -z_1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

6M

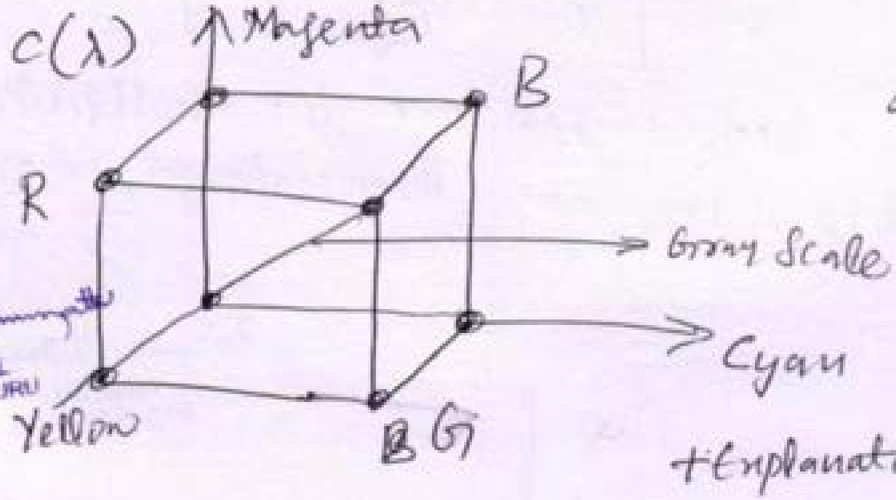
$$R_x(\alpha) = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & c/d & -b/d & 0 \\ 0 & b/d & c/d & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

b.



2M

+Explanation 2M



2M

+Explanation 2M

3

a.

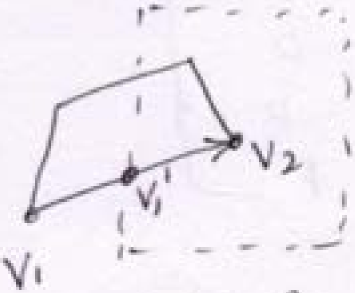
step1: out -> in $V_1' V_2$

step2: in -> in V_2

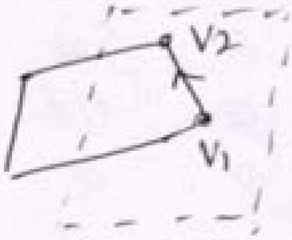
step3 in -> out V_1' 4M

step4 : out -> out none

Selection of vertex clipper edge of intersection is done as follows

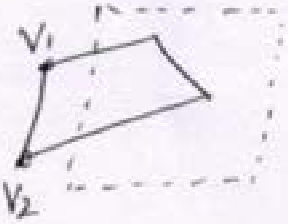


out -> in



in -> in
o/p V_2

in -> out
o/p : V_1'



out -> out
o/p : None

2M

+ Example 4M

4. 2M

Definition

Matrix for Rigid body Transformation

$$\begin{bmatrix} r_{xx} & r_{xy} & tr_x \\ r_{yx} & r_{yy} & tr_y \\ 0 & 0 & 1 \end{bmatrix}$$ 2M

where r_{jk} are the multiplicative rotation terms tr_x & tr_y are translational terms orthogonal vector set for rigid body denoted by

$$r_{xx}^2 + r_{xy}^2 = r_{yx}^2 + r_{yy}^2 = 1$$

2M

$$r_{xx}r_{yx} + r_{xy}r_{yy} = 0$$

(r_{yx}, r_{yy}) is transformed into a unit vector along the y axis of coordinate Systems

$$\begin{bmatrix} r_{xx} & r_{xy} & 0 \\ r_{yx} & r_{yy} & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} r_{xx} \\ r_{xy} \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} r_{xx} & r_{xy} & 0 \\ r_{yx} & r_{yy} & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} r_{yx} \\ r_{yy} \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$$

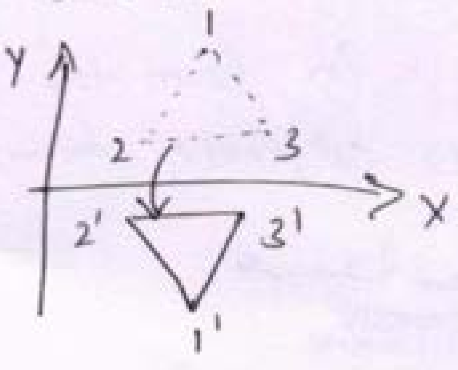
4M

$$T(t_x, t_y) \cdot R(x_r\, y_r, \theta) =$$

$$\begin{bmatrix} \cos\theta & -\sin\theta & x_r(1-\cos\theta) + y_r\sin\theta + t_x \\ \sin\theta & \cos\theta & y_r(1-\cos\theta) - x_r\sin\theta + t_y \\ 0 & 0 & 1 \end{bmatrix}$$

4a. 2-D reflection

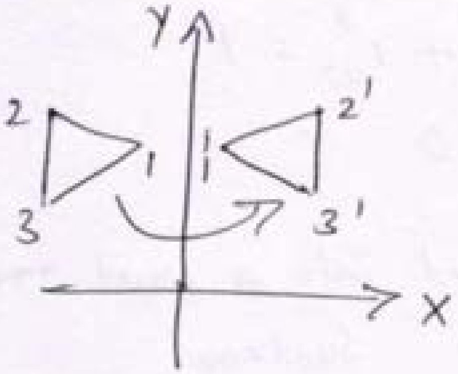
case 1: Reflection Along ~~y~~ x axis $y=0$



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

1½

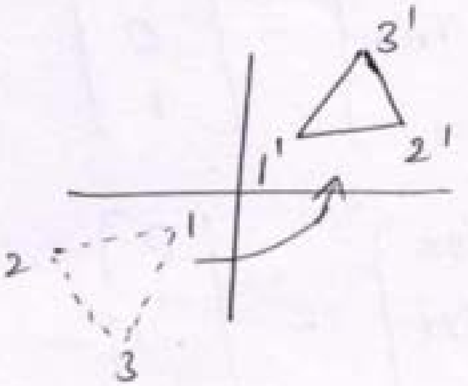
case 2: Reflection along y axis $x = 0$



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

1½

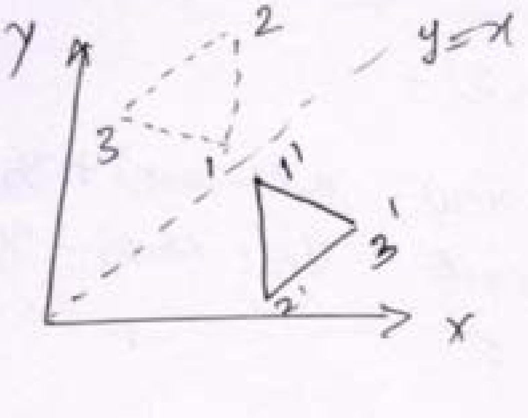
case 3: Reflection perpendicular to xy plane



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

1½

case 4: Reflection axes diagnal to line $y = x$



$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

1½

b) ⇒Light Source : There are 3 types of light Sources

1. Point Sources- The source that emits rays in all directions 4M
2. Parallel Sources: which in far from the surface
3. Distributed Sources: Rays originate from a finite area

=> Surface

PRINCIPAL
SIET., TUMAKURU.

Ambient Illumination

$$I_{amb} = K_a I_a$$

Diffuse Reflection

$$I_{diff} = K_d I_p \cos(\theta) = K_d I_p (N.L)$$

Specular Reflection

$$I_{spec} = W(\theta) I_l \cos^n(\phi)$$

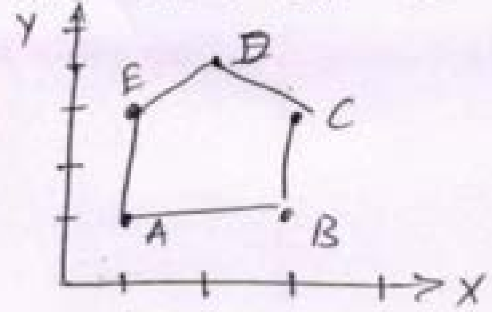
+explanation 4M

c).

Homogeneous co-ordinate System 2M

A(1, 1) B(3, 1) C(3, 3) D(2, 4) E(1, 3)

X axis with $S_x = 2$



$$\begin{bmatrix} 1 & 3 & 3 & 2 & 1 \\ 1 & 1 & 3 & 4 & 3 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}$$

original object

$$\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 3 & 3 & 2 & 1 \\ 1 & 1 & 3 & 4 & 3 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}$$ 4M

new Matrix $$\begin{bmatrix} 3 & 5 & 9 & 10 & 7 \\ 1 & 1 & 3 & 4 & 3 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}$$ 2M

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
Department of Electrical & Electronics Engineering

CIE FIRST INTERNAL ASSESSMENT TEST

Sub: Basic Electrical Engineering. **Sub code:** 21ELE13
Sem: I sem **Date:** 15.01.22
Max Marks: 40 **Common to A & B Sections** **Duration:** 90 Min

Note: **Answer two full questions selecting one full question from each module.**

MODULE-1

1. a) State and explain Ohm's laws & its limitations. **[CO1] (6 M)**
   b) State and explain Maximum Power Transfer theorem. **[CO1] (6 M)**
   c) For the following n/w shown in fig(1c), find the currents in all the branches and potential difference across AD & CE. **[CO1] (8M)**

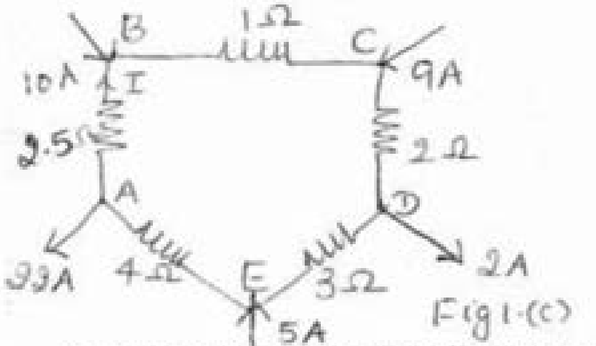


Fig 1-(c)

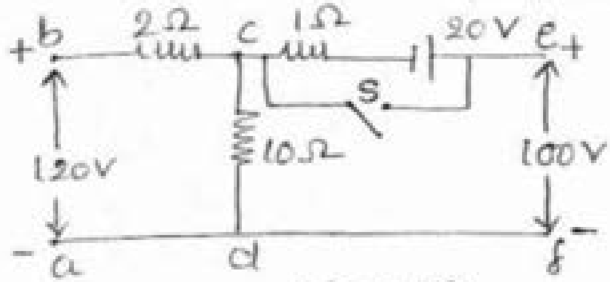


fig.2(c)

OR

2. a) State and explain Kirchoff's laws as applied in to DC circuits. **[CO1] (6 M)**
   b) Define i) Instantaneous value ii)Cycle of EMF iii) Time Period iv) Amplitude v) Frequency w.r.t sinusoidally varying quantity and their units. **[CO1] (6 M)**
   c) In the circuit shown in fig(2.c) what is the voltage across CD if (i) Switch S is open (ii) Switch S is closed. **[CO1] (8 M)**

MODULE-2

3. a) Define average value of a sinusoidal varying current and find their values in terms of its peak. **[CO1] (6 M)**
   b) The equation for alternating current wave is given by i=141.4sin314t Find **[CO1] (6 M)**
   (i) Peak current (ii) Average value (iii) Frequency (iv) Periodic time (v) Instantaneous value
   c) Derive the expression for the instantaneous current, power in a pure capacitor energized by a sinusoidal voltage. Draw the wave shapes of voltage, current and power signals involved. **[CO2] (8M)**

OR

4. a) Derive an expression for the RMS value of a sinusoidally varying Current. **[CO1] (6M)**
   b) Derive the expression for the instantaneous current, power consumed by RC series circuit. Draw the waveforms of voltage, current and power. **[CO1] (6M)**
   c) Show power consumed in pure inductance is zero. Draw the waveforms of voltage, current and power. **[CO2] (8 M)**

Scheme and Solution

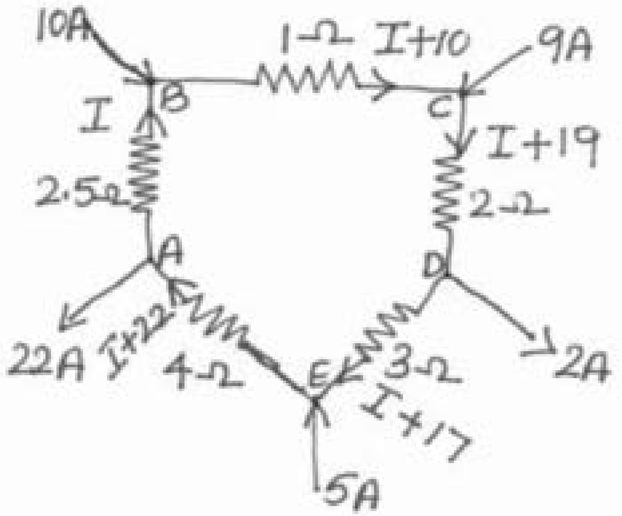
Internal Assessment Test-I

Basic Electrical Engg - 21ELE13

1 a) Statement —— (2M)
Explanation —— (2M) (6 M)
limitations —— (2M)

b) Statement —— (2M) (6M)
Explanation —— (4M)

c)



—— (2M)

Apply KVL to ABCDEA

$$2.5I + 1(I+10) + 2(I+19) + 3(I+17) + 4(I+22) = 0$$

$$12.5I + 187 = 0$$

$$\boxed{I = -14.96 \text{ Amps}}$$ —— (1M)

$I_{AB} = I = -14.96$ Amps.
$I_{BC} = I+10 = -14.96+10 = -4.96$ Amps
$I_{CD} = I+19 = -14.96+19 = 4.04$ Amps.
$I_{DE} = I+17 = -14.96+17 = 2.04$ Amps.
$I_{EA} = I+22 = -14.96+22 = 7.04$ Amps.

(2M)

potential difference across AD & CE

$V_{AD} = -4(I+22) - 3(I+17)$

$= -4(-14.96+22) - 3(-14.96+17)$

$= -4(7.04) - 3(2.04)$ ——— (1½)

$= -28.16 - 6.12$

$\boxed{V_{AD} = -34.28 \text{ volts}}$

(8M)

$V_{CE} = 2(I+19) + 3(I+17)$

$= 2(-14.96+19) + 3(-14.96+17)$

$V_{CE} = 2(4.04) + 3(2.04)$ ——— (1½)

$V_{CE} = 8.08 + 6.12$

$\boxed{V_{CE} = 14.2 \text{ Volts.}}$

2 a) KCL

Statement ——— (1M)

Explanation ——— (2M)

(6M)

KVL

Statement ——— (1M)

Explanation ——— (2M)

b) ~~(i)~~ Defination of

(i) instantaneous value ——— (1½M)

(ii) cycle of Emf ——— (1M)

(iii) Time period ——— (1M)

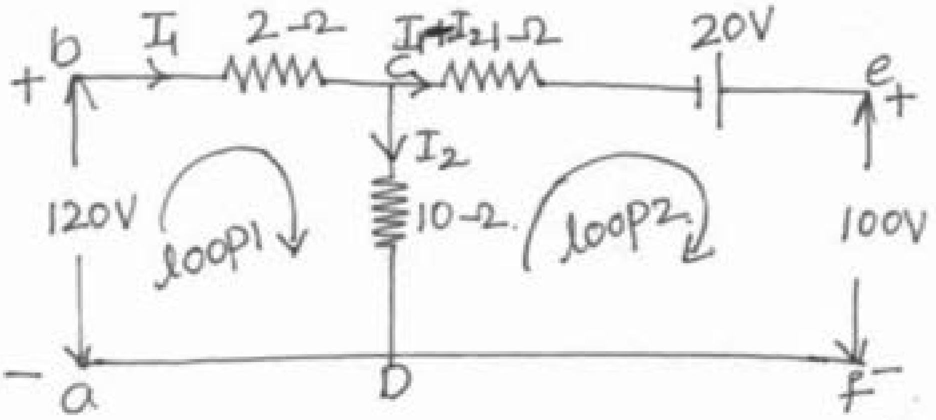
(6M)

(IV) Amplitude ——— (1M)

(V) frequency wrt sinusoidally varying quantity ——— (1½)

c) (i) when switch 'S' is closed

Equivalent ckt of above case is given by



— 2M

Apply KVL to loop 1

$2I_1 + 10I_2 = 120$ — ① — (1M)

Apply KVL to loop 2

$1(I_1+I_2) - 10I_2 = 20 - 100$ (8M)

$I_1 + I_2 - 10I_2 = -80$

$I_1 - 9I_2 = -80$ — ② — (1M)

By solving Eqn: ① & ②

$I_1 =$ ~~06 Amp~~, $I_2 =$ ~~10 Amps.~~

16.25 Amps $I_2 = 8.75$ Amps } — (1M)

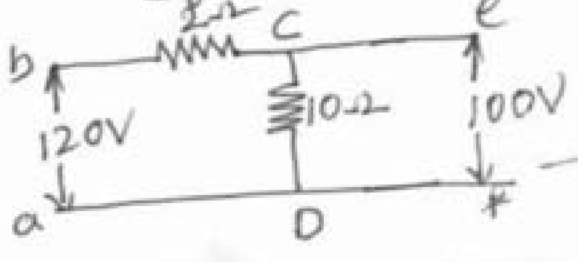
Voltage across CD = $I_2 * 10$

= 8.75×10

$V_{CD} =$ 87.5 volts — (1M)

(ii) when switch 'S' is closed

Equivalent ckt of above case is given by

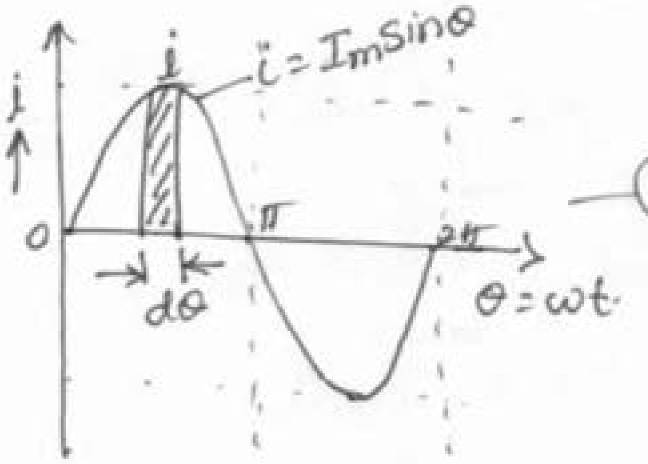


$V_{CD} = 100$ volts — (1M)

— (1M)

3a) Defination of avg value — (2M)

Derivation of avg value in terms of peak.



— (1M) $i = I_m \sin\theta$ — ①

area of strip $= i\, d\theta$ } (1M)

$$\therefore \text{Area of half cycle} = \int_0^{\pi} i\, d\theta$$

$$= \int_0^{\pi} I_m \sin\theta\, d\theta$$

$$= I_m \left(-\cos\theta\right)_0^{\pi}$$

$$= I_m\left(-\cos\pi + \cos 0\right)$$

$$= I_m (1+1)$$

(1M) (6M)

Area of halfcycle $= 2 I_m$

$$\therefore I_{avg} = \frac{\text{Area of half cycle}}{\text{half cycle base}}$$

$$= \frac{2I_m}{\pi - 0} = \frac{2I_m}{\pi}$$

(1M)

$$\boxed{I_{avg} = 0.637\, I_m}$$

b) $i = 141.4 \sin 314 t$

(i) peak current $I_m = 141.4$ Amps — (1M)

(ii) Avg value $I_{avg} = 0.637 \times 141.4$

$= \cancel{141}\ 90.07$ Amps. — (1M)

(iii) Frequency

$\omega = 2\pi f.$

$\omega = 314$

$314 = 2\pi f$

$f = \frac{314}{2\pi}$

$f = 49.97\ Hz$ — (1M)

$f \simeq 50\ Hz$

(6M)

(iv) periodic time

$T = \frac{1}{f}$

$T = \frac{1}{50}$ — (1M)

$T = 0.02$ sec

(v) Instantaneous value $t = 3$ msec

$i = 141.4 \sin 314t$

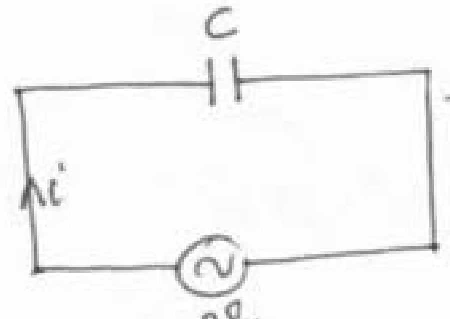
$= 141.4 \sin 314 \times 3 \times 10^{-3}$

$= 141.4 \sin 53.97$ — (2M)

$= 141.4$

$\boxed{i = 114.355 \text{ Amps.}}$

c)



(1/2 M)

$v = V_m \sin \omega t$ — ①

charge on capacitor $q = Cv$ — ②

(1M)

current through capacitor $i = \frac{dq}{dt}$

$$i = \frac{d(Cv)}{dt}$$

$$= C\frac{dv}{dt}$$

$$= C\frac{d(V_m \sin\omega t)}{dt}$$

$$= C V_m \cos\omega t \cdot \omega$$

(1M)

$$= V_m C \omega \cos\omega t$$

$$i = \frac{V_m}{1/\omega C} \sin(\omega t + \pi/2) \text{ ——②}$$

i goes to max $\sin(\omega t + \pi/2) = 1$

(1M)

$$I_m = \frac{V_m}{1/\omega C} = \frac{V_m}{X_C} \quad X_C \to \text{capacitive reactance}$$

$$i = I_m \sin(\omega t + \pi/2) \text{ ——③}$$

comparing eqn: ① & ③ i reads v by π/2

instantaneous power

$$p = vi$$

$$= V_m \sin\omega t \; I_m \sin(\omega t + \pi/2)$$

$$= V_m I_m \sin\omega t \cos\omega t$$

(1M)

$$p = V_m I_m \frac{\sin 2\omega t}{2}$$

Avg power over a complete cycle

$$P = \int_0^{2\pi} \frac{p\, dt}{2\pi - 0}$$

$$= \int_0^{2\pi} \frac{\frac{V_m I_m}{2} \sin 2\omega t \, dt}{2\pi}$$

⑦

$$P = \frac{V_m I_m}{4\pi}\left(-\frac{\cos 2\omega t}{2\omega}\right)_0^{2\pi}$$

$$= \frac{-V_m I_m}{8\omega\pi}\left(-\cos 4\pi + \cos 0\right)$$

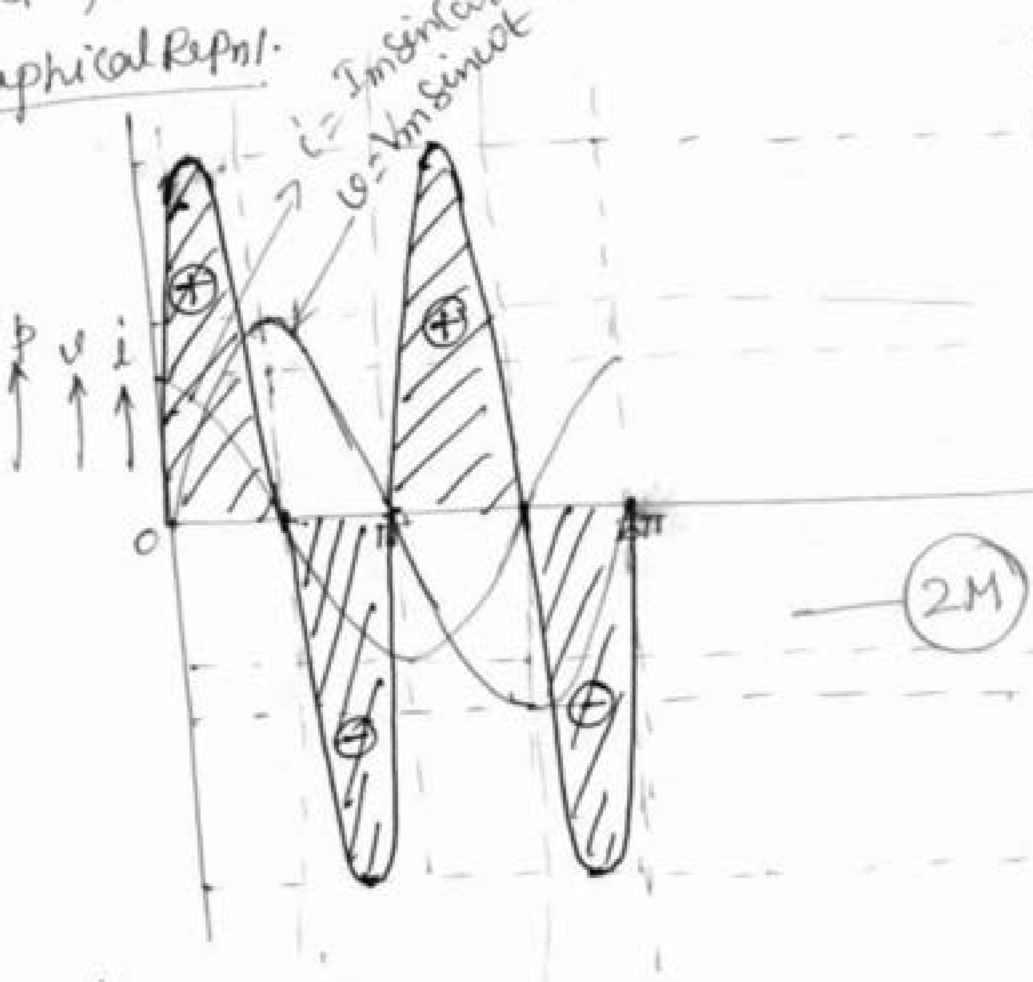
$$= -\frac{V_m I_m}{8\omega\pi}\left(-1 + 0\right)$$

(1M)

$$\boxed{P = 0}$$

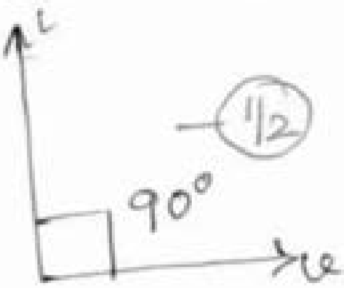
power consumed in pure capacitor is zero
graphical representation of voltage, current & power waveform are given below

graphical Repn.



(2M)

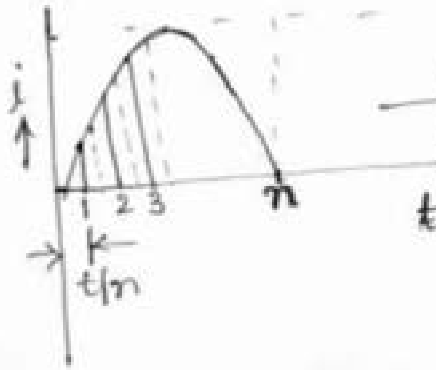
Vector Repn.



(½)

(8M)

4 a)



(1M)

Heat produced in AC $= I_{AC}^2 R t$

Heat produced in DC $= I_{DC}^2 R t$

Heat produced in AC = Heat produced in DC

Heat produced in 1st interval $= i_1^2 R t/n$

2nd interval $= i_2^2 R t/n$

$\vdots$

nth interval $= i_n^2 R t/n$ (2M)

Total heat produced in AC $= i_1^2 R t/n + i_2^2 R t/n + \cdots + i_n^2$

$= R t/n \left[i_1^2 + i_2^2 + \cdots + i_n^2 \right]$

Heat produced in DC $= I^2 R t$

According to def^n of ~~rms~~

Heat produced in DC = Heat produced in AC — (1M)

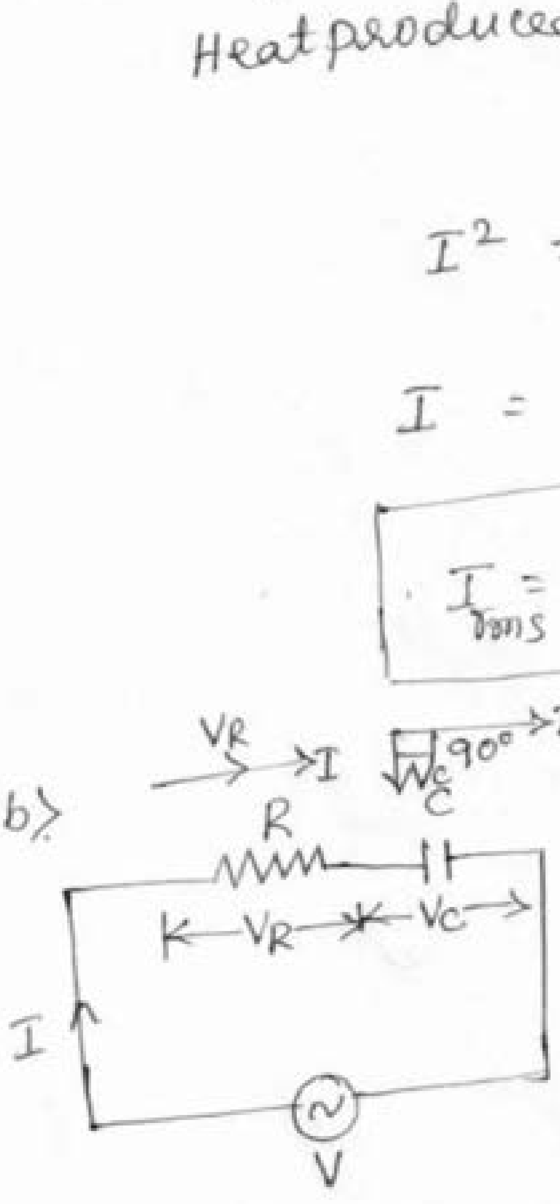
$I^2 R t = R t/n \left[i_1^2 + i_2^2 + \cdots + i_n^2 \right]$ (6M)

$$I^2 = \frac{i_1^2 + i_2^2 + \cdots + i_n^2}{n}$$ (2M)

$$I = \sqrt{\frac{i_1^2 + i_2^2 + \cdots + i_n^2}{n}}$$

$$\boxed{I_{rms} = \sqrt{\frac{\text{Area of half cycle}}{\text{half cycle base}}}}$$

4 b)



Let

V → Vrms — (1M)

I → Irms

$V_R = IR$ inphase phase with I gives vector OA

$V_L = I X_C$ lags current by 90° gives vector AB

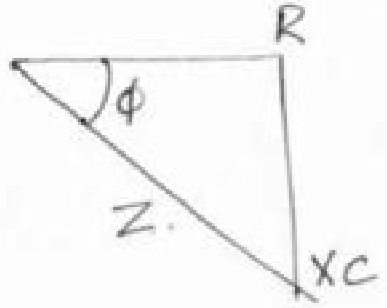
from Δle OAB

$OB^2 = OA^2 + AB^2$

$OB = \sqrt{OA^2 + AB^2}$

$$V = \sqrt{V_R^2 + V_c^2} \Big\} \text{ — } (1M)$$

Impedance :



$$V = \sqrt{(IR)^2 + (IX_C)^2}$$

$$V = I\sqrt{R^2 + X_c^2}$$

$$\frac{V}{I} = \sqrt{R^2 + X_c^2}$$

$$Z = \sqrt{R^2 + X_c^2}$$

(1M)

from Δ^{le}

$$\cos\phi = \frac{R}{Z} \qquad \sin\phi = \frac{-X_c}{Z}$$

$$\tan\phi = \frac{-X_c}{R}$$

$$\phi = \tan^{-1}\frac{-X_c}{R}$$

angle is negative mean current leads the voltage by an angle Φ. Instantaneous value of voltage and current is given by

$$\left.\begin{aligned} v &= V_m \sin\omega t \\ i &= I_m \sin(\omega t + \phi) \end{aligned}\right\}$$ ([illegible])

power :

Instantaneous power $p = v.i$

$$= V_m \sin\omega t \, I_m \sin(\omega t + \phi)$$

$$= \frac{V_m I_m}{2}\left[\cos(\omega t - \omega t - \phi) - \cos(\omega t + \omega t + \phi)\right.$$

$$p = \frac{V_m I_m \cos\phi}{2} - \frac{V_m I_m}{2}\cos(2\omega t + \phi)$$

(1M)

avg power over a completecycle $P = \frac{V_m I_m \cos\phi}{2} = \frac{V_m}{\sqrt{2}}\frac{I_m}{\sqrt{2}}\cos\phi$

$$\boxed{P = V_{rms} I_{rms} \cos\phi}$$

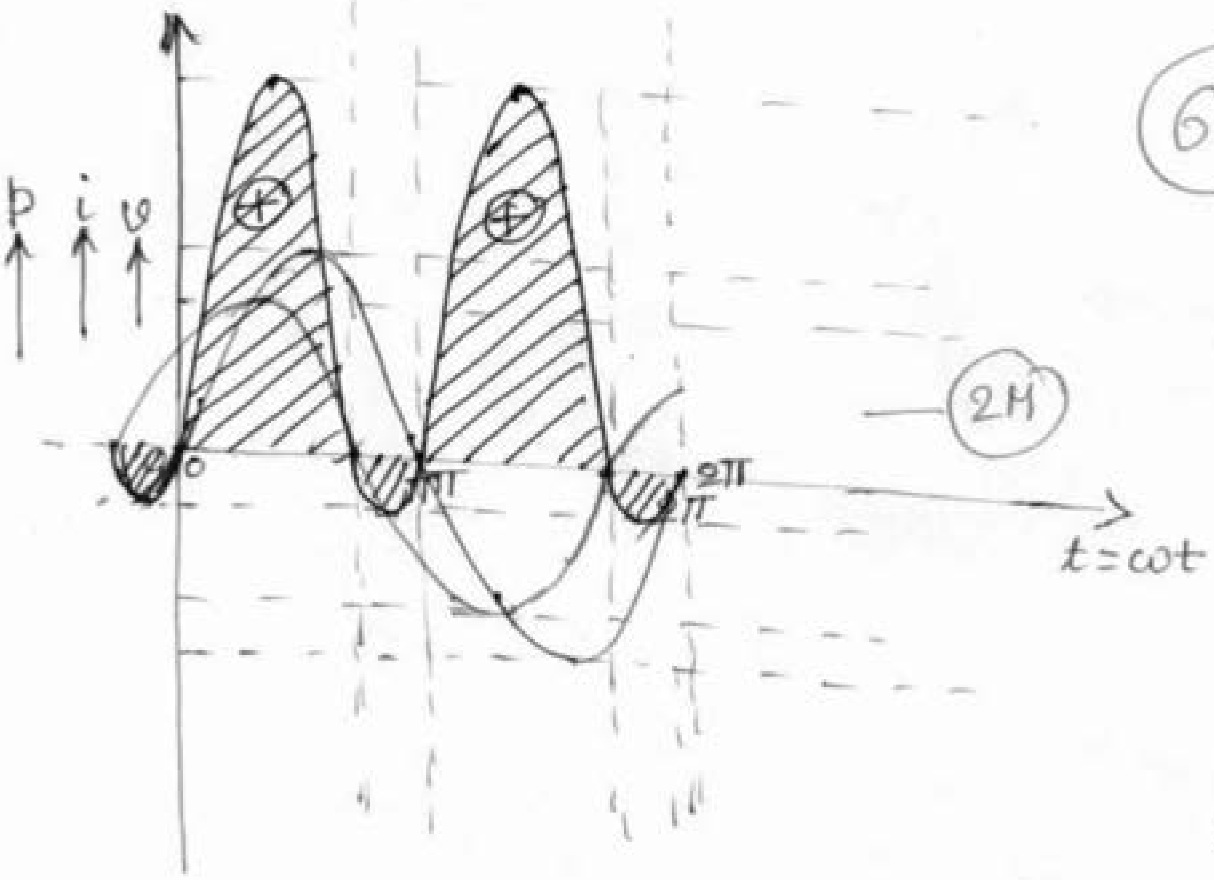
from impedance Δle

$$P = VI\cos\phi$$

$$= VI\frac{R}{Z}$$

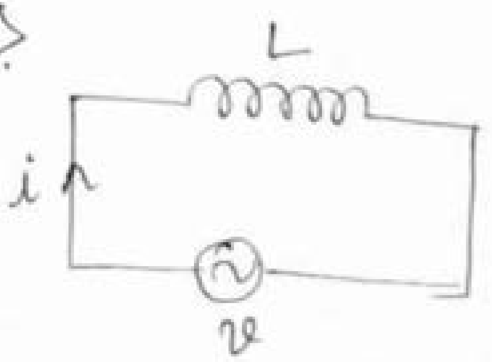
$$\boxed{P = I^2 R}$$

(6M)



(2M)

c)



$v = V_m \sin\omega t$

$i = I_m \sin(\omega t - \pi/2)$ (2M)

Instantaneous power $p = v\,i$

$= V_m \sin\omega t \; I_m \sin(\omega t - \pi/2)$

$= V_m I_m \sin\omega t \; (-\cos\omega t)$

$= -V_m I_m \sin\omega t \cos\omega t$ (2M)

$= -V_m I_m \dfrac{\sin 2\omega t}{2}$

avg power over a complete cycle $= P = \int_0^{2\pi} \frac{p.dt}{2\pi - 0}$

$$P = \int_0^{2\pi} \frac{-\frac{V_m I_m}{2} \sin 2\omega t \, dt}{2\pi}$$

$$= \frac{-V_m I_m}{4\pi} \left[-\frac{\cos 2\omega t}{2} \right]_0^{2\pi}$$

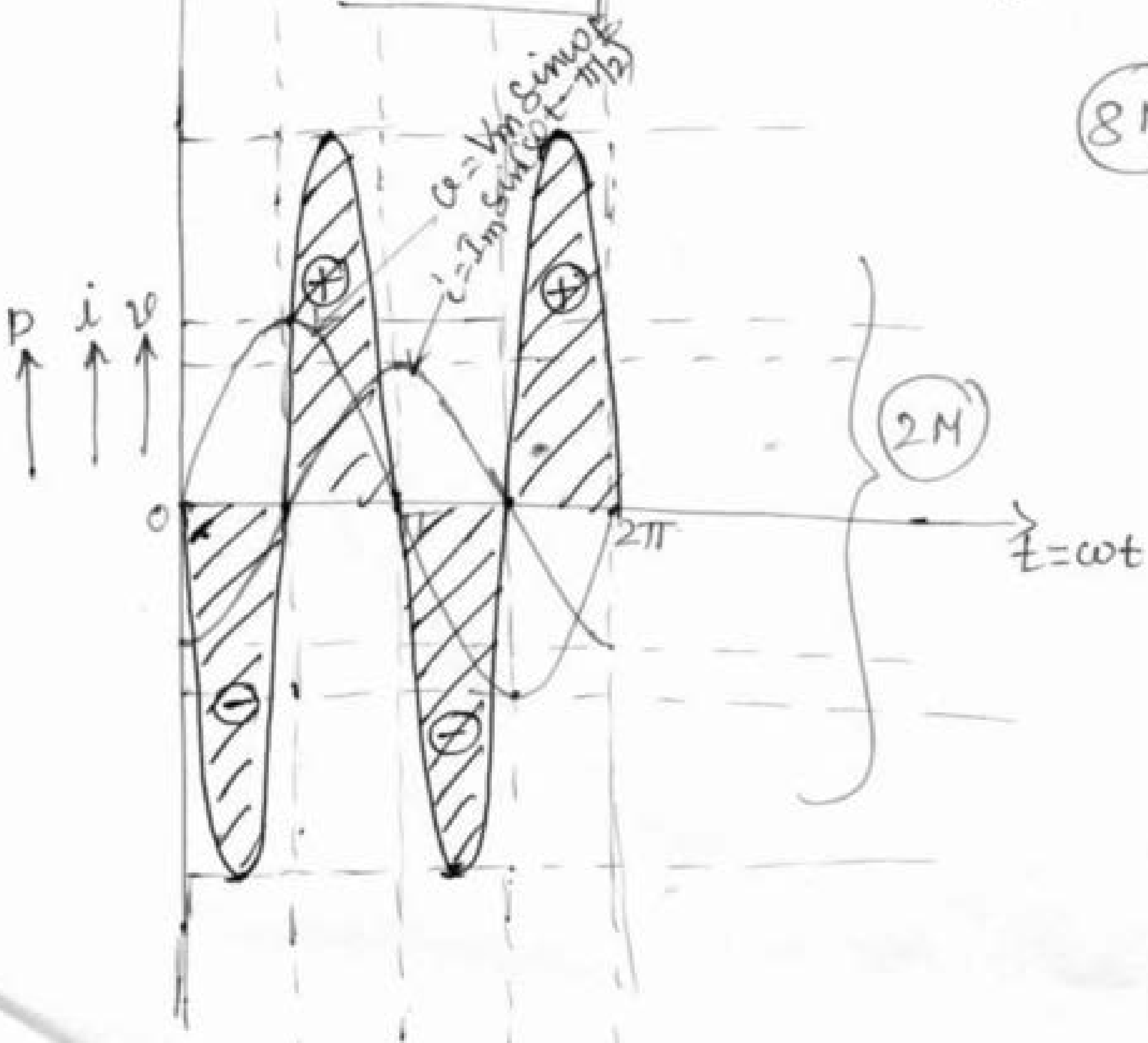
$$= \frac{V_m I_m}{8\pi} \left[\cos 2\pi - \cos 0 \right]$$

$$= \frac{V_m I_m}{8\pi} \left[1 - 1 \right]$$

$$\boxed{P = 0}$$

(2M)

(8M)



(2M)

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

(An ISO 9001:2008 Certified Institution)

Department of Electrical & Electronics Engineering

Power Systems 2 -15/17/18EE-71

SHRIDEVI

Max Marks: 40
Semester: VII

Internal Assessment Test-III

Date: 07-02-2022
Duration: 90 Minutes

NOTE: Answer any *two* full questions choosing one question in each part

PART-A

1. a) Explain the method of equal incremental cost for the economic operation and generation with transmission loss consideration. **(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 fuel costs in Rs/MWhr and the generation constants, if the transmission losses are neglected.

$dc_1/dp_1= 30+0.15P_1$ $25MW \leq P1 \leq 125MW$

$dc_2/dp_2= 40+0.2P_2$ $30MW \leq P2 \leq 100MW$

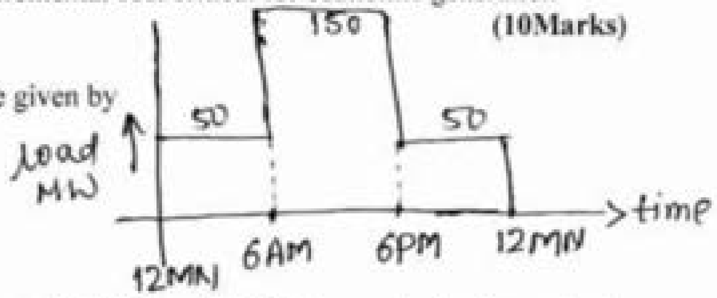
$dc_3/dp_3= 15+0.18P3$ $50MW \leq P3 \leq 200MW$ **(10 Marks)**

OR

2. a) Neglecting transmission losses derive equal incremental cost critical for economic generation scheduling in a interconnected system. **(10Marks)**

b) The fuel input in calories/hr for plants 1 & 2 are given by

$$F_1 = (8P_1+0.024P_1^2+80) \times 10^6$$
$$F_2 = (6P_2+0.044P_2^2+120) \times 10^6$$



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. **(10Marks)**

PART-B

3. a) Explain iterative technique for load dispatch neglecting losses and including limits. **(10Marks)**

b) A power system has plants 1 and connected by a transmission line and a load is located at plant2. When a load of 100 MW is transmitted to the load from plant 1, the transmission loss is 10 MW. Find the power generation of each plant and the power received by the load if the incremental cost of received power is $\lambda=25$ Rs/MWhr.

$dc_1/dp_1=(0.02P_1 + 15)$ Rs/MWhr $dc_2/dp_2= (0.05P_2 + 20)$ Rs/MWhr **(10Marks)**

OR

4. a) Explain iterative technique for load dispatch including losses. **(10Marks)**

b) Incremental fuel cost for a plant consisting of 2 units is given by
$dF_1/dp_1 = (0.008P_1+8)$, $dF_2/dp_2 = (0.0096P_2+6.4)$.
The maximum and minimum loads on each unit is 625 & 100 MW respectively. Find the incremental fuel cost and the allocation of load of 100 MW between the units. Determine the saving in fuel cost in dollars per hour, for the optimum scheduling of total load of 1000MW as compare to equal distribution of the same load between the two units. **(10Marks)**

Scheme of Evaluation

Internal Assessment - III

1> a>

$$C = \sum_{i=}^{m} C_i P_{Gi} \quad \text{———} ①$$

$$\sum_{i=1}^{n} P_{Gi} - \sum_{i=1}^{n} P_{Di} - P_L = 0 \quad \text{———} ①$$

$$\frac{\partial \mathcal{L}}{\partial P_{Gi}} = \frac{dC_i}{dP_{Gi}} - \lambda + \lambda \frac{\partial P_L}{\partial P_{Gi}} = 0 \quad \text{———} ②$$

$$\frac{dC_i}{dP_{Gi}} = \lambda\left(1 - \frac{\partial P_L}{\partial P_{Gi}}\right) \quad \text{———} ②$$

$$\lambda = \frac{dC_i}{dP_{Gi}} L_i \quad \text{———} ②$$

$$L_i = \frac{1}{1 - \frac{\partial P_L}{\partial P_{Gi}}} \quad \text{———} ②$$

2b>

$$\left.\begin{aligned} F_1 &= 80P_1 + 0.24P_1^2 + 800 \text{ Rs/hr} \\ F_2 &= 60P_2 + 0.4P_2^2 + 1200 \text{ Rs/hr} \end{aligned}\right\} \text{———} ①$$

$$\frac{dF_1}{dP_1} = \frac{dF_2}{dP_2}$$

$$\left.\begin{aligned} \frac{dF_1}{dP_1} &= 0.48P_1 + 80 \\ \frac{dF_2}{dP_2} &= 0.8P_2 + 60 \end{aligned}\right\} \text{———} ①$$

2 b)

$$\left.\frac{dc_1}{dP_1} = \frac{dc_2}{dP_2} = \frac{dc_3}{dP_3}\right\} \text{—①}$$

$$\left.\begin{array}{l}\dfrac{dc_1}{dP_1} = \dfrac{dc_2}{dP_2} \\ P_2 = 0.75P_1 - 50 \text{ —①}\end{array}\right\} \text{—①}$$

$$\left.\begin{array}{l}\dfrac{dc_1}{dP_1} = \dfrac{dc_3}{dP_3} \\ P_3 = 0.833P_1 + 83.33\end{array}\right\} ①$$

$$\left.\begin{array}{l}P_1 + P_2 + P_3 = 300 \\ P_1 = 103.24MW \\ P_2 = 27.43 MW \\ P_3 = 169.33 MW\end{array}\right\} \text{—②}$$

$$\left.\begin{array}{l}P_2 = 27.3 \\ \text{let } P_2 = 30MW \\ \dfrac{dc_2}{dP_2} = \lambda \\ \lambda = 46\end{array}\right\} \text{—①}$$

$$\left.\frac{dc_1}{dP_1} = \frac{dc_2}{dP_2} = \frac{dc_3}{dP_3}\right\} \text{—①}$$

$$\left.\begin{array}{l}P_1 = 106.66 MW \\ P_2 = 30 MW \\ P_3 = 172.22 MW\end{array}\right\} \text{—②}$$

$$\left.\begin{array}{l}\therefore \text{Total received load} \\ P_D = P_1 + P_2 + P_3 \\ P_D = 309 MW\end{array}\right\} \text{—①}$$

$P_1 + P_2 = 50\ \text{MW}$

$P_2 = 50 - P_1$

$$\frac{dF_1}{dP_1} = \frac{dF_2}{dP_2}$$

$0.48P_1 + 80 = 0.8P_2 + 60$

$P_1 = 15.625\ \text{MW}$

$P_2 = 34.375\ \text{MW}$ — ②

$F_{T_1} = F_1 + F_2$

$F_{T_1} = 5843.75\ \text{Rs/hr}$, $F_{T_1} = 5843.75 \times 12$

$\boxed{F_{T_1} = 70125\ \text{Rs/day}}$ — ①

$P_1 + P_2 = 150\ \text{MW}$

$$\frac{dF_1}{dP_1} = \frac{dF_2}{dP_2}$$

$P_1 = 78.125\ \text{MW}$

$P_2 = 71.875\ \text{MW}$ — ②

$F_{T_2} = 16093.75\ \text{Rs/hr}$

$= 16093.75 \times 12$

$F_{T_2} = 193125\ \text{Rs/day}$ — ②

Total min cost/day

$F_T = F_{T_1} + F_{T_2}$

$\boxed{F_T = 263250\ \text{Rs/day}}$ — ①

2 a>

$C = \sum_{i=1}^{n} C_i P_{G_i}$ Rs/hr — ②

with Explanation — ①

$C = C - \lambda \sum_{i=1}^{K} P_G - P_D$ — ②

with Explanation — ①

$\frac{dC_i}{dP_{G_i}} = 0$ where $i = 1, 2, 3 \ldots\ldots K$ — ②

$\frac{dc_1}{dP_{G_1}} = \frac{dc_2}{dP_{G_2}} = \frac{dc_3}{dP_{G_3}} = \cdots\cdots = \lambda$ — ②

3 a>

Flow chart — ⑤

Algorithm — ⑤

b>

$P_L = B_{11}P_1^2 + B_{12}P_1P_2 + B_{22}P_2^2$

$B_{12} = 0, \quad B_{22} = 0$

$P_L = B_{11}P_1^2$

$B_{11} = \frac{10}{(100)^2} = 0.001$ — ③

$\frac{dc_1}{dP_1} + \lambda \frac{dP_L}{dP_1} = \lambda$

$0.02P_1 + 15 + \lambda \frac{d}{dP_1}\left(B_{11}P_1^2\right) = \lambda$ — ③

$\boxed{P_1 = 142.85 \text{ MW}}$

$$\frac{dC_2}{dP_2} + \lambda \cancelto{0}{\frac{dP_T}{dP_2}} = \lambda$$

$$0.05P_2 + 20 = 25$$

$$P_2 = \frac{5}{25}$$

$$\boxed{P_2 = 100 \text{ MW}}$$

— ②

power received by load

$$P_1 + P_2 = P_D + P_T$$

$$P_D = P_1 + P_2 - P_T$$

$$\boxed{P_D = 222.44 \text{ MW}}$$

— ②

4 a>

Flow chart — ⑤

Algorithm — ⑤

b>

$$\frac{dF_1}{dP_1} = 0.008P_1 + 8 = 0.008 \times 100 + 8 = 8.8$$

$$\frac{dF_1}{dP_2} = 0.0096P_2 + 6.4 = 0.0096 \times 100 + 6.4 = 7.36$$

— ①

λ	P_1	P_2	$P_1 + P_2$
7.36	100	100	200
7.84	100	150	250
⋮			
13	625	625	1250

— ②

(ii) $P_1 + P_2 = 1000$ — ①

$$\frac{dF_1}{dP_1} = \frac{dF_2}{dP_2}$$

$$0.008P_1 + 8 = 0.0096P_2 + 6.4$$ — ②

$P_1 = 425.55$ MW

$P_2 = 545.45$ MW

(iii) $P_1 = P_2 = 450$ MW

$$F_1 = \int_{400}^{450} (0.008P_1 + 8)\, dP_1$$ — ②

$F_1 = 570\ \$/\text{hr}$

$$F_2 = \int_{500}^{450} (0.0096P_2 + 6.4)\, dP_2$$ — ②

$F_2 = -548\ \$/\text{hr}$

net savings $= 22\ \$/\text{hr}$

$= 22 \times 8760$ — ①

$= 192720\ \$$

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering
II semester CIE I Internal Assessment Test: 18.07.22
21ELE23: Basic Electrical Engineering

Max Marks: 40 **Duration:** 90 Minutes

Note: **Answer two full questions selecting one full question from each module.**

MODULE – 1

1.a) State and explain Ohm's law & its limitations. **(6 Marks CO1)**

b) State & Explain Kirchhoff's laws. **(6 Marks CO1)**

c) A current of 30 A flows through two ammeters A_1 and A_2 connected in series. The p.d. across the two ammeters is 0.3 V and 0.6 V respectively. Find how the same current will divide when they are connected in parallel. **(8 Marks CO1)**

OR

2. a) Define the terms w.r.t to alternating quantities i) Instantaneous value ii) Cycle of e.m.f iii) Frequency iv) Time period v) Amplitude. **(6 Marks CO1)**

b) Define RMS and average value of a sinusoidal varying current and find their values in terms of its peak.

c) A circuit consists of two parallel resistors having resistances of 20Ω and 30Ω respectively, connected in series with 15Ω. If current through 15Ω resistor is 3A, find (i) current in 20Ω & 30Ω resistors, (ii) voltage across the whole circuit (iii) the total power & power consumed in all the resistances. **(6 Marks CO1)**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering
II semester CIE I Internal Assessment Test: 18.07.22
21ELE23: Basic Electrical Engineering

Max Marks: 40 Duration: 90 Minutes

Note: Answer two full questions selecting one full question from each module.

MODULE – 1

1.a) State and explain Ohm's law & its limitations. (6 Marks CO1)

b) State & Explain Kirchhoff's laws. (6 Marks CO1)

c) A current of 30 A flows through two ammeters A_1 and A_2 connected in series. The p.d. across the two ammeters is 0.3 V and 0.6 V respectively. Find how the same current will divide when they are connected in parallel. (8 Marks CO1)

OR

2. a) Define the terms w.r.t to alternating quantities i) Instantaneous value ii) Cycle of e.m.f iii) Frequency iv) Time period v) Amplitude. (6 Marks CO1)

b) Define RMS and average value of a sinusoidal varying current and find their values in terms of its peak.

c) A circuit consists of two parallel resistors having resistances of 20Ω and 30Ω respectively, connected in series with 15Ω. If current through 15Ω resistor is 3A, find (i) current in 20Ω & 30Ω resistors, (ii) voltage across the whole circuit (iii) the total power & power consumed in all the resistances. (6 Marks CO1)

MODULE – II

3. a) Show that power consumed in pure resistance is VI. Draw the waveforms. **(6 Marks CO1)**

b) With usual notation, Prove that power consumed in a R-L series circuit is VIcosΘ

c) For the current waveform shown in fig2(b) **(6 Marks CO2)**

Find: (i) Peak current (ii) Average value (iii) periodic time (iv) Frequency (v) Instantaneous value at t=3ms **(8 Marks CO1)**

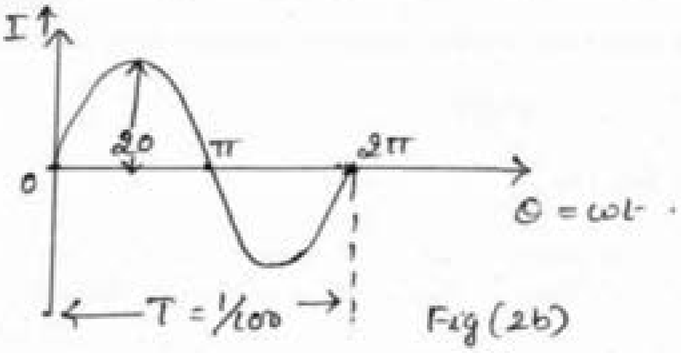


Fig (2b)

OR

4.a) Show that a pure capacitance does not consumes any power. Draw the waveforms of voltage , current and power, when alternating voltage is applied to the pure capacitace circuit. **(6 Marks CO1)**

b) With usual notation, Prove that power consumed in a R-C series circuit is VIcosΘ. **(6 Marks CO2)**

c) A series R-L-C circuit is composed of 100Ω resistance, 0.15 H inductance and 25μF capacitance. A voltage of 100 volts, 50Hz is applied to the circuit. Determine the current and voltage VR, VL and VC. **(8 Marks CO2)**

MODULE – II

3. a) Show that power consumed in pure resistance is VI. Draw the waveforms. (6 Marks CO1)

b) With usual notation, Prove that power consumed in a R-L series circuit is VIcosΘ

c) For the current waveform shown in fig2(b) (6 Marks CO2)

Find: (i) Peak current (ii) Average value (iii) periodic time (iv) Frequency (v) Instantaneous value at t=3ms (8 Marks CO1)

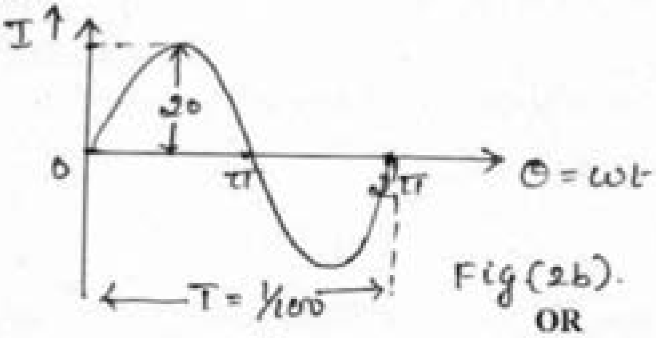


Fig (2b).

OR

4.a) Show that a pure capacitance does not consumes any power. Draw the waveforms of voltage , current and power, when alternating voltage is applied to the pure capacitace circuit. (6 Marks CO1)

b) With usual notation, Prove that power consumed in a R-C series circuit is VIcosΘ. (6 Marks CO2)

c) A series R-L-C circuit is composed of 100Ω resistance, 0.15 H inductance and 25μF capacitance. A voltage of 100 volts, 50Hz is applied to the circuit. Determine the current and voltage VR, VL and VC. (8 Marks CO2)

Basic Electrical Engg. (21ELE23)

CIE IA → 1

18.07.22

Scheme of Evaluation :

1. a) Ohm's Law → Statement → 2M
Explaination → 2M
Limitations. → 2M
} → 6M.

b) Statement of KCL
Explaination of KCL
} → 3M

Statement of KVL
Explaination of KVL
} → 3M.

c) $R_1 = 0.01\ \Omega$
$R_2 = 0.02\ \Omega$
} → 4M.

$I_1 = 20A$
$I_2 = 10A$
} → 4M.

2. a) Definitions of
i) Instantaneous Value
ii) Cycle of e.m.f
iii) Frequency
iv) Time period
v) Amplitude
} → 6M.

b) Definition of R.M.S Value → 1M.
Derivation $I_{rms} = I_m/\sqrt{2} = 0.707 I_m$ → $\boxed{5M}$

c) $I = 3A$
i) $I_1 = 1.8A = I_{20}$
$I_2 = 1.2A = I_{30}$
} 2M

ii) $V = 81V$ } 2M
iii) $P = 243W$ } 2M.

3. a) Pure resistance Circuit :
Circuit diagram → 1M
Derivation $P = VI$ → 3M
waveforms of e, i & P → 2M
} → 6M.

b) Circuit diagram . R-L Series Circuit → 1M
Equations $e = E_m \sin \omega t$
$i = I_m \sin(\omega t - \phi)$
} → 2M
Derivation $P = VI\cos\theta$ → 2M
waveforms of e, i & P → 1M
} 6M

c) i) Peak current.

ii> Average value =
iii> Periodic time =
iv) Frequency =
v) Instantaneous value =

4·a> Pure Capacitance Circuit :-
Circuit diagram → 1M
Equations $e = E_m \sin\omega t$
$i = I_m \sin(\omega t - \pi/2)$ } → 2M } → 6M.
Derivation $P = 0$ → 2M
Waveforms of e, i & P → 1M

b> R-C Series Circuit → Circuit diagram → 1M
Equations $e = E_m \sin\omega t$
$i = I_m \sin(\omega t - \phi)$ } 2M
Derivation $P = VI\cos\phi$ → 2M
Waveforms of e, i & P → 1M.

c> $X_C = 127{\cdot}32\ \Omega$
$X_L = 47{\cdot}12\ \Omega$
$Z = 128{\cdot}19\ \Omega$ } → 3M
$I = 0{\cdot}785\ A$. → 2M.

$V_R = 78{\cdot}5\ V$
$V_L = 36{\cdot}98\ V$
$V_C = 100\ V$ } → 2M

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering
II semester CIE II Internal Assessment Test: 17.08.22
21ELE23: Basic Electrical Engineering

Max Marks: 40 **Duration:** 90 Minutes

***Note:* Answer two full questions selecting one full question from each module.**

MODULE – 1

1.a) Obtain the relationship between line and phase voltages and current in a three phase balanced star connected system. **(6M CO2)**

b) Show that two watt meters are sufficient to measure three phase power for balanced load. **(6M CO2)**

c) A parallel circuit consists of a resistor of 20Ω in series with an inductive reactance of 15 in one branch and a resistor of 30Ω in series with a capacitive reactance of 20Ω in the other branch.Determine the current & power consumed in each branch if the total current drawn by the parallel circuit is $10\angle -30$ A. **(8M CO2)**

OR

a) Obtain the relationship between line and phase voltages and current in a three phase balanced delta connected system. **(6M CO2)**

b) Explain the effect of power factor on wattmeter readings when i) Φ=0 ii) Φ=30 iii) Φ=60 iv) Φ=90**(6M CO2)**

c) Two impedances $Z1 = (10 + j\,15)\Omega$ and $Z2 = (6 - j\,8)\Omega$ are,connected in parallel across a voltage of 200v. If the total current drawn is 10 A, calculate (i) currents in Z1 and Z2. ii) power consumed by the circuit. **(8M CO2)**

MODULE – II

3. a) Derive emf equation of a transformer. **(6M CO3)**

b) What is an electric shock. What are the precautions have to be taken to prevent the shock. **(6M CO5)**

c) Two watt meters connected to measure the power in a 3 phase circuit read 5 kW and 1 kW, the latter being read after reversing the potential coil ends. Calculate the power, power factor, total volt-amperes and reactive volt-amperes. **(8M CO2)**

OR

4. a) What are the losses that occur in a transformer ? How are they minimized? **(6M CO3)**

b) What is the necessity of earthing ? With a neat sketch explain the any one type of earthing. **(6M CO5)**

c) A single phase, 20 kVA transformer has 1000 primary turns and 2500 secondary turns. The net cross sectional area of the core is 100 cm^2. When the primary winding is connected to 500V, 50 Hz supply, calculate (i) the maximum value of the flux density in the core (ii) the voltage induced in the secondary winding and (iii) the primary and secondary full load currents. **(8M CO3)**

Basic Electrical Engg (21ELE23) 17.08.22.

CIE - II IA Test.

Scheme of Evaluation:

1. a) Circuit diagram ⟶ 1M
Phasor diagram ⟶ 2M
$I_l = I_{ph}$ ⟶ 1M
$E_l = \sqrt{3} E_{ph}$ (Derivation) → 2M
} ⟶ 6M.

b) Circuit diagram ⟶ 1M
Phasor diagram ⟶ 2M
Equations $W_1 = E_l I_l \cos(\omega t - \phi)$
$W_2 = E_l \cos(\omega t + \phi)$ } ⟶ 1M
$W_1 + W_2 = \sqrt{3} E_l I_l \cos\phi$. (Derivation) ⟶ 2M
} ⟶ 6M

c) $I_1 =$
$I_2 =$
$P_1 =$
$P_2 =$

2. a) Circuit diagram → 1M
Phasor diagram → 2M
$E_l = E_{ph}$ → [illegible]M
(Derivation) $I_l = \sqrt{3} I_{ph}$ → 2M
} → 6M

b) $W_1 = E_l I_l \cos(30 - \phi)$
$W_2 = E_l I_l \cos(30 + \phi)$
i) $\phi = 0$, $W_1 = W_2 = \sqrt{3}/_2 E_l I_l$.
ii) $\phi = 30$ $W_1 =$ [illegible] $E_l I_l$, $W_2 = \frac{1}{2} E_l I_l$
iii) $\phi = 60^\circ$ $W_1 = \sqrt{3}/_2 E_l I_l$, $W_2 = 0$
iv) $\phi = 90^\circ$ $W_1 = \frac{1}{2} E_l I_l$, $W_2 = -\frac{1}{2} E_l I_l$
} ⟶ 6M.

c) $P = 4$ kw
$\cos\phi = 0.369$
KVA = 11,135.86 VA
KVAR = 10391.98 VAR.
} Each 2M
2M×4 = 8M.

3. a) Derivation: EMF eqn of a transformer.
$E_1 = 4.44 f N_1 \phi_m$ & $E_2 = 4.44 f N_2 \phi_m$ ⟶ $\boxed{6M}$

b) Definition of Electric Shock ⟶ 1M
Preventions (any 5) ⟶ 5M
} ⟶ $\boxed{6M}$

c> P = 4kw
P.f = 0.369
VA = 11135.86 VA
KVAR = 10391.98 VA
→ 8M

4. a> Losses → Iron losses → We
Wh
Copper losses
→ 6M.
Explaination.

b> Necessity of Earthing → 2M
Any one type of Earthing
Pipe or plate Earthing → Diagram → 2M
Explaination → 2M.

c> i> ϕ_m = 2.25 mwb
ii> E_2 = 1250V
iii> I_1 = 40A
I_2 = 16A
Each 2M
2M × 4 = 8M.

Subject Code: 21ELE13/23

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
[An Institution Affiliated to VTU Belagavi, Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEGREE :UG	AY:2022-2023	SEM : II	TITLE: Preparatory Examination	DATE:01-09-2022

SUB NAME /CODE: BASIC ELECTRICAL ENGINEERING/21ELE23

TIME: 03 Hours **Max. Marks: 100**

Note: Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module -1	**Marks**
Q.01	a	Illustrate with examples, Kirchhoff's laws as applied to an electric circuit.	8
	b	Prove that, the circuit efficiency during maximum power transfer from source to load is only 50%.	6
	c	The equation for an AC voltage is given as $V= 0.04\sin (2000t+60^{0}$ volts. Determine the frequency, angular frequency and instantaneous voltage when $t=160\mu s$.	6
		OR	
Q.02	a	Define R.M.S value of alternating current. Show that its value is proportional to maximum value.	8
	b	A circuit consisting of 12Ω, 18 Ω and 36 Ω respectively, joined in parallel, is connected in series with a fourth resistance. The whole is supplied at 60V and it is found that the power dissipated in 12 Ω resistance is 36 W. determine the value of fourth resistance and the total power dissipated in the group.	6
	c	Justify, why pure inductor does not consume any power when connected across single phase A.C. supply?	6
		Module-2	
Q. 03	a	Demonstrate that, two wattmeters are sufficient to measure power in a three phase balanced star connected circuit with the help of neat circuit diagram and phasor diagram.	8
	b	A circuit consists of a resistance of 20Ω, an inductance of 0.05H connected in series. A supply of 230V at 50 Hz is applied across the circuit. Determine the current, power factor and power consumed by the circuit.	6
	c	Deduce the relationship between the phase and the line voltages of a three phase star connected system.	6
		OR	
Q.04	a	Develop an equation for the power consumed by an R-L series circuit. Draw the waveforms of voltage, current and power.	8
	b	When a three phase balanced impedances are connected in star, across a three phase, 415V, 50Hz supply, the line current drawn is 20A, at a lagging p.f of 0.4. Determine the parameters of the impedance in each phase.	6
	c	A balanced 3 phase star connected system draws power from 440V supply. The two wattmeters connected indicate 5KW and 1.2 KW. Determine power, power factor and current in the circuit.	6
		Module-3	
Q. 05	a	Explain the principle of operation and construction of a dc generator.	8
	b	How back emf regulates the armature current in a D.C. Motor? Explain with relevant equations.	6

	c	A 4 pole, 1500 r.p.m. D.C. generator has a lap wound armature, having 32 slots and 8 conductors per slot. If the flux per pole is 0.04Wb, datermine the E.M.F. induced in the armature. What would be the E.M.F induced, if the winding is wave connected.	6
		OR	
Q. 06	a	Discuss various types of losses in a transformer.	8
	b	With usual notations, develop the torque equation of D.C. motor.	6
	c	A 250 KVA, 11000/415 volts, 50 Hz single phase transformer has 80 turns on the secondary. Calculate i) Rated primary and secondary currents ii) Number of primary turns iii) Maximum value of flux in the core iv) Voltage induced/turn on secondary.	6
		Module-4	
Q. 07	a	How rotating magnetic field is set up in case of three phase induction motor? Illustrate with neat figures.	8
	b	What is slip of an induction motor and derive expression for frequency of rotor current in terms of supply frequency.	6
	c	A 12 pole 3 phase alternator is coupled to an engine running at 500 rpm. It supplies an induction motor which has a full load speed of 1440 rpm. Determine the percentage slip and the number of poles of the motor.	6
		OR	
Q. 08	a	With neat sketches, explain the construction of two types of synchronous generator.	8
	b	Develop the E.M.F. equation of synchronous generator.	6
	c	A 12 pole, 500 rpm star connected alternator has 48 slots with 15 conductors per slot. The flux per pole is 0.02 Wb and is distributed sinusoidally. The winding factor is 0.97. Calculate the line e.m.f.	6
		Module-5	
Q. 09	a	What is electric power supply system? Draw a single line diagram of a typical a.c. power supply scheme.	8
	b	What are the desirable characteristics of a tariff and explain two part tariff.	6
	c	A consumer has a maximum demand of 200 kW at 40% load factor. If the tariff is Rs. 100 per kW of maximum demand plus 10aise per kWh, Find the overall cost per kWh.	6
		OR	
Q. 10	a	Explain the working principle of fuse and MCB.	6
	b	What is earthing? Why earthing is required? With the help of neat sketch, explain plate earthing.	8
	c	Write a short note on precautions against an electric shock.	6

15. 6
6
8

Basic Electrical Engg (21ELE23)   01/09/22.
CIE - III. (IA - III).

Scheme of Evaluation:

1. a) Statement & Explaination of KCL & KVL → 6M

b) Derivation $P_i/P_L = 0.5 = 50\%$ → 6M

c) $f = 320.102$ Hz → 3M
$V = 0.034$ Volts → 3M } → 6M.

2. a) Definition of R.M.S value → 1M
$I_{rms} = 0.707 I_m$ → 5M.

b)

c) Circuit diagram → 1M
Derivation $P = 0$ → 5M } → 6M

3. a) Circuit diagram → 1M
Phasor diagram → 2M
derivation $W_1 + W_2 = \sqrt{3} E_L I_L \cos\phi$ → $\boxed{3M}$

b) $X_L = 15.7\,\Omega$ → 1M
$Z = 25.42\,\Omega$ → 1M
$I = 9.04\,A$ → 1M } → 6M
$P.f = 0.786$ → 1M
$P = 1684.43$ → 2M

c) $I_L = I_{ph}$ → 1M
Circuit diagram → 1M } → 6M
Phasor — " — → 2M
Derivation $E_L = \sqrt{3} E_{ph}$ → 2M

4. a) Circuit diagram → 2M
Equations → $e = E_m \sin\omega t$
$i = I_m \sin(\omega t - \phi)$ } 2M } → 8M.
Derivation. $P = EI\cos\phi$. → 2M
Waveforms of e, i & P. → 2M

b) $V_{ph} = 239.6V$
$Z = 11.98V$ } each 1M.
$R = 4.79\,\Omega$

$L = 35\,mH$
$X_L = 10.98\,\Omega$ } → 3M

4.c) $P = 6.2 KW$ → 2M
$\cos\phi = 0.68$ → 2M } → 6M.
$I_L = 11.86A$ → 2M

5. a) Diagram → 3M
parts of D.C. Generator → 2M
Function of each part → 3M.

b) Explaination of back e.m.f } → 6M.
Equations → 3M.

c) $E_b = \frac{\phi Z N P}{60A} = 256V$ [Lap] } → 6M
$E = 512V$ [Wave].

6. a) Types of Losses — Iron losses < W_e, W_h
Copper losses } → 8M
Explaination (Each) → 4M × 2

b) Torque equation of a D.C. Motor.
Derivation $T_a = 0.159 \phi Z I_a \left(\frac{P}{A}\right)$.

c) $I_1 = 22.72A$
$I_2 = 602.40A$ } 2M
$N_1 = 2120$ → 2M } → 6M.
$\phi_m = 23 mWb$ → 1M
$E_2/N_2 = 5.18V$ → 1M

7. a) Rotating Magnetic Field → Circuit diagram → 2M
When $\phi = 0$, $\phi = 60^\circ$, $\phi = 120^\circ$, $\phi = 180^\circ$ } phasor diagram $\phi_m = 1.5\phi_m$. } → Each 1M × 4 = 4M
Explaination → 2M

b) Definition of Slip(s) → 1M
Derivation $f' = sf$ → 5M.

c) $f = 50Hz$
$N_s = 1500$ rpm } → 6M
$P = 22$
$\%S = 4\%$

8. a) Salient pole ⟶ Diagram → 2M] Each → 8M
Non Salient pole. Explaination → 2M.] 4M×2

b) EMF eqn of alternator (derivation) } → 6M.
$E_{ph} = 2.22 f Z K_p K_d$

c) $Z = 720$ → 2M
$\delta = 50.48$ → 2M } → 6M.
$E_l = 496.16\,V$ → 2M

9. a) Explaination of power supply systems. → 2M.
Single line diagram of typical a.c → 6M.
power supply scheme.

b) Characteristics of tariff → 3M] → 6M.
Explaination of 2 part tariff. → 3M]

c)

10. a) Working principle of Fuse } 3M×2 → 6M.
—"— —"— MCB }

b) Definition of Earthing → 2M
Necessity of Earthing → 2M } → 8M
Diagram of plate earthing → 2M
Explaination. → 2M

c) Precautions against shock (any 6 points) → 6M

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
SIRA ROAD, TUMKUR – 572 106

INTERNAL ASSESMENT TEST NO-1

Sub: Power Generation Economics **Subcode**: 18EE42
Sem: IV Sem **Date**: 27 /06/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 75 Minutes

1 a) Explain the general arrangement and operation of Hydraulic power plant. (CO1) [8M]
b)Define Hydrograph, Hydrology,Flow duration curve, Hydrological cycle. (CO1) [8M]
c)Explain the parameters for selection of site of hydel plant. (CO1) [4M]

OR

2 a)Explain Pelton and Francis turbine. (CO1) [10M]
. b) Explain merits and demerits of hydel plant. (CO1) [4M]
c) Discuss how hydro electric plants are classified according to available head. (CO1) [6M]

3 a) Draw and explain the schematic layout of a typical Thermal Power plant. (CO1) [10M]
b)Explain Pumped storage Plant. (CO1) [6M]
(c)Explain coal handling plant. (CO1) [4M]

OR

4 a)Give the comparsion of hydel and steam power plant. (CO1) [7M]
b)Explain the techniques of dust collection in thermal power plant. (CO1) [7M]
c)Explain Fluidised bed combustion. (CO1) [6M]

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
SIRA ROAD, TUMKUR – 572 106

INTERNAL ASSESMENT TEST NO-1

Sub: Power Generation Economics **Subcode**: 18EE42
Sem: IV Sem **Date**: 27 /06/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 75 Minutes

1 a) Explain the general arrangement and operation of Hydraulic power plant. (CO1) [8M]
b)Define Hydrograph, Hydrology,Flow duration curve, Hydrological cycle. (CO1) [8M]
c)Explain the parameters for selection of site of hydel plant. (CO1) [4M]

OR

2 a)Explain Pelton and Francis turbine. (CO1) [10M]
. b) Explain merits and demerits of hydel plant. (CO1) [4M]
c) Discuss how hydro electric plants are classified according to available head. (CO1) [6M]

3 a) Draw and explain the schematic layout of a typical Thermal Power plant. (CO1) [10M]
b)Explain Pumped storage Plant. (CO1) [6M]
(c)Explain coal handling plant. (CO1) [4M]

OR

4 a)Give the comparsion of hydel and steam power plant. (CO1) [7M]
b)Explain the techniques of dust collection in thermal power plant. (CO1) [7M]
c)Explain Fluidised bed combustion. (CO1) [6M]

Signature of staff

G. H. Rame
Signature of HOD

Course Title: Power Generation Economics Scheme & Solution **Course Code:** 18EE42

Question Number	Solution	Marks Allocated
1a)	Hydro power plant. Diagram Conversion of energy working.	4 8M. 4
b)	Hydrograph hydrology 2×4 Flow duration curve Mass curve.	8M
c)	Selection of site for Hydel plant. 4 points	4M
2) a)	pelton turbine Diagram 3 3 Francis turbine Working 2 2	5M 10M 5M
b)	Merits and Demerits of Hydel plant 4 points	4M
3)a)	Thermal power plant. Diagram. Conversion of energy working	5 10M. 5
b)	pumped Storage plant. Diagram 3 Working 3	6M.

Course Title: **Scheme & Solution** **Course Code:**

Question Number	Solution	Marks Allocated
2) a) 3) c	~~Ideal transformer.~~ Coal handling plant diagram 3M different parts explanation 3M	6M.
4) a)	Hydel plant | steam plant comparison 7 points	7M
b)	Dust collection in Thermal. Diagram 3 Mechanical and automatic systems 4	7M
c)	Fluidised bed combustion Diagram —3 M working —3M	6M

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
SIRA ROAD, TUMKUR – 572 106

INTERNAL ASSESMENT TEST NO-2

Sub: Power Generation Economics **Subcode:** 18EE42
Sem: IV Sem **Date:** 25 /07/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 75 Minutes

1 a) Explain the general arrangement and working of Disel power plant. **(CO2)** [8M]
b)Explain how thermal efficiency of gas plant can be increase. **(CO3)** [8M]
c)Explain simple gas turbine plant. (CO3) [4M]

OR

2 a)Explain CANDU Reactor. **(CO3)** [10M]
b)Explain Nuclear chain reaction process and shielding of plant. **(CO3)** [10M]

3 a) Draw and explain the schematic layout of a typical Nuclear Power plant. **(CO3)** [10M]
b)Explain Nuclear Reactor. **(CO3)** [5M]
(c)With a neat diagram explain pressurized **water** reactor. [5M]

OR

4 a)Explain the method of Radioactive waste disposal of nuclear plant. **(CO3)** [10M]
b)Explain Nuclear reaction and Fission process of Nuclear Plant. **(CO3)** [10M]

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
SIRA ROAD, TUMKUR – 572 106

INTERNAL ASSESMENT TEST NO-2

Sub: Power Generation Economics Subcode: 18EE42
Sem: IV Sem Date: 25 /07/2022
Max Marks: 40 Note: Answer any two full questions Duration: 75 Minutes

1 a) Explain the general arrangement and working of Disel power plant. (CO2) [8M]
b)Explain how thermal efficiency of gas plant can be increase. (CO3) [8M]
c)Explain simple gas turbine plant. (CO3) [4M]

OR

2 a)Explain CANDU Reactor. (CO3) [10M]
b)Explain Nuclear chain reaction process and shielding of plant. (CO3) [10M]

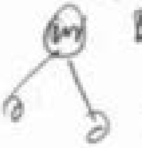
3 a) Draw and explain the schematic layout of a typical Nuclear Power plant. (CO3) [10M]
b)Explain Nuclear Reactor. (CO3) [5M]
(c)With a neat diagram explain pressurized water reactor. [5M]

OR

4 a)Explain the method of Radioactive waste disposal of nuclear plant. (CO3) [10M]
b)Explain Nuclear reaction and Fission process of Nuclear Plant. (CO3) [10M]

Power Generation Economics   18EE42

Test 2.

Question Number	Solution	Marks Allocated
1) a)	Diesel plant Diagram parts labelling. 4M Conversion of energy Working. 4M	8M
b)	Thermal efficiency of plant can be increase by Regeneration Reheating Intercooling Diagram 4M Working 4M	8M
c)	Gas turbine plant. Diagram parts labelling. 4M Working. 2M	6M
2) a)	CANDU Reactor Diagram 5 Working 5	10M
b)	Nuclear Chain reaction  Diagram 2M Splitting 3M	5M
	Shielding of plant necessity of importance points 5M 5×1	10M

Question Number	Solution	Marks Allocated
3) a)	Nuclear power plant Diagram parts labelling 5M Conversion of Energy working 5M	10M.
b)	Nuclear Reactor Diagram 2M theory 2M	5M.
c)	Pressurized water Reactor. Diagram 2M theory 2M	5M.
4) a)	Radioactive waste disposal of Nuclear Plant. Different methods 5x1M Cautions precautions Measurements 5x1M	10 M
b)	Nuclear Reactions Fission 5M Defn how uranium Split Fussion 5M force, Creation of heat energy. and conversion	10M

SHRIDEVI INSTITUTE OF ENGINEEINRG AND TECHNOLOGY

SIRA ROAD, TUMKUR – 572106

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

THIRD INTERNAL ASSESSMENT TEST

COURSE CODE: 18EE42 **COURSE NAME: PGE**
SEMESTER : IV **MAX MARKS : 100**

Answer any five full Questions, choosing one full question from each module

Module-1

1 (a) Explain the general arrangement and operation of Hydraulic power plant. (8 Marks)
(b)Define Hydrograph, Hydrology, Flow duration curve, Hydrological cycle. (6 Marks)
(c)Explain Pelton ans Francis turbine. (6Marks)

OR

2(a) Explain merits and demerits of hydel plant. (6 Marks)
(b) Discuss how hydro electric plants are classified according to available head (8 Marks)
(c) Explain the parameters for selection of site of hydel plant (6 Marks)

Module-2

3(a) Draw and explain the schematic layout of a typical Thermal Power plant (6 Marks)
(b) Explain simple gas turbine plant (6Marks)
(c) List the difference between open loop and closed loop gas plant (6 Marks)

OR

4(a) Draw and explain the schematic layout of a typical diesel Power plant (8 Marks)
(b) Explain the method of improving thermal efficiency of gas plant (6 Marks)
(c)List advantages and disadvantages of diesel plant (6 Marks)

Module-3

5(a)With a neat diagram explain nuclear reactor (6 Marks)
(b) Explain the construction and working of a pressurized water reactor (6Marks)
(c) Mention the factors to be considered for selecting the site of nuclear plant (6 Marks)

OR

6(a) Draw and explain the schematic layout of a typical nuclear Power plant (8 Marks)
(b) Explain the fission and fusion processes (6 Marks)
(c) Explain the method of disposing nuclear waste (6 Marks)

Module-4

7(a) Define substation and explain single line diagramof substation. (8Marks)

(b) Explain neutral grounding system. (6Marks)

(c) Explain the functions of transformer, circuit breaker, insulator, and isolator switch (6 Marks)

OR

8(a)Explain double bus bar with sectionalizers. (8 Marks)

(b) Explain gas insulated substation and its advantages (6 Marks)

(c) Explain earthing transformer with neat diagram (6 Marks)

Module-5

9(a)Define tariff and explain different types of tariff (6 Marks)

(b) Explain the method of improving power factors (8 Marks)

(c)Derive the economical power factor when KW demand is constant (6 Marks)

OR

10(a) List the parameters for causes of low Power factor. (10Marks)

(b) The daily load of an industrial consumer is as follows :

100kw for 9 hours,125 kw for 6 hours,50 kw for 7 hours and 5 kw for 2 hours .The tariff rate is Rs.800 per kw of maximum demand per year plus Rs.2.50 per kwh.Determine the energy consumption per year(365 days) and yearly bill (10Marks)

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: PGC **Scheme & Solution** **Course Code:** 18EE42

Question Number	Solution	Marks Allocated
1 a)	Hydro power plant diagram 4M Construction working 4M	8M
b)	Hydrograph 2M Hydrology 2M flowduration curve. 1M hydrological cycle 1M	6M
c	pelton turbine -3M -diagram working Francis turbine -3M diagram working	6M.
2) a)	Merits 3 points 3M demerits 3 points 3M	6M.
b).	classification Low Medium High heads. diagram 4M theory 4M	8M.
c)	site of hydel plant. 6 points	6M
3) a)	Thermal power plant diagram 4M working 4M	8M
b)	Simple gas turbine plant Diagram 3M working 3M	6M
c)	open loop | closed loop. difference 6 points	6M

Question Number	Solution	Marks Allocated
4)a)	Diesel power plant diagram 4 Working Principle 4	8M
b)	Improving Thermal η of gas plant. Reheating 2 Regeneration 2 Inter 2	6M
c)	Merits and demerits 3M 3M 3 or 4 points	6M.
or		
5) a)	Nuclear Reactor. Diagram 4 Working. 4	8M.
	pressurized water reactor. diagram 3M Theory 3M	6M.
	Site of Nuclear plant. 6points	6M.
5) a)	Nuclear power plant diagram 4 Working 4	8M
b).	fission and fussion process. Definition 3M 3M	6M
c)	Disposing of Nuclear waste	

Question Number	Solution	Marks Allocated
7) a)	substation definition 2M. single line diagram – 4M theory – 2M	8M
b)	Neutral grounding systems Diagram 3M Grounding system methods	6M
c)	Transformer Circuit Breaker Insulator. Isolator switch 3×2M	6M.
8) a)	Double Bus Bar. sectionalized diagram. 5M theory 3M	8M.
b)	Gas Insulated substation working. 4 Advantages 2	6M.
c)	Earthing Transformer diagram 3 Theory. 3	6M.
9) a)	Tarriff. Definition 3M types Block rate 3M Single rate	6M
b)	Improving pf static Capacitor diagram 2 working 2 synchronous Condensor diagram 2 working 2	4M 8M 4M

Question Number	Solution	Marks Allocated
10) a)	Causes of Low P.f. 10 points with ex needed.	10 M.
b)	Daily Energy Consumption 10×9 + 12.5×6 + 50×7 + 5a 2010 kWh. 2M Annual energy Consumption 2010 × 365 733,650 kWh. 2M MD = 125 kW. Demand charges per annum = 100,000 2M Energy Charges per ann = Rs 34,125 2M Yearly bill = 2,834,125 2M	10M

Shridevi Institute of Engineering and Technology, Tumkur -06
Department of Electrical and Electronics

SHRIDEVI

INTERNAL ASSESSMENT – I

Sub: Elctric motors
Sem: IV sem
Max Marks: 40

Sub code: 18EE44
Date: 29/06/22
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)**

Shridevi Institute of Engineering and Technology, Tumkur -06
Department of Electrical and Electronics

SHRIDEVI

INTERNAL ASSESSMENT – I

Sub: Elctric motors
Sem: IV sem
Max Marks: 40

Sub code: 18EE44
Date: 29/06/22
Duration: 90 Minutes

Note: Answer any two full questions

MODULE-I

. 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)**

Internal Assessment – I 29/06/22

Electric Motors (18EE44)

Scheme of Evaluation

1. a) Torque equation of a D.C. Motor

Derivation $T_a = 0.159 \phi Z I_a \left(\frac{P}{A}\right) \longrightarrow 6M.$

b) Applications of DC Series Motors

" " " Shunt "

" " " compound Motors } each 2M → 6M.

c) $I_{sh} = 2.2 A.$

$I_a = 19.8 A$

$E_b = 210.1 V$

$N = 2101$ rpm

$T_a = 18.907$ Nm } → 8M

2. a) power flow diagram → 4M

Condition for Maximum efficiency Derivation

Variable losses = Constant losses. } → $\boxed{4M}$

b) Characteristics of DC Shunt Motor :

Ta/Ia characteristics

N/Ia —— " ——

N/Ta —— " —— } → 6M

c) Losses in DC Motor :

Copper losses < Stator cu losses, Rotor " "

Iron Losses

Mechanical Losses – Stray losses, Friction & windage losses } 6M

3. a) Three point Starter →

Figure → 4M

Construction → 3M

working → 3M

b) Flux control Method :-

Circuit diagram & working } 5M

Potential divider Control Method

Circuit diagram & working } 5M.

4. a) Ward Leonard Method.

Circuit diagram → 4M.
working → 6M.

b) $$\left.\begin{array}{l} I_{sh1} = 0.92A. \\ E_{b1} = 222.5V \\ E_{b2} = 218V \\ I_{sh2} = 0.721A. \\ R_x = 69\Omega \end{array}\right\} \rightarrow \text{Each 2M} \quad \boxed{10M}.$$

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering

ELECTRIC MOTORS (18EE44)
SECOND-INTERNALS

IV Semester **Duration:90Minutes**
Max Marks: 40 **Date:06.08.2022**

Note: Answer any two full questions

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 and calculate the efficiency of the machines as a generator and motor. **10M (CO2)**

b) Hopkinson's test on two machines gave the following results for full load: Line voltage= 250V, 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)**

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) A test on two coupled tram way motors with their field connected in series gave the following results when one machine acted as a motor and the other as a generator. **Motor:** Armature current=56A, Armature voltage=590V, voltage drop across field winding=40V. **Generator:** Armature current=44A, Armature voltage=400V, voltage drop across field winding=40V. Resistance of each armature=0.3Ω. Calculate the efficiency of the motor and generator at this field. **10M (CO2)**

IA - II

Electric Motors (18EE44) 06.08.22

Scheme of Evaluation

1. a) Torque slip characteristics of 3-ϕ I.M.

Graph of Torque-slip Characteristics. → $\boxed{3M}$

Regions of torque-slip characteristics showing generating, Motoring & braking regions. (when $S \geq 1$, $0 \leq S \leq 1$, $S < 0$). } → $\boxed{4M}$

Explaination. → $\boxed{3M}$

b) Field Test :

Circuit diagram → 3M

working → 3M

Calculation of η. → 4M.

2. a) Back to back test (Hopkinson's test).

Circuit diagram. → 3M

Explaination. → 3M

Calculation of η as a generator & Motor → 4M.

b) For Generator.

Arm cu loss = 2178W

Field cu loss = 1250W

Total loss = 7145W

Gen o/p = 82500W

Gen I/p = 89645W

%ηg = 92.02%

→ $\boxed{5M}$

For Motor.

Arm. cu loss = 2888 W

Field cu loss = 1050 W

Total loss = 7655W

Motor I/p = 96050W

Motor o/p = 88395 W

%ηm = 92.03 % → $\boxed{5M}$

3. a) Definition of slip → $\boxed{1M}$

Derivation of Torque equation, $T = \dfrac{SE_2^2 R_2}{R_2^2 + (SX_2)^2}$ Nm → $\boxed{6M}$

Condition for η_{max} a variable losses = constant losses. → $\boxed{3M}$

b) Swinburn's Test :-

Circuit diagram → 2M

working. → 2M

Calculation of efficiency → 2M

Advantages → 2M
Disadvantages → 2M

4.a) $N_s = 1500$ rpm.
$K = 57.735$ V
i) $S = 1$.
$T_{st} = 63.03$ Nm
ii) $S_m = 10\%$.
iii) $N = 1350$ rpm.
iv) $T_m = 318.16$ N-m
v) $T_{fl} = 219.52$ N-m.

each 2M.

2M x 5

= 10M.

4. b)

Total I/P = 35280 W
O/P = 17600 W
Total losses = 17680 W
Total cu losses = 6001.06 W
Stray losses/m/c = 5839.47 W
→ 3M

For Motor : Motor I/P = 33040 W
Arm. cu loss = 3180.58 W
Total losses = 9020 W
Motor O/P = 24020 W
$\eta_m = 72.69\%$
→ 3M

For generator :- Arm. cu Loss = 580.8 W
Field cu loss = 2240 W.
Total losses = 8660.27 W.
Gen O/P = 17600 W
Gen I/P = 26260.27 W
$\eta_g = 67.02\%$
→ 4M

→ 10M.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
Department of Electrical & Electronics Engineering

CONTROL SYSTEMS -18EE61
INTERNAL ASSEESSMENT TEST -I

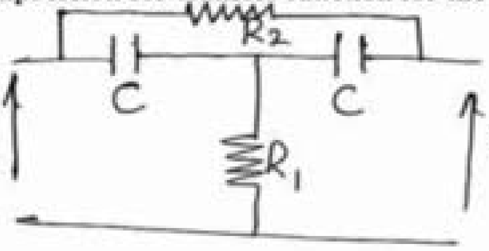
Max Marks: 40 **Date:** 20-05-2022
Semester: VI **Duration:** 90 Minutes

NOTE: Answer any *two* full questions choosing one question each part

PART A

1. a) Define and compare open loop control system with closed loop control system with an example (06Marks)

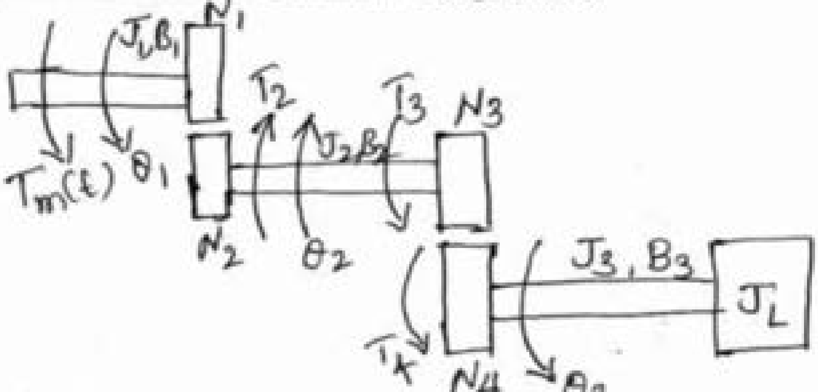
b) Obtain the expression for transfer function for the n/w shown. (06Marks)



c) Derive an expression for the TF of an field controlled DC motor and also construct the block diagram of DC motor. (08Marks)

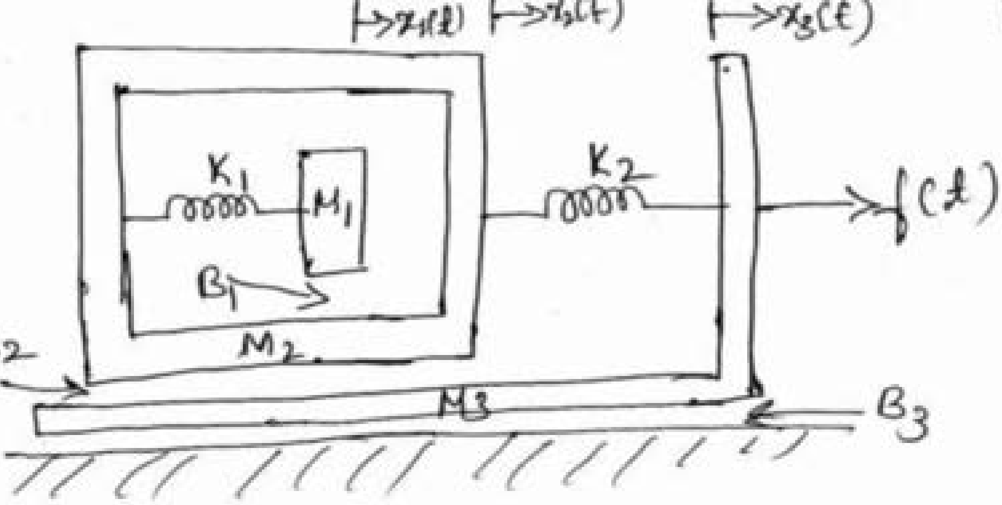
OR

2. a) Write the differential equation of the gear train system shown in fig . The moment of inertia of the gear and shafts are J1, J2 & J3. T(t) is the applied torque, N denotes the number of gear teeth. Assume K=∞ for all shafts (rigid Shaft). (08Marks)



b) For the mechanical system shown in Fig below. Write
i) The mechanical network ii) The equation of motion and
(iii) The F-I analogous electric circuit

(06Marks)

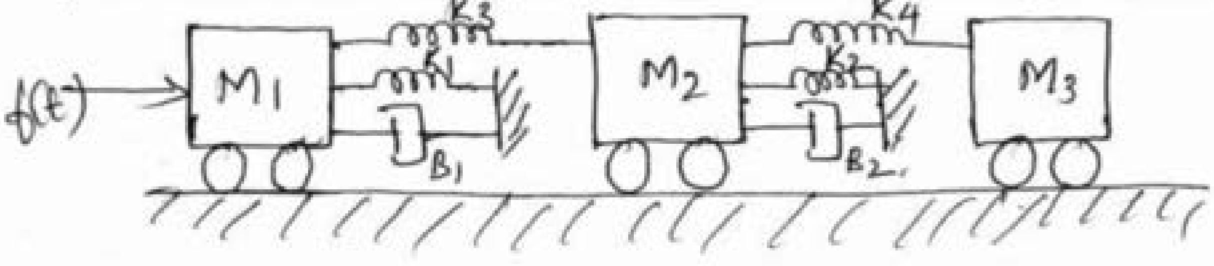


c) What are the properties of good control system? — 6M

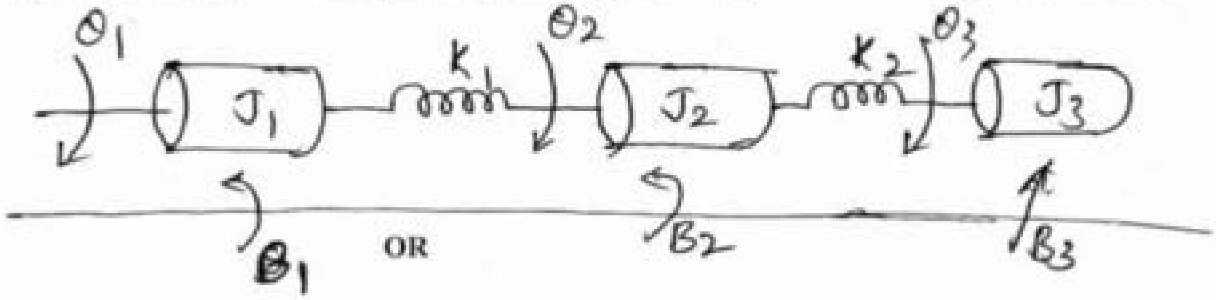
PART B

3. a) Obtain the transfer function of the AC Servomotor also construct the block diagram. **(08 Marks)**

b) Draw the mechanical network for the system shown in fig. write the equation of performance and derive the analogous circuit based on force voltage analogy . **(06 Marks)**



c) Obtain the differential equation describing the system shown in fig and also sketch the electrical circuit based on i) Torque voltage analogy ii) Torque current analogy **(06 Marks)**



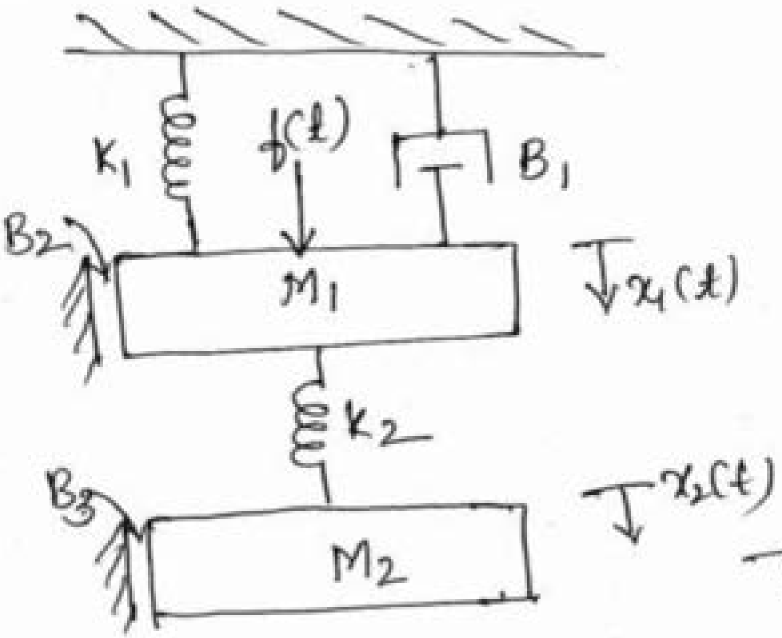
4. a) Define servomotor. Compare AC servomotor and DC servomotor **(06 Marks)**

b) Derive an expression for the TF of an armature controlled DC motor and also construct the block diagram of DC motor. **(08 Marks)**

c) A mechanical system is shown in fig

i) Obtain the performance equation

ii) Draw the electrical analogy based on force current analogy

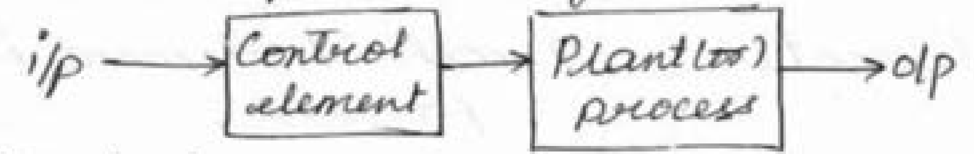


18EE61: Control System

Internal-Assessment-01

1·A Define and compare open loop control systems with closed loop control system with an example.

=> i) Open loop Control system:-

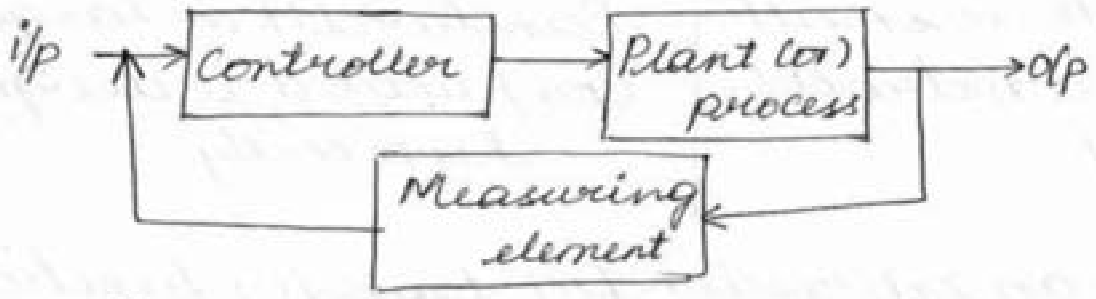


(2M)

Open loop control system is the one in which the control action is independent of the o/p. The o/p does not affect the control action.

Ex:- Iron Box, Traffic Control, Washing m/c.

ii) Closed loop Control system:-



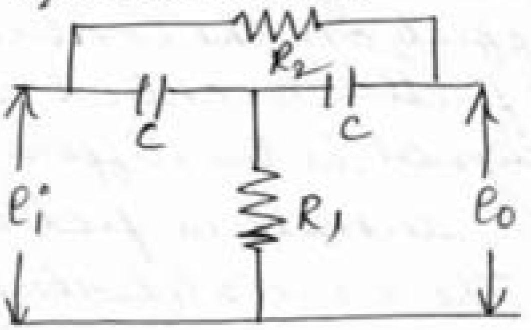
A Closed loop control system is one in which o/p signal has a direct effect on the control action i.e closed loop system (or) feedback control system.

(2M)

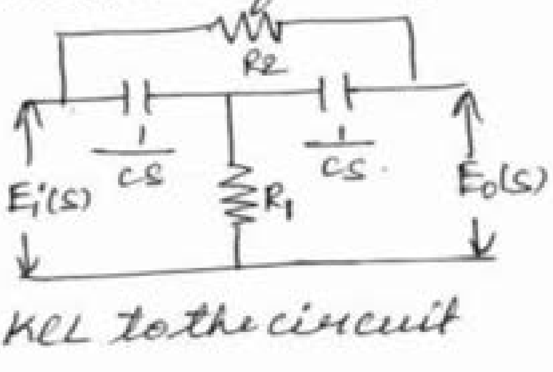
The actual error signal is the difference b/w i/p signal & the feedback signal is fed to the controller so as to reduce the error & bring the o/p of the system to a desired value.

Open-loop	Closed-loop
1. Any change in o/p has no effect on the i/p	Change in o/p affects the i/p which is possible by the use of feedback.
2. O/p measurement is not recquired for operation of system	O/p measurement is necessary.
3. Feedback element is absent	Feedback element is present. — (2M)
4. Error detector is absent	Error detector is necessary.
5. It is inaccurate & unreliable	Highly accurate & reliable
6. Highly sensitive to disturbances	less sensitive to disturbances.
7. Bandwidth is small	Bandwidth is large.
8. Simple to construct & cheap	Complicated to design & hence costly.

1.B) Obtain an expression for transfer function for the n/w shown.



⇒ By Laplace Transform,



— (1M)

Apply KCL to the circuit

$$\frac{E_1(s)-E_i(s)}{\left(\frac{1}{cs}\right)}+\frac{E_1(s)}{R_1}+\frac{E_1(s)-E_0(s)}{\left(\frac{1}{cs}\right)}=0$$

$$CSE_1(S)-CSE_i(s)+\frac{E_1(s)}{R_1}+CSE_1(S)-CSE_0(S)=0$$

$$E_1(s)\left[cs+\frac{1}{R_1}+cs\right]-CSE_0(s)=CSE_i(s) \quad — ①$$ — 1M

$$E_1(s)\left[2CS+\frac{1}{R_1}\right]-CSE_0(s)=CSE_i(s) \quad — ②$$

Apply KCL to the o/p node,

$$\frac{E_0(s)-E_i(s)}{\frac{1}{cs}}+\frac{E_0(s)-E_i(s)}{R}=0$$

$$cSE_0(s)-CSE_1(s)+\frac{E_0(s)}{R}-\frac{E_i(s)}{R}=0$$

$$E_0(s)\left[cs+\frac{1}{R}\right]-CSE_1(s)=\frac{1}{R}E_i(s) \quad — ③$$ — 1M

By matrix method.

$$\begin{bmatrix} 2CS+\frac{1}{R_1} & -CS \\ -CS & CS+\frac{1}{R} \end{bmatrix}\begin{bmatrix} E_1(s) \\ E_0(s) \end{bmatrix}=\begin{bmatrix} CS\,E_i(s) \\ \frac{1}{R_2}E_i(s) \end{bmatrix}$$

$$E_0(s)=\frac{\begin{vmatrix} 2CS+\frac{1}{R_1} & CSE_i(s) \\ -CS & \frac{1}{R_2}E_i(s) \end{vmatrix}}{\begin{matrix} 2CS+\frac{1}{R_1} & -CS \\ -CS & CS+\frac{1}{R} \end{matrix}}$$ — 1M

Num: $\left(2CS+\frac{1}{R_1}\right)\left(\frac{1}{R_2}E_i(s)\right)-\left(CSE_i(s)\right)(-CS)=0$

$$\frac{2CS}{R_2}E_i(s)+\frac{1}{R_1R_2}E_i(s)+C^2S^2E_i(s)=0$$

$$E_i(s)\left[\frac{2CS}{R_2}+\frac{1}{R_1R_2}+C^2S^2\right]$$ — 1M

Deno: $\left(2CS+\frac{1}{R}\right)\left(CS+\frac{1}{R}\right)-(-CS)(-CS)$

$$2C^2S^2+\frac{2CS}{R}+\frac{CS}{R}+\left(\frac{1}{R}\right)^2-C^2S^2$$

$$E_o(s)=\frac{\left[\frac{2CS}{R_2}+\frac{1}{R_1R_2}+C^2S^2\right]E_i(s)}{2C^2S^2+\frac{2CS}{R}+\frac{CS}{R}+\frac{1}{R^2}-C^2S^2}$$

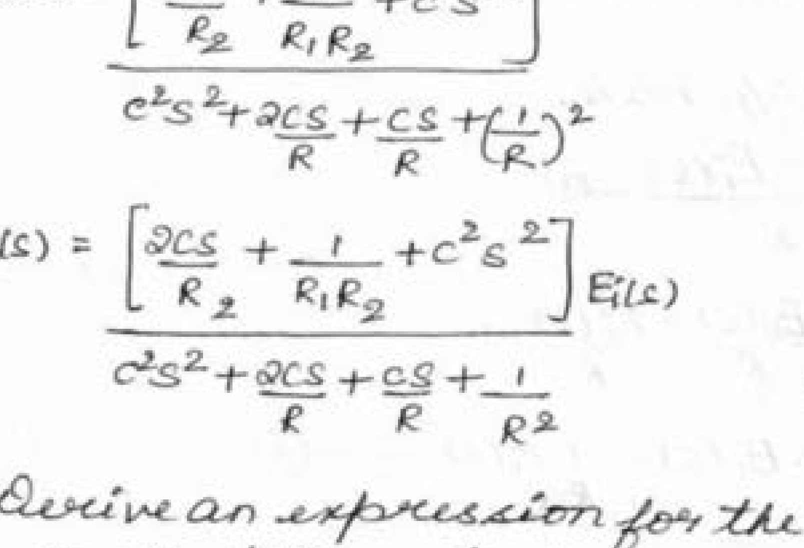
$$E_o(s)=\frac{\left[\frac{2CS}{R_2}+\frac{1}{R_1R_2}+c^2S^2\right]}{c^2S^2+\frac{2CS}{R}+\frac{CS}{R}+\left(\frac{1}{R}\right)^2}$$

$$E_o(s)=\frac{\left[\frac{2CS}{R_2}+\frac{1}{R_1R_2}+c^2s^2\right]E_i(s)}{c^2S^2+\frac{2CS}{R}+\frac{CS}{R}+\frac{1}{R^2}}$$

1M

1.c) Derive an expression for the TF of an field controlled DC motor & also construct the block diagram of DC motor.

⇒



1M

Let R_f be the field winding resistance in ohm.

L_f → field winding inductance in henry.

I_f → field current in Amps

e_f → be the field control vtg.

Tm → Torque developed by motor in N-m

J → Equivalent moment of inertia of motioning kg-m

B → Equivalent viscous friction co-efficient of motor & load referred to motor shaft in N-m/rad-sec.

1M

WKT, $\phi \propto I_f$

where ϕ is air gap flux

$\phi = K_f I_f$ — ① 1M

Where K_f = constant

The torque developed by motor is proportional to product of i_a & ϕ.

$T_m = i_a \phi$

$T_m = i_a K_f I_f$

$T_m = i_a K_f I_f K_1$

$T_m = K_1 K_f i_a I_f$

$T_m = K_1' I_f$ — ② where $K_1' = K_1 K_f I_a$. 1M

Here i_a is constant & also K_1' is constant apply KVL to field loop.

$e_f = R_f i_f + L_f \frac{di_f}{dt}$ — ③ 1M

Torque eq^n is given by,

$$J \cdot \frac{d^2\theta}{dt^2} + B \cdot \frac{d\theta}{dt} = T_m$$

$J \cdot \frac{d^2\theta}{dt^2} + B \cdot \frac{d\theta}{dt} = K_1' i_f$ — ④

By taking Laplace tranfoom of eq^n ③ & ④ we get,

$I_f(s) R_f + S L_f I_f(s) = E_f(s)$ — ⑤ 1M

$JS^2\theta(s) + BS\theta(s) = T_m(s) = K_1' I_f(s)$ — ⑥

$$\theta(s)[JS^2 + BS] = K_1' I_f(s)$$

$$\theta(s) = \frac{K_1' I_f(s)}{JS^2 + BS} \qquad I_f(s) = \frac{\theta(s)[JS^2 + BS]}{K_1'}$$

Consider eq^n ⑤:

$I_f(s)[R_f + SL_f] = E_f(s)$ — ⑦

Substitute $I_f(s)$ in ⑦

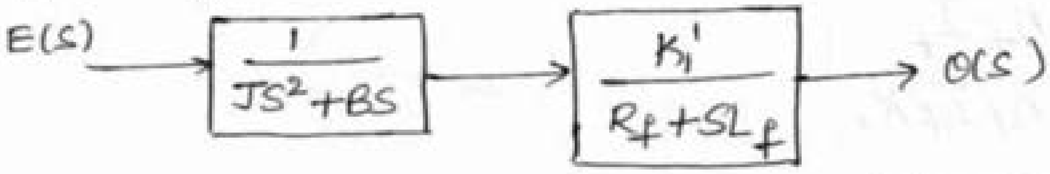
$$E_f(s) = \frac{\theta(s)[JS^2 + BS]}{K_1'}[R_f + SL_f]$$

1M

$$G(s) = \frac{\theta(s)}{E_f(s)}$$

$$\boxed{G(s) = \frac{K_1'}{(JS^2+BS)(R_1+SL_1)}}$$

Block diagram representation of the above eqⁿ is given by:-

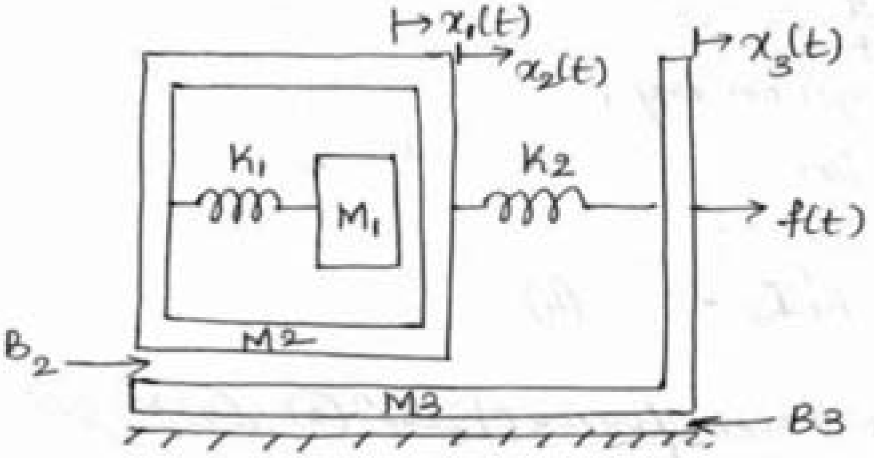


— (1M)

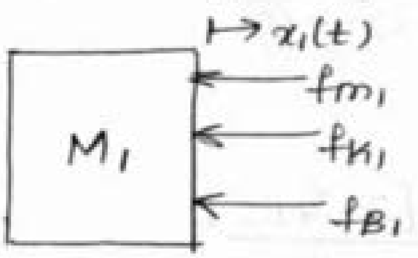
2B. For the mechanical system shown in fig below. Write i) The mechanical networks

ii) The eqⁿ of motion and

iii) The F-I Analogous electric circuit.



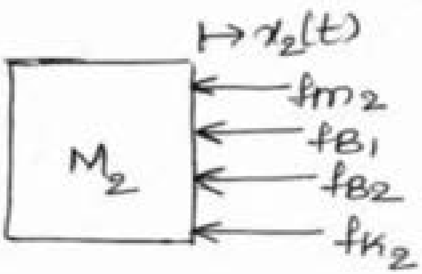
=> Free Body Diagram:-



$$f_{m_1} + f_{K_1} + f_{B_1} = 0$$

$$M_1\frac{d^2x_1}{dt^2} + K_1(x_1-x_2) + B_1\left(\frac{dx_1}{dt} - \frac{dx_2}{dt}\right) = 0$$

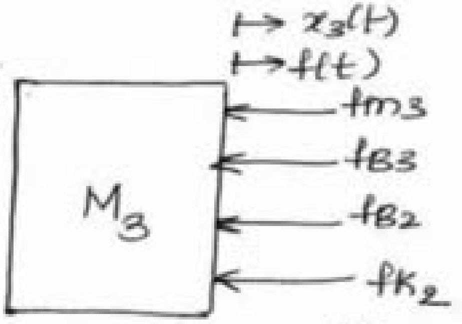
$$M_1\ddot{X}_1 + K_1(X_1 - X_2) + B_1(\dot{X}_1 - \dot{X}_2) = 0$$



$$f_{m_2} + f_{B_1} + f_{B_2} + f_{K_2} = 0$$

$$M_2 \cdot \frac{d^2x_2}{dt^2} + B_1\left(\frac{dx_2}{dt} - \frac{dx_1}{dt}\right) + B_2\left(\frac{dx_2}{dt} - \frac{dx_3}{dt}\right) + K(x_2 - x_3) + K_1(x_2 - x_1) = 0$$

$$\therefore M_2\ddot{X}_2 + B_1(\dot{X}_2 - \dot{X}_1) + B_2(\dot{X}_2 - \dot{X}_3) + K(X_2 - X_3) + K_1(X_2 - X_1) = 0$$



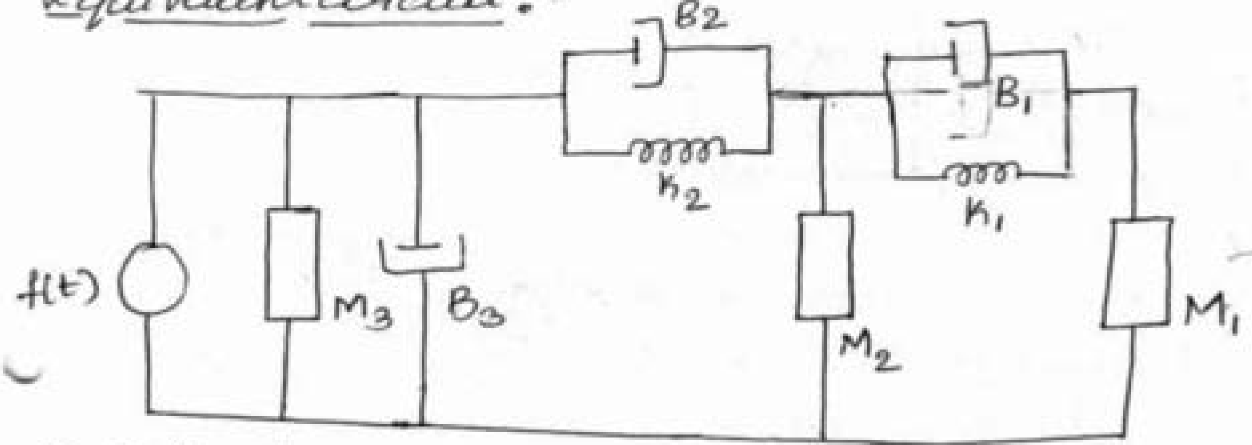
$$f(t) = fm_3 + fB_3 + fB_2 + fk_2$$

$$f(t) = M_3 \cdot \frac{d^2x_3}{dt^2} + B_3 \frac{dx_3}{dt} + B_2\left(\frac{dx_3}{dt} - \frac{dx_2}{dt}\right) + K_2(x_2 - x_3)$$

$$\therefore f(t) = M_3 \ddot{X}_3 + B_3 \dot{X}_3 + B_2(\dot{X}_3 - \dot{X}_2) + K_2(X_2 - X_3)$$

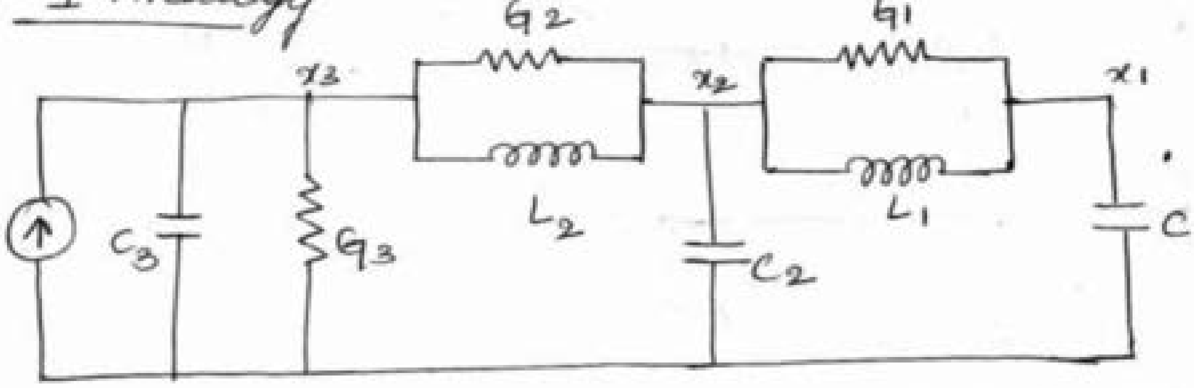
2M

Equivalent circuit :-



2M

F-I Analogy



2M

2c) What are the properties of good control system ?

→ * A good control system is the system with high speed of response.
- * steady state error must be less.
- * Bandwidth should be large.
- * Noise must be very low.
- * sensitive to parametric variations

6M

3. A) Obtain the transfer function of the AC servomotor & also construct the block diagram.

⑥

⇒ Transfer function of AC servomotor:

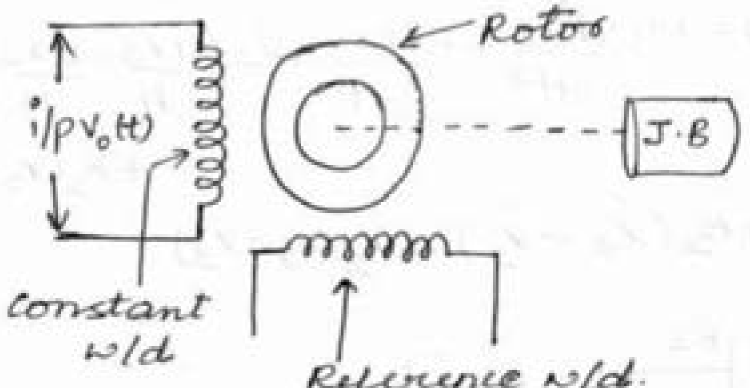
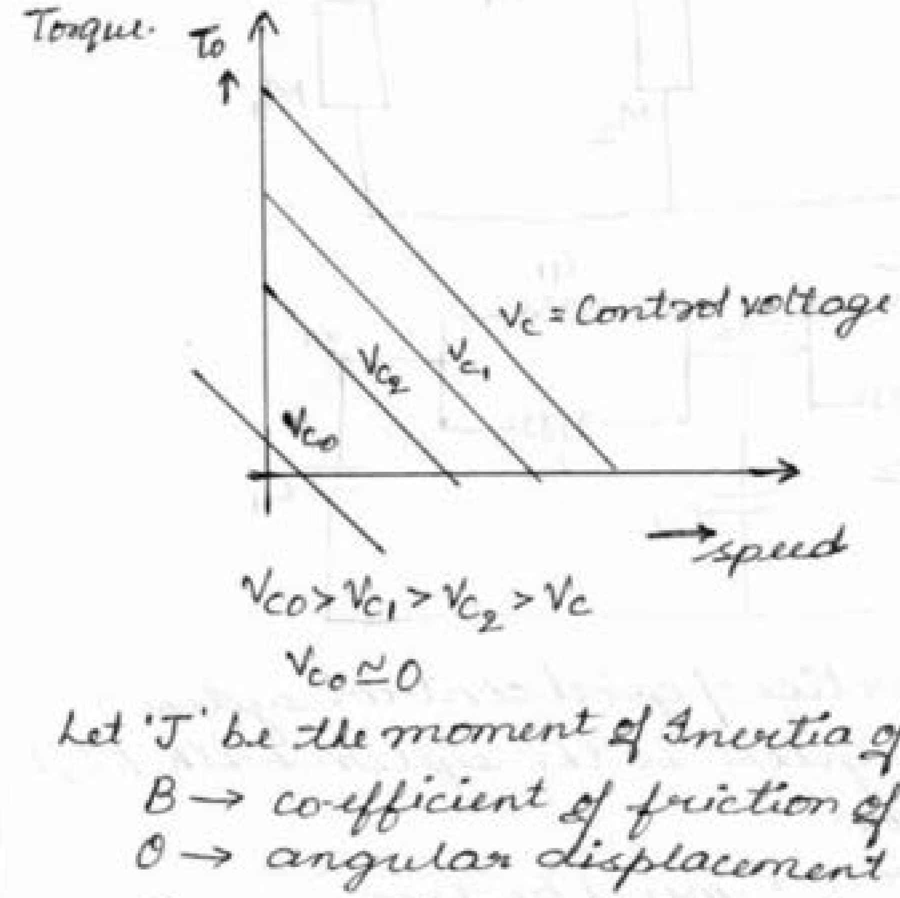


Fig: AC servomotor

Torque-speed characteristics curve.



$V_{c0} > V_{c1} > V_{c2} > V_c$

$V_{c0} \simeq 0$

1M

Let 'J' be the moment of Inertia of motor shaft.

B → co-efficient of friction of motor shaft

θ → angular displacement of motor shaft

w → angular velocity $= \frac{d\theta}{dt}$ — 1M

For due Torque-speed characteristics. The torque equation is given by,

$T_m = M\omega + KV_c$ (∵ The eq^n of straight line $y = mx + c$) $\longrightarrow ①$

where m is the slope & K is a constant.

Evaluate from the above eq^n m & K.

Let us assume ω_0 → be the no-load speed &

T_0 → stalling torque (Torque @ '0' speed)

Put $w=0$, then T_m = becomes T_0.

$$\boxed{\omega=0\ ,\ T_m=T_0}$$

$$T_0 = KV_c$$

$$K = \frac{T_0}{V_c} \quad —— ②$$ ——— 1M

From, Torque-speed characteristics due the slope m is given by,

$$m = \frac{-T_0}{\omega} \quad \text{but w.K.T} \quad \omega = \frac{d\theta}{dt}$$

eqⁿ ① becomes,

$$T_m = m\cdot\frac{d\theta}{dt} + KV_c \quad —— ③$$

$$T_m = J\cdot\frac{d^2\theta}{dt^2} + B\cdot\frac{d\theta}{dt} \quad —— ④$$ —— 1M

Taking Laplace transform of eqⁿ ③ & ④ & substituting zero initial condition.

$$T_m(s) = m\cdot s\theta(s) + KV_c(s) \quad —— ⑤$$

$$T_m(s) = Js^2\theta(s) + Bs\theta(s) \quad —— ⑥$$

$$\theta(s) = \frac{T_m(s)}{(Js^2+Bs)} \quad —— ⑦$$ —— 1M

substitute ⑦ in ⑤

$$T_m(s) = ms\frac{T_m(s)}{(Js^2+Bs)} + KV_c(s)$$

$$T_m(s)\left[1-\frac{ms}{Js^2+Bs}\right] = KV_c(s)$$

$$V_c(s) = \frac{T_m(s)\left[1-\frac{ms}{Js^2+Bs}\right]}{K}$$ —— 1M

$$G(s) = \frac{\theta(s)}{V_c(s)}$$

$$= \frac{\frac{T_m(s)}{(Js^2+Bs)}}{\frac{\left(1-\frac{ms}{Js^2+Bs}\right)T_m(s)}{K}} = \frac{K}{(Js^2+Bs)\left[\frac{Js^2+Bs-ms}{Js^2+Bs}\right]}$$

$$G(s) = \frac{K}{JS^2+BS-mS}$$

$$\boxed{G(s) = \frac{K}{JS^2+s(B-m)}}$$

Divide nr & Dr by B-m in above eqⁿ

we get, $\frac{\theta(s)}{V_c(s)} = \frac{\frac{K}{B-m}}{\left[\frac{JS^2}{(B-m)}+S\right]} = \frac{\frac{K}{(B-m)}}{S\left[1+\frac{JS}{B-m}\right]}$

$$= \frac{\frac{K}{(B-m)}}{S\left[1+S\cdot\frac{J}{B-m}\right]}$$

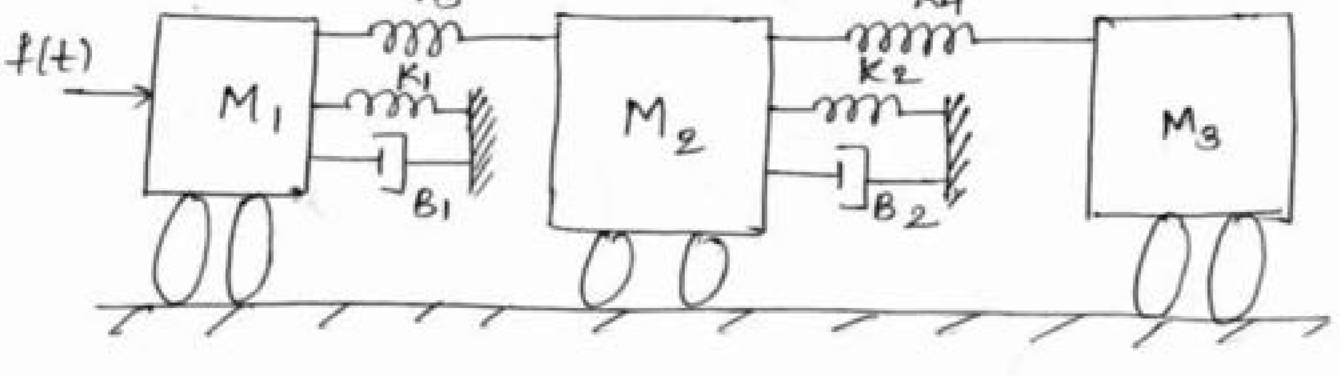
$$\boxed{\frac{\theta(s)}{V_c(s)} = \frac{Km}{S(1+ST_m)}}$$

1M

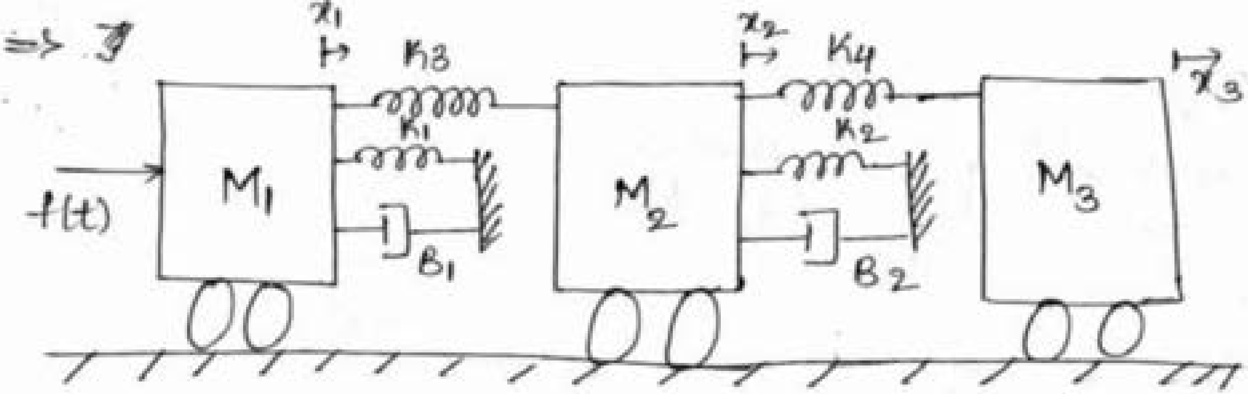
where: $K_m = \frac{K}{B-m}$ motor gain constant

$T_m = \frac{J}{B-m}$ motor time constant

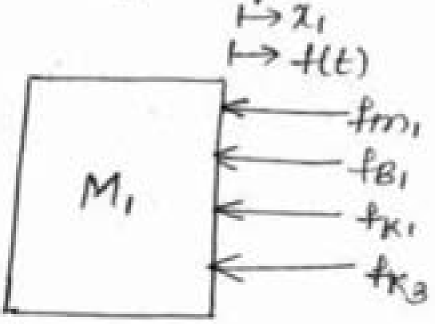
3B.) Draw the mechanical n/w for the system shown in fig. Write the eqⁿ of performance & derive the analogous circuit based on force voltage analogy.



⇒ 3



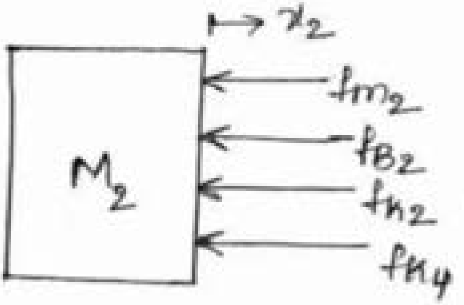
Free body diagram:-



$$f(t) = f_{m_1} + f_{B_1} + f_{K_1} + f_{K_3}$$

$$= M_1 \frac{d^2x_1}{dt^2} + B\frac{dx_1}{dt} + K_1x_1 + K_3(x_1 - x_2)$$

$$f(t) = M_1\ddot{x}_1 + B_1\dot{x}_1 + K_1x_1 + K_3(x_1 - x_2)$$

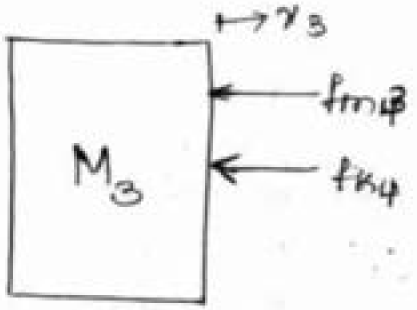


$$f_{m_2} + f_{B_2} + f_{K_2} + f_{K_4} = 0$$

$$M_2 \cdot \frac{d^2x_2}{dt^2} + B_2\frac{dx_2}{dt} + K_2x_2 + K_4(x_2 - x_3) = 0$$

$$M_2\ddot{x}_2 + B_2\dot{x}_2 + K_2x_2 + K_4(x_2 - x_3) = 0.$$

— 2M

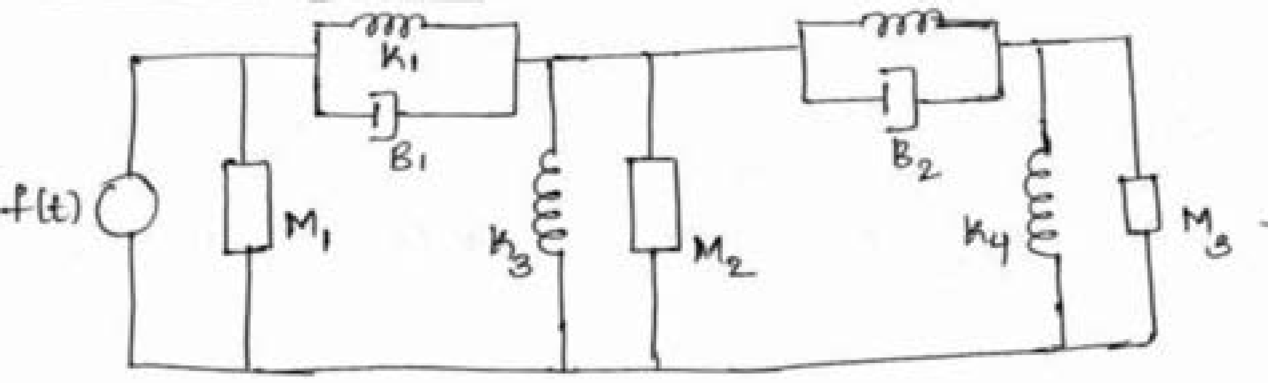


$$f_{m_3} + f_{K_4} = 0$$

$$M_3 \cdot \frac{d^2x_3}{dt^2} + K_4(x_3 - x_2) = 0$$

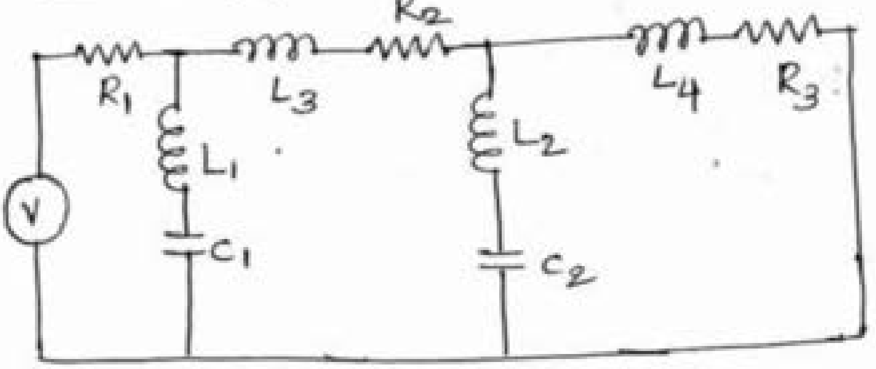
$$M_3\ddot{x}_3 + K_4(x_3 - x_2) = 0$$

Equivalent circuit:-



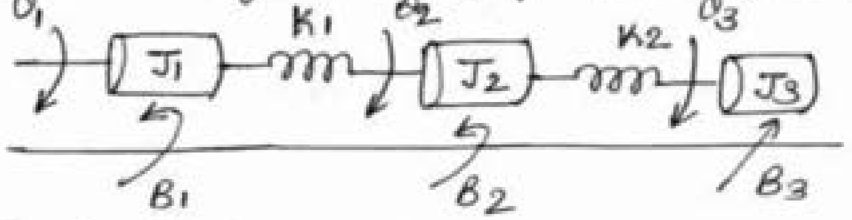
— 2M

F-V Analogy:-

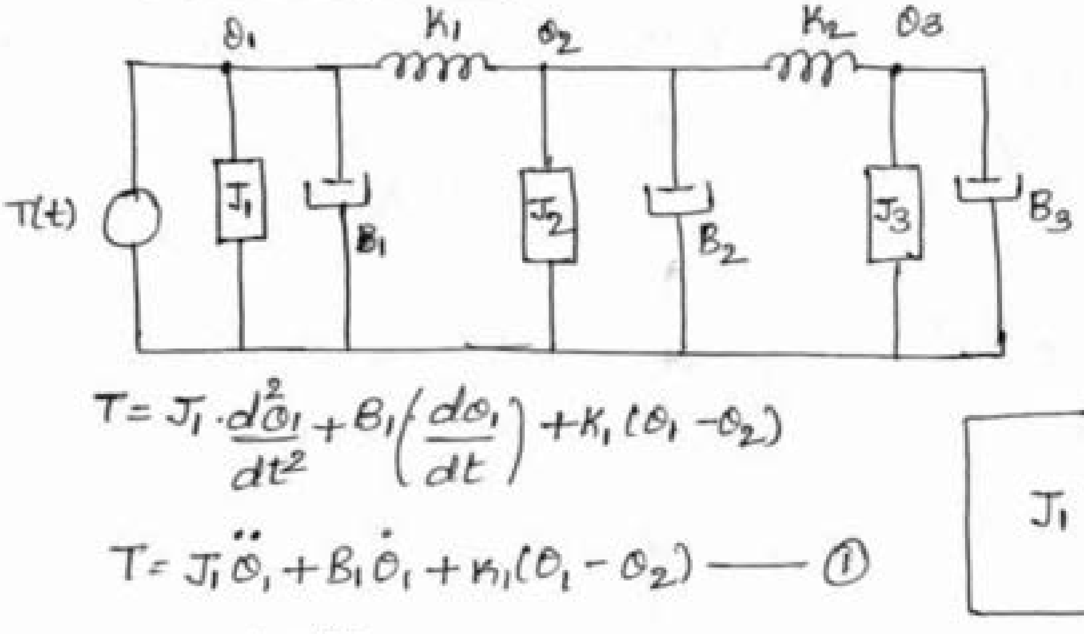


2M

3c) obtain the differential eq^n describing the system shown in fig & also sketch the electrical circuit based on
i) Torque-voltage analogy ii) Torque-current analogy.

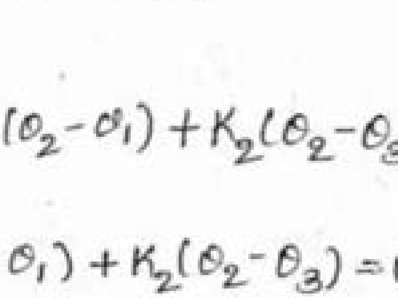


⇒ Equivalent model:-



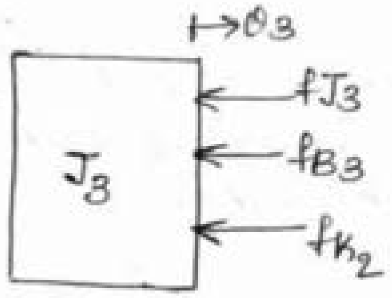
$$T = J_1 \cdot \frac{d^2\theta_1}{dt^2} + B_1\left(\frac{d\theta_1}{dt}\right) + K_1(\theta_1 - \theta_2)$$

$$T = J_1\ddot{\theta}_1 + B_1\dot{\theta}_1 + K_1(\theta_1 - \theta_2) \text{ —— } ①$$



$$J_2 \cdot \frac{d^2\theta_2}{dt^2} + B_2 \cdot \frac{d\theta_2}{dt^2} + K_1(\theta_2 - \theta_1) + K_2(\theta_2 - \theta_3) = 0$$

$$J_2\ddot{\theta}_2 + B_2\dot{\theta}_2 + K_1(\theta_2 - \theta_1) + K_2(\theta_2 - \theta_3) = 0 \text{ —— } ②$$

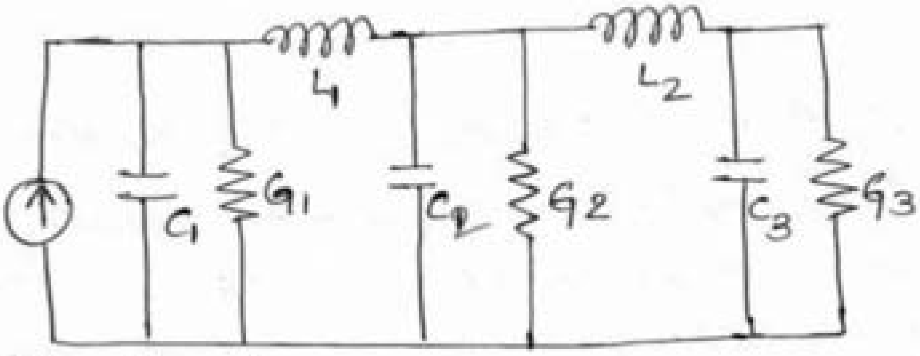


$$J_3 \cdot \frac{d^2\theta_3}{dt^2} + B_3 \cdot \frac{d\theta_3}{dt} + K_2(\theta_3-\theta_2) = 0$$

$$J_3 \cdot \ddot{\theta}_3 + B_3\dot{\theta}_3 + K_2(\theta_3-\theta_2) = 0 \quad —③$$

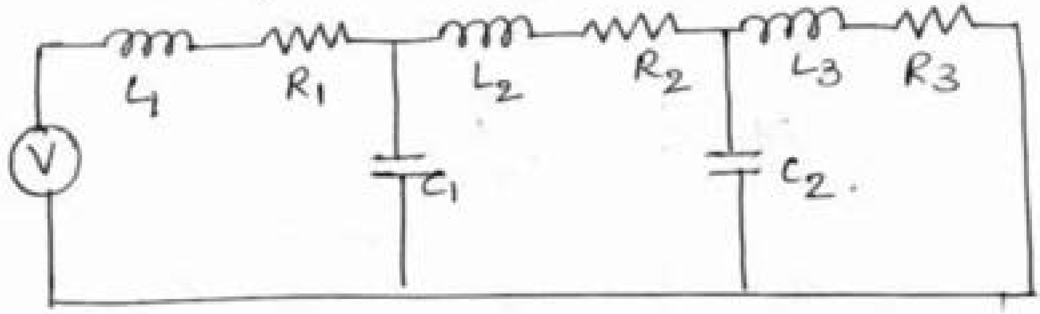
— 2M

T-I Analogy:-



— 2M

T-V Analogy:-



— 2M

4 A.) Define servomotor. Compare AC servomotor & DC servomotor

=>

AC Servomotor	DC Servomotor
* speed is varied by varying the control vtg with the reference vtg being constant.	* Speed is varied either by varying the armature vtg will field current kept constant (or) by varying the field current with armature vtg kept constant.
* speed drops as torque increases	speed - Torque characteristics is slightly dropping.
* speed-torque characteristics is non-linear but it is approximately linear in low-speed region.	speed - Torque characteristics is approximately linear

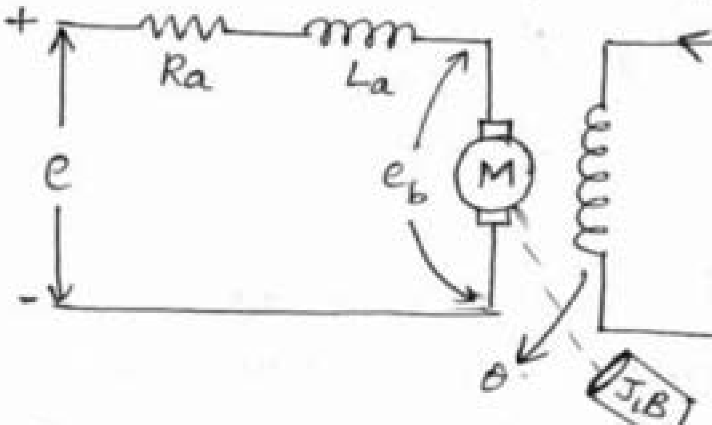
6M

* Low cost	High cost
* Maintainance is little due to rugged construction	Maintainance is high due to the presence of commutator & brushes.

4B) Derive an expression for the TF of an armature controlled DC motor & also construct the block diagram of DC motor.

⇒ Transfer function of Armature Control of DC motor:-

The TF of armature control of DC motor relates the angular displacement of motor shaft θ (o/p). To the armature voltage i/p with the field current kad constant fig shows the circuit diagram of armature.



1M

Let Ra → resistance of armature in ohms
i_a → Armature current in amps
La → Inductance of armature w/d in henry.
I_f → field current in amps
e → i/p vtg to the armature in volts.
e_b → back emf in volts
Tm → Torque developed by motor in N-m
θ → Angular displacement of motor shaft in rad
J → equivalent moment of Inertia of motor & load referred to motor shaft in kg m².
B → be equivalent viscous friction co-efficient of motor & load refer to the motor shaft in Nm per rad/sec.

1M

In DC motor the air gap flux ϕ is the proportional to field current.

$$\phi \propto I_f$$

$$\phi = K_f I_f \quad — ①$$

— (1M)

where K_f is constant due to the flux.

The torque T_m developed by the motor is proportional to the product of the armature current & air gap flux

$$T_m \propto i_a \cdot \phi$$

$$T_m \propto i_a K_f I_f$$

$$T_m = K_1 K_f i_a I_f$$

$$T_m = K_1 K_f I_f i_a \quad — ②$$

— (1M)

where K_1 is constant

In armature control DC motor. I_f is constant

eq^n ② becomes, $T_m = K_T i_a$ — ③

where K_T is torque constant

The back emf E_b is directly proportional

$$e_b \propto \frac{d\theta}{dt}$$

$$e_b = K_b \cdot \frac{d\theta}{dt} \quad — ④$$

— (1M)

where K_b is back emf constant

The differential eq^n of armature circuit is given by

$$e = i_a R_a + L_a \cdot \frac{di_a}{dt} + e_b \quad — ⑤$$

The Torque eq^n is given by,

$$T_m = J \cdot \frac{d^2\theta}{dt^2} + B \cdot \frac{d\theta}{dt} = K_T i_a \quad — ⑥$$

— (1M)

Taking laplace transform of eq^n ④. ⑤ & ⑥

$$E_b(s) = K_b (s) \theta(s) \quad — ⑦$$

$$E(s) = R_a I_a(s) + L_a S I_a(s) + E_b(s)$$

$$E(s) = R_a I_a(s) + L_a S I_a(s) + E_b(s)$$

$$I_a(s) [R_a + L_a(s)] = E(s) - E_b(s) \quad — ⑧$$

— (1M)

$$T_m(s) = J s^2 \theta(s) + B s \theta(s) = K_T I_a(s)$$

substituting eq^n ⑦ in eq^n ⑧ we get,

$$I_a(s)[R_a + L_a(s)] = E(s) - K_b s \theta(s)$$

$$E(s) = I_a(s)(R_a + L_a s) + K_b s \theta(s) \text{ —— } ⑩$$

From eq^n ⑨

$$I_a(s) = \frac{\theta(s)[Js^2 + sB]}{K_T} \text{ — } ⑪$$

substituting eq^n ⑪ in ⑩

$$E(s) = \frac{\theta(s)[Js^2 + Bs]}{K_T}[R_a + sL_a] + K_b s \theta(s)$$

$$G(s) = \frac{\theta(s)}{E(s)}$$

From eq^n ⑫

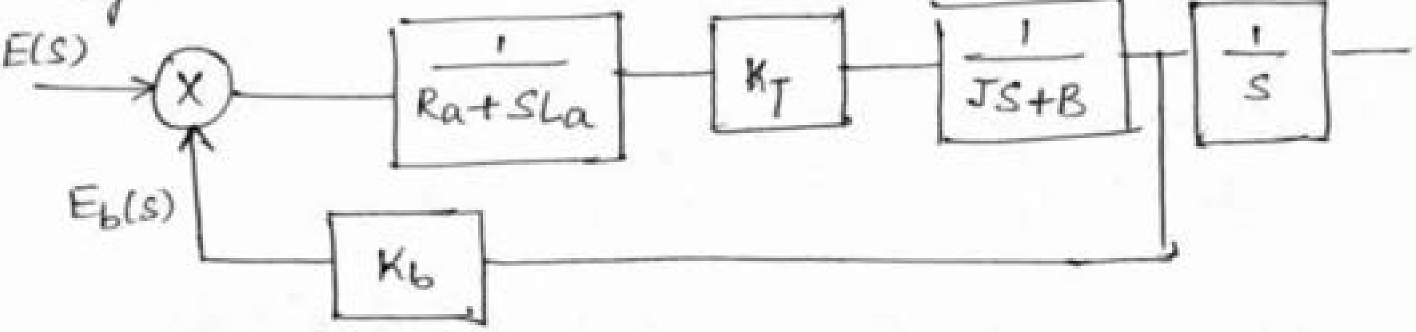
$$E(s) = \frac{\theta(s)[Js^2 + Bs][R_a + sL_a] + K_T K_b s \theta(s)}{K_T}$$

$$\boxed{G(s) = \frac{\theta(s)}{E(s)} = \frac{K_T}{(Js^2 + Bs)(R_a + sL_a) + K_T K_b s}}$$

1M

$$G(s) = \frac{K_T}{(Js^2 + Bs)(R_a + sL_a) + K_T K_b} //$$

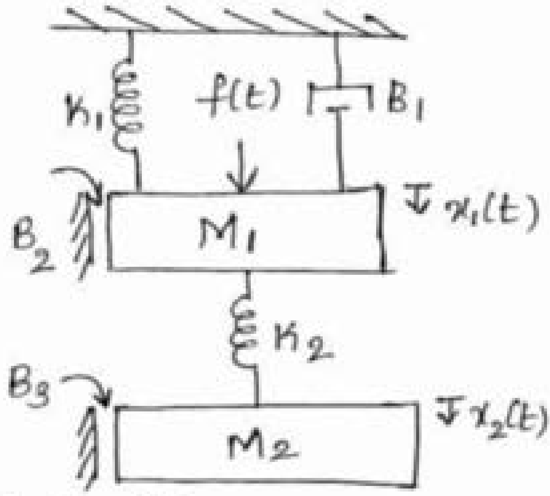
The block diagram representation of above eq^n is given by :-



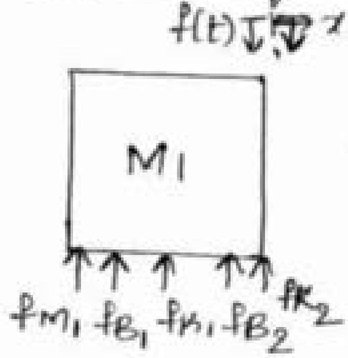
4c:) A mechanical system shown in fig.

i) Obtain the performance equations

ii) Draw the electrical analogy based on force current analogy.



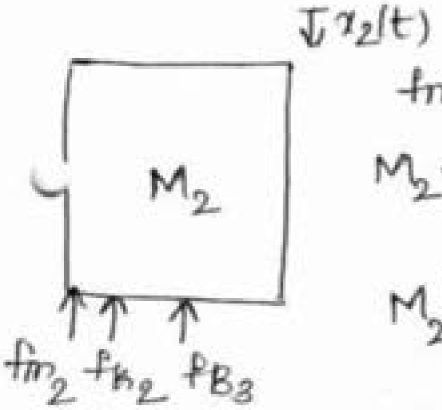
Free body Diagram:-



$$f(t) = f_{M_1} + f_{B_1} + f_{K_1} + f_{B_2} + f_{K_2}$$

$$f(t) = M_1 \cdot \frac{d^2x_1}{dt^2} + B_1\frac{dx_1}{dt} + K_1x_1 + B_2\frac{dx_1}{dt} + K_2(x_1 - x_2)$$

$$f(t) = M_1\ddot{X}_1 + B_1\dot{X}_1 + K_1X_1 + B_2\dot{X}_1 + K_2(X_1 - X_2) \quad \text{—①}$$



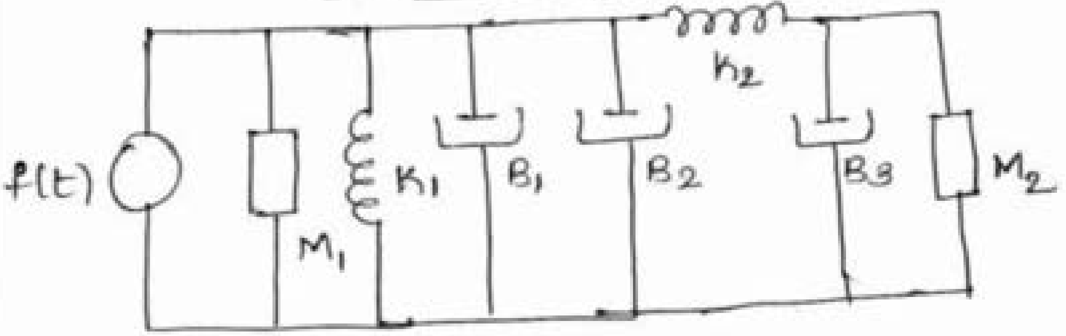
$$f_{m_2} + f_{K_2} + f_{B3} = 0$$

$$M_2 \cdot \frac{d^2x_2}{dt^2} + K_2(x_2 - x_1) + B_3\frac{dx_2}{dt} = 0$$

$$M_2\ddot{X}_2 + K_2(X_2 - X_1) + B_3\dot{X}_2 = 0 \quad \text{—②}$$

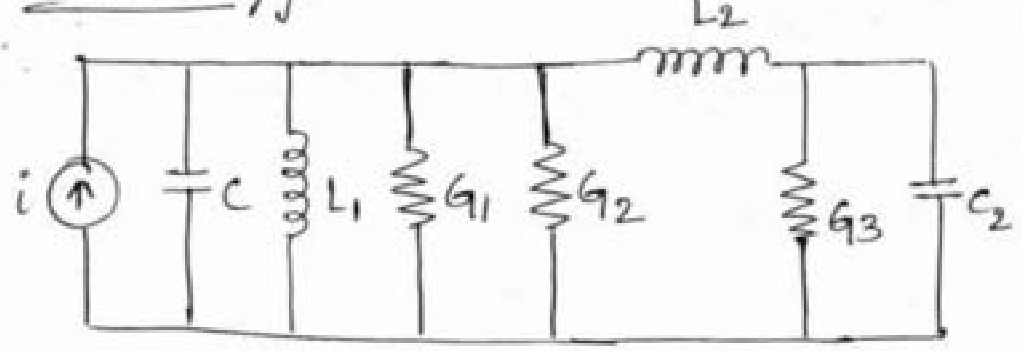
2M

Equivalent circuit

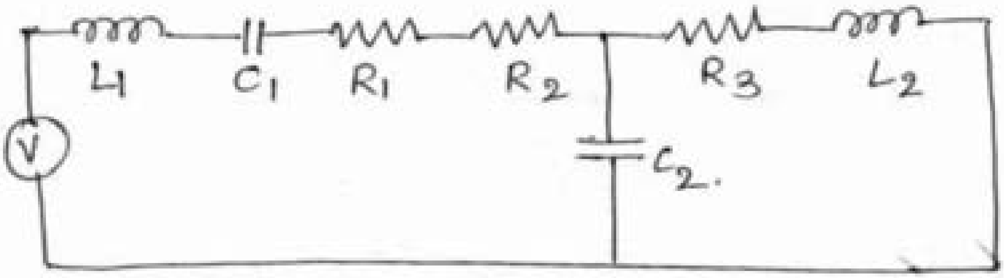


2M

F-I Analogy

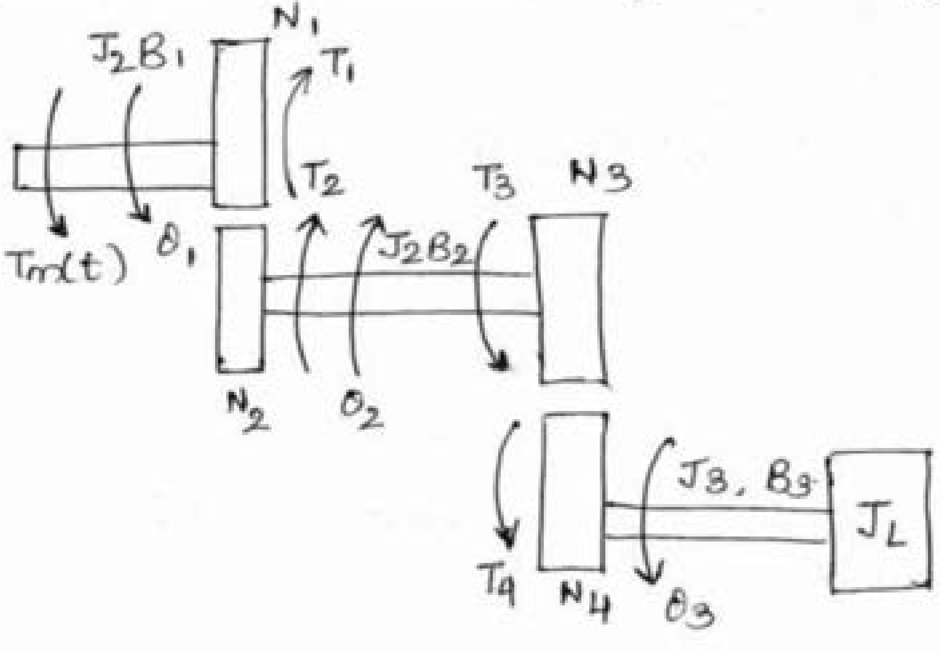


F-V Analogy :-



2M

2A) Write the differential eq^n of the gear train system shown in fig. The moment of inertia of the gear & shafts are J_1, J_2 & J_3. $T(t)$ is the applied torque, N denotes the no. of gear teeth. Assume $K=\infty$ for all shafts (rigid shaft)



Sol: Torque equation for the shaft is

$$T_m(t) = J_1\ddot{\theta}_1 + B_1\dot{\theta}_1 + T_1 \quad \text{—} \quad ①$$

where T_1 is the load torque on gear 1 due to rest of the gear train.

Torque eqⁿ for the 2nd shaft is,

$$T_2 = J_2\ddot{\theta}_2 + B_2\dot{\theta}_2 + T_3 \quad \text{—} \quad ②$$

(1M)

where T_2 is the torque transmitted to gear 2 & T_3 is the load torque on gear 3 due to rest of the gear train.

Torque eqⁿ for the 3rd shaft is

$$T_4 = J_3\ddot{\theta}_3 + B_3\dot{\theta}_3 + J_L\ddot{\theta}_3 \quad \text{—} \quad ③$$

where T_4 is the torque transmitted to gear 4 & $J_L\ddot{\theta}_3 = (T_L)$ is the load torque. Assuming no loss in power transfer, work done by gear 1 is equal that of gear 2,

$$T_1\theta_1 = T_2\theta_2 \quad (\text{or}) \quad \frac{T_1}{T_2} = \frac{\theta_2}{\theta_1} \quad \text{—} \quad ④$$

(1M)

since, $$\frac{\theta_2}{\theta_1} = \frac{N_1}{N_2} \quad \text{—} \quad ⑤$$

Substitute eqⁿ ⑤ in ④

$$\therefore \frac{T_1}{T_2} = \frac{N_1}{N_2} \quad \text{—} \quad ⑥$$

Also, $$\frac{\ddot{\theta}_2}{\ddot{\theta}_1} = \frac{\dot{\theta}_2}{\dot{\theta}_1} = \frac{N_1}{N_2} \quad \text{—} \quad ⑦$$

(1M)

At the second gear following relations are ~~stored~~ obtained.

$$\frac{T_3}{T_4} = \frac{N_3}{N_4} \quad \text{—} \quad ⑧$$

$$\frac{\ddot{\theta}_2}{\ddot{\theta}_3} = \frac{\dot{\theta}_2}{\dot{\theta}_3} = \frac{\theta_2}{\theta_3} = \frac{N_4}{N_3} \quad \text{—} \quad ⑨$$

(1M)

From eqⁿ ⑧ & ②

$$T_2 = J_2\ddot{\theta}_2 + B_2\dot{\theta}_2 + \frac{N_3}{N_4}T_4$$

$$T_2 = J_2\ddot{\theta}_2 + B_2\dot{\theta}_2 + \frac{N_3}{N_4}\left[J_3\ddot{\theta}_3 + B_3\dot{\theta}_3 + J_L\ddot{\theta}_3\right] \quad — ⑩$$ ⑳

Substituting θ_3, $\dot{\theta}_3$ & $\ddot{\theta}_3$ from eqⁿ ⑨ in ⑩

$$T_2 = J_2\ddot{\theta}_2 + B_2\dot{\theta}_2 + \frac{N_3}{N_4}\left[J_3\cdot\frac{N_3}{N_4}\ddot{\theta}_2 + B_3\cdot\frac{N_3}{N_4}\theta_2 + J_L\cdot\frac{N_3}{N_4}\ddot{\theta}_2\right]$$

$$T_2 = \left[J_2 + \left(\frac{N_3}{N_4}\right)^2 J_3\right]\ddot{\theta}_2 + \left[B_2 + \left(\frac{N_3}{N_4}\right)^2 B_3\right]\dot{\theta}_2 + \left(\frac{N_3}{N_4}\right)^2 J_L\ddot{\theta}_2 \quad — ⑪$$

1M

From eqⁿ ① & ⑥

$$T_m(t) = J_1\ddot{\theta}_1 + B_1\dot{\theta}_1 + \frac{N_1}{N_2}T_2 \quad — ⑫$$

Substituting eqⁿ ⑪ in ⑫,

$$T_m(t) = J_1\ddot{\theta}_1 + B_1\dot{\theta}_1 + \frac{N_1}{N_2}\left\{\left[J_2 + \left(\frac{N_3}{N_4}\right)^2 J_3\right]\ddot{\theta}_2 + \left[B_2 + \left(\frac{N_3}{N_4}\right)^2 B_3\right]\dot{\theta}_2 + \left(\frac{N_3}{N_4}\right)^2 J_L\ddot{\theta}_2\right\} \quad — ⑬$$

1M

Substituting $\theta_2 . \dot{\theta}_2$ & $\ddot{\theta}_2$ from eqⁿ ⑦ in ⑬

$$T_m(t) = J_1\ddot{\theta}_1 + B_1\dot{\theta}_1 + \left[\frac{N_1}{N_2}\right]\left\{\left[J_2 + \left(\frac{N_3}{N_4}\right)^2 J_3\right]\frac{N_1}{N_2}\ddot{\theta}_1 + \left[B_2 + \left(\frac{N_3}{N_4}\right)^2 B_3\right]\frac{N_1}{N_2}\theta_1 + \left(\frac{N_3}{N_4}\right)^2\left(\frac{N_1}{N_2}\right)J_L\ddot{\theta}_1\right\}$$

$$T_m(t) = \left[J_1 + \left(\frac{N_1}{N_2}\right)^2 J_2 + \left(\frac{N_1}{N_2}\right)^2\left(\frac{N_3}{N_4}\right)^2 J_3\right]\ddot{\theta}_1 + \left[B_1 + \left(\frac{N_1}{N_2}\right)^2 B_2 + \left(\frac{N_1}{N_2}\right)^2\left(\frac{N_3}{N_4}\right)^2 B_3\right]\dot{\theta}_1 + \left(\frac{N_1}{N_2}\right)^2\left(\frac{N_3}{N_4}\right)^2 J_L\ddot{\theta}_1\Big\} \quad — ⑭$$

1M

In terms of load torque T_L,

$$T_m(t) = \left[J_1 + \left(\frac{N_1}{N_2}\right)^2 J_2 + \left(\frac{N_1}{N_2}\right)^2 \left(\frac{N_3}{N_4}\right)^2 J_3\right]\ddot{\theta}_1 + \left[B_1 + \left(\frac{N_1}{N_2}\right)^2 B_2 + \left(\frac{N_1}{N_2}\right)^2 \left(\frac{N_3}{N_4}\right)^2 B_3\right]\dot{\theta}$$

$$+ \frac{N_1}{N_2} \cdot \frac{N_3}{N_4} \cdot T_L \;//$$

JM

where $T_L = J_L \cdot \ddot{\theta}_3$

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
Department of Electrical & Electronics Engineering
CONTROL SYSTEMS -18EE61
INTERNAL ASSEESSMENT TEST -III

Max Marks: 40 **Date:** 14-07-2022
Semester: VI **Duration:** 90 Minutes

NOTE: Answer any *two* full questions choosing one question each part

PART A

1. a) A given system oscillates with the frequency 2 rad/sec. Find the values of K and P . No of poles are in RHS. $GH(S)= K(S+1)/S^3+PS^2+2S+1$. What are the advantages of R-H criterian (10Marks)

b) Design of PI, PD and PID controllers in frequency domain. (10Marks)

OR

2. a) Consider a unity feedback system with open loop transfer function $G(S)= 5/S(S+0.5)(S+1)$. Design a PD controller, so that the phase margin of the system is 30° at frequency of 1.2 rad/sec (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) $S^5+2S^4+2S^3+4S^2+3S+6=0$ (10Marks)

PART B

3. a) Consider a unity feedback system with open loop TF $G(S)= 100/(S+1)(S+2)(S+5)$. Design a PI controller ,so that the phase margin of the system is 60° at a frequency of 0.5 rad/sec. (10Marks)

b) Plot the roots locus for the forward transfer function $G(S)=K/ S(S+2)(S+3)$. (10 Marks)

OR

4. a) Unity feedback system with open loop TF $G(S)= 100/(S+1)(S+2)(S+10)$. Design a PID controller so that the phase margin of system is 45° at a frequency of 4 rad/sec. Steady state error for unit ramp i/p is 0.1. (10 Marks)

b) Sketch the Bode magnitude and phase angle plot for a system whose loop TF is $GH(S)=K(S+0.4)/S(S+0.01)(S+4)(S+10)$. Hence determine the value of K for which the system is stable . (10 Marks)

18EE61: Control system
Internal Assesment -03.

①

1. A given system oscillates with the frequency 2rad/sec find the value of 'K' & 'P'. No. of poles are in RHS. $GH(s) = \frac{K(S+1)}{S^3+PS^2+2S+1}$. What are the advantages of R-H Criteria

$$\Rightarrow 1+GH(s)=0$$

$$1+\frac{K(S+1)}{S^3+PS^2+2S+1}=0$$ — 1M

$$S^3+PS^2+2S+1+K(S+1)=0$$

$$S^3+PS^2+2S+1+SK+1=0$$

$$S^3+PS^2+S(2+K)+(1+K)=0$$ — 1M

$$\begin{array}{c|cc} S^3 & 1 & (2+K)S \\ S^2 & P & (1+K) \\ S^1 & \frac{P[2+K]-(1+K)}{a} & 0 \\ S^0 & 1+K & \end{array}$$ — 2M

Take S^1

$$\frac{a(2+K)-(1+K)}{a}=0$$

$$a(2+K)=(1+K)$$

$$a=\frac{1+K}{2+K}$$

Finding frequency

$$PS^2+(1+K)=0$$

$$PS^2=-(1+K)$$

$$S^2=-\frac{(1+K)}{a} \quad \text{put } s=j\omega$$

$$j^2\omega^2=-\frac{(1+K)}{a}$$

$$\cancel{-}\omega^2=\cancel{-}\frac{(1+K)}{a}$$

$$\omega^2=\frac{1+K}{a}$$ — 2M

$$4=\frac{1+K}{a}$$

$$a=\frac{1+K}{2+K}$$

$$K+2=\frac{1+K}{a}=4$$

$$\boxed{K=2}$$ — 2M

$$\frac{1+K}{a}=4$$

$$1+2=4a$$

$$\boxed{a=3/4}$$

Advantages:

1) The stability of the system can be obtained

2) No evaluation determinant which saves the calculation time.

3) For unstable system it gives the no. of roots of the CE having +ve realparts. — 2M

4) By using this criterion critical value of the system gain can be determined hence frequency of the sustained oscillation can be determined.

2) Design PI, PD & PID Controller in frequency domain?

→ In frequency domain P, PI, PD & PID controllers can be designed to satisfy specific gain margin & error constant.

Let ω_1 = Gain Cross over frequency of the system with cascade PI (or) PD (or) PID Controller.

A_1 = magnitude of frequency $j\omega$ at ω_1

$A_1 = |G(j\omega)|$ at ω_1

ϕ_1 = phase of $G(j\omega)$ at ω_1

γ_u = phase margin compensated system at ω_1.

γ_d = desired phase margin at ω_1 — 1M

θ = angle to be contributed by PI, PD, PID controller at gain crossover frequency ω. to achieve a phase margin of γ_d.

By the definition of phase margin.

$$\gamma_u = 180 + \phi_1$$

The desired phase margin γ_d is given by,

$$\gamma_d = \theta + \gamma_u$$

$$\theta = \gamma_d - \gamma_u \quad \text{— ①}$$

WKT, the TF of PID controller $G_c(s)$ — 1M

$$G_c(s) = K_p + \frac{K_i}{s} + s \cdot K_d.$$

$$G_c(s) = \frac{K_p s + K_i + s^2 K_d}{s} = \frac{s^2 K_d + s K_p + K_i}{s}$$ put $s = j\omega$

②

$G_c(j\omega) = \dfrac{K_d(j\omega)^2 + (j\omega)K_p + K_i}{j\omega} = \dfrac{(-K_d\omega^2 + K_i) + j\omega K\omega}{j\omega}$ — ②

Let $A_c = G_c(j\omega)$ at $\omega = \omega_1$ &

θ = phase of $G_c(j\omega)$ at $\omega = \omega_1$

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 — (1M)

The magnitude of open loop TF at gain cross over frequency is unity at $\omega = \omega_1$,

$|G_c(j\omega)| \cdot G(j\omega_1) = 1$

$A_c \cdot A_1 = 1$

$A_c = \dfrac{1}{A_1}$ — ④

From eq^n ③ & ④

$G_c(j\omega) = \dfrac{1}{A_1}\angle\theta$ — ⑤ — (1M)

From eq^n ② at $\omega = \omega_1$, we get

$G_c(j\omega_1) = \dfrac{(-K_d\omega_1^2 + K_i) + j\omega_1 K_p}{j\omega_1}$ — ⑥ — (1M)

equating eq^n ⑤ & ⑥

$\dfrac{(-K_d\omega_1^2 + K_i) + jK_p\omega_1}{j\omega_1} = \dfrac{1}{A_1}\angle\theta$

$(-K_d\omega_1^2 + K_i) + jK_p\omega_1 = j\omega_1 \dfrac{1}{A_1}\angle\theta$

$(-K_d\omega_1^2 + K_i) + jK_p\omega_1 = \omega_1 \angle 90 \; \dfrac{1}{A_1}\angle\theta$

$(-K_d\omega_1^2 + K_i) + jK_p\omega_1 = \dfrac{\omega_1}{A_1}\angle 90+\theta$ — (1M)

$(-K_d\omega_1^2 + K_i) + jK_p\omega_1 = \dfrac{\omega_1}{A_1}\cos(90+\theta) + \dfrac{j\omega_1}{A_1}\sin(90+\theta)$

$(-K_d\omega_1^2 + K_i) + jK_p\omega_1 = -\dfrac{\omega_1}{A_1}\sin\theta + \dfrac{j\omega_1}{A_1}\cos\theta$ — ⑦ — (1M)

Equating real & imaginary parts

$(-K_d\omega_1^2 + K_i) = -\dfrac{\omega_1}{A_1}\sin\theta$

$\omega_1^2\left(-K_d + \dfrac{K_i}{\omega_1^2}\right) = -\dfrac{\omega_1}{A_1}\sin\theta$

$-K_d + \dfrac{K_i}{\omega_1^2} = -\dfrac{\sin\theta}{A_1\omega_1}$

$$-\left(K_d - \frac{K_i}{\omega_1^2}\right) = -\frac{\sin\theta}{A_1\omega_1}$$

$$K_d - \frac{K_i}{\omega_1^2} = \frac{\sin\theta}{A_1\omega_1}$$

$$K_d = \frac{\sin\theta}{A_1\omega_1} + \frac{K_i}{\omega_1^2} \text{ — } ⑧ \text{ — } (1M)$$

Imaginary: $K_p\omega_1 = \frac{\omega_1 \cos\theta}{A_1}$

$$K_p = \frac{\cos\theta}{A_1} \text{ — } ⑨ \text{ — } (1M)$$

In eq ⑧ & ⑨ are used to design cascade PD (or) PI (or) PID controller. For designing a PD controller, put $K_i = 0$ in eq ⑧ hence, constant K_p & K_d of PD controller are given. by the following f^n:-

$$K_d = \frac{\sin\theta}{A_1\omega_1} \qquad K_p = \frac{\cos\theta}{A_1}$$

For designing of PI controller, put $K_d = 0$ in eq^n ⑧ hence,

$$0 = \frac{\sin\theta}{A_1\omega_1} + \frac{K_i}{\omega_1^2} \Rightarrow \frac{K_i}{\omega_1^2} = -\frac{\sin\theta}{A_1\omega_1} \Rightarrow \frac{K_i}{\omega_1} = -\frac{\sin\theta}{A_1}$$

$$K_i = -\sin\theta \cdot \frac{\omega_1}{A_1} \text{ — } (1M)$$

For the designing of a PID controller, determine the constant K_i to satisfy the error constant then calculate K_d & K_p from eq^n ⑧ & ⑨

2b)

⇒ To find magnitude & phase

Given that $G(s) = \frac{5}{s(s+0.5)(s+1)} = \frac{5}{s(s+\frac{1}{2})(s+1)} = \frac{10}{s(1+2s)(1+s)}$

put $s = j\omega$

$$G(j\omega) = \frac{10}{j\omega + (1+2j\omega)(1+j\omega)} \text{ — } (1M)$$

$$= \frac{10}{\omega\angle 90^\circ \sqrt{(2\omega)^2 + 1^2}\angle \tan^{-1}\left(\frac{2\omega}{1}\right) \sqrt{1+\omega^2}\angle \tan^{-1}\left(\frac{\omega}{1}\right)} \text{ — } (1M)$$

$$|G(j\omega)| = \frac{10}{\omega\sqrt{1+4\omega^2} * \sqrt{1+\omega^2}}$$ — (1M)

$\angle G(j\omega) = -90 - \tan^{-1}2\omega - \tan^{-1}\omega$

$\omega_1 = 1.2$ rad/sec.

Let $A_1 = |G(j\omega)|$ at $\omega = \omega_1$

$\phi_1 = \angle G(j\omega)$ at $\omega = \omega_1$

$$A_1 = \frac{10}{\omega(\sqrt{1+4\omega_1^2})(\sqrt{1+\omega_1^2})} = \frac{10}{1.2(\sqrt{1+4(1.2)^2})(\sqrt{1+(1.2)^2})}$$ — (1M)

$A_1 = 2.052$

$\phi_1 = -90 - \tan^{-1}2\omega - \tan^{-1}\omega$

$= -90 - \tan^{-1}2\times1.2 - \tan^{-1}1.2 = -207.57$ — (1M)

$\gamma_u = 180 + \phi_1 = 180 - 207.57 = -27.574$ — (1M)

$\theta = \gamma_d - \gamma_u = 30 + 27.574 = 57.574$

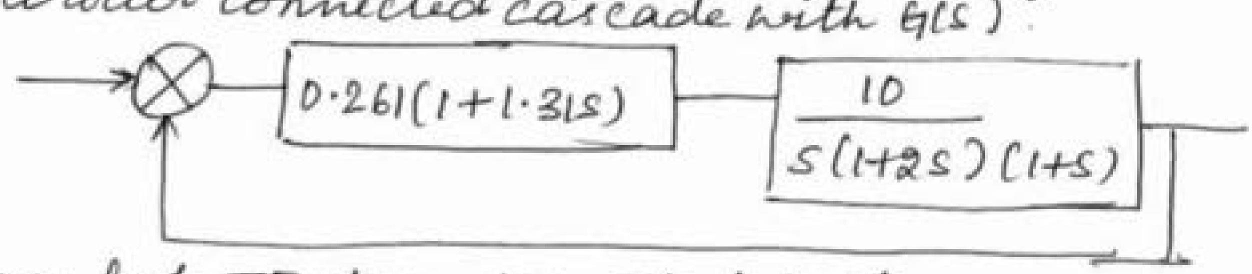
To find TF of PD controller. — (1M)

$$K_p = \frac{\cos\theta}{A_1} = \frac{\cos 57.574}{2.052} = 0.261$$

$$K_d = \frac{\sin\theta}{\omega_1 A_1} = \frac{\sin 57.574}{2.052\times1.2} = 0.342$$ } — (1M)

$TF = G_c(S) = K_p + SK_d = 0.261 + s(0.342) = 0.261(1+1.313)$

To find open loop TF of compensated system the PD controller connected cascade with G(S).



Open loop TF of compensated system — (1M)

$G_0(s) = G_c(s)\,G(s)$

$$= 0.261(1+1.31s) * \frac{10}{s(1+2s)(1+s)} = \frac{2.61(1+1.31s)}{s(1+2s)(1+s)}$$

Verify the design pnt $S = j\omega$.

$$G_0(j\omega) = \frac{2.61(1+1.31(j\omega))}{j\omega(1+2j\omega)(1+j\omega)}$$

$$G_0(j\omega) = \frac{2.61\sqrt{1^2+(1.31\omega)^2}\ \tan^{-1}1.31\omega}{\omega\angle 90\ \sqrt{1^2+(2\omega)^2}\ \angle\tan^{-1}2\omega * \sqrt{1^2+\omega^2}\ \angle\tan^{-1}\omega}$$

At $\omega = \omega_1$

$$G_0(j\omega) = \frac{2.6\sqrt{1+1.71\omega^2}}{\omega\sqrt{1+4\omega^2}\sqrt{1+\omega^2}}$$ — (1M)

$A_{01} = 1.07 \simeq 1$.

At $\omega = \omega_1$ $\phi_{01} = \tan^{-1}1.31\omega - 90 - \tan^{-1}2\omega - \tan^{-1}\omega = -150$

Phase margin of $\gamma_{01} = 180 + \phi_{01} = 180 - 150 = 30°$

i) TF of PD controller $G_c(s) = 0.261 + 0.342S$

ii) Open loop TF $= \dfrac{2.61(1+1.31s)}{s(1+2s)(1+s)}$

A) (i) $s^4+6s^3+21s^2+36s+20=0$

s^4	1	21	20
s^3	6	36	0
s^2	15	20	
s^1	28		
s^0	20		

— (2M)

No. of sign changes in 1st column is zero. No roots are lying on the RHS of S-plane. The system is absolutely stable.

(ii) $4s^3+3s^2+2s+5=0$

s^3	4	2
s^2	3	5
s^1	-4.66	0
s^0	5	

— (2M)

∴ No. of sign changes in 1st column is one. No roots are lying on the RHS of S-plane. The system is unstable.

(iii) $s^4+2s^3+s^2+4s+5=0$

s^4	1	1	5
s^3	2	4	0
s^2	-1	3	
s^1	-10	0	
s^0	8		

— 2M

No. of sign changes in 1st column is two. No roots are lying on the RHS of S-plane. The system is unstable.

(iv) $s^4+3s^3+4s^2+s+k=0$ ①

s^4	1	4	K
s^3	3	1	0
s^2	$\frac{11}{3}$	k	
s^1	-3k	0	
s^0	k		

— 2M

No. of sign changes in 1st column is one. No roots are lying on the RHS of S-plane. So, the system is unstable.

(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	
s^2	0	0	
s^1	0		
s^0	0		

— 2M

No. of sign changes in 1st column is zero.

5b) ⇒ To find magnitude & phase of $G(j\omega)$

$$G(s) = \frac{100}{(s+1)(s+2)(s+5)}$$

$$G(s) = \frac{10}{(s+1)(0.5s+1)(0.2s+1)}$$ put $s=j\omega$ — 1M

$$G(j\omega) = \frac{10}{\sqrt{1+\omega^2}\tan^{-1}\omega\sqrt{1+(0.5\omega)^2}\tan^{-1}0.5\omega\sqrt{1+(0.2\omega)^2}\tan^{-1}0.2\omega}$$

$$|G(j\omega)| = \frac{10}{\sqrt{1+\omega^2}\sqrt{1+(0.5\omega)^2}\sqrt{1+(0.2\omega)^2}}$$ — 1M

$\angle G(j\omega) = -\tan^{-1}\omega - \tan^{-1}0.5\omega - \tan^{-1}0.2\omega$

$$|G(j\omega)| = \frac{10}{\sqrt{1+(0.5)^2}\sqrt{1+(0.5\times0.5)^2}\sqrt{1+(0.2\times0.5)^2}} = 8.63 = A1$$

$\angle G(j\omega) = -\tan^{-1}\omega - \tan^{-1}0.5\omega - \tan^{-1}0.2\omega$

$\angle G(j\omega) = -46.3 = \phi_1$ —— 1M

2) To find γ_u & θ

$\gamma_u = 180+\phi = 180-46.3 = 134$ — 1M

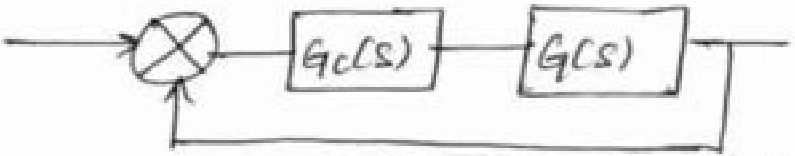
$\theta = \gamma_d - \gamma_u = 60-134 = -74$ —— 1M

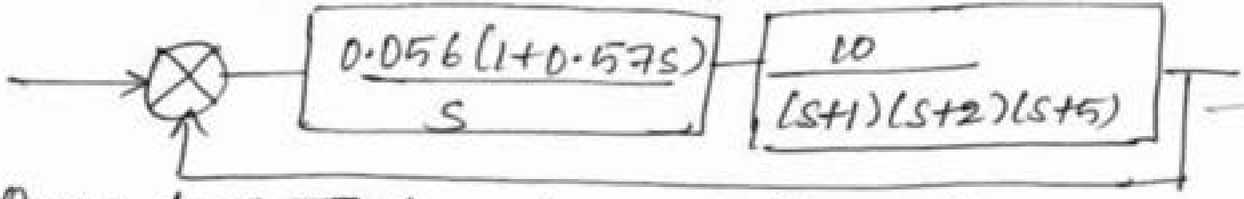
3) To find TF of PI controller

Proportional constant $K_p = \frac{\cos\theta}{A_1} = \frac{\cos(-74)}{8.63} = 0.032$ — 1M

Integral constant $K_i = \frac{-\omega_1 \sin\theta}{A_1} = 0.056$

$TF = G_c(s) = K_p + \frac{K_i}{s} = 0.032 + \frac{0.056}{s} = \frac{0.056(1+0.57s)}{s}$





— 1M

Open loop TF of compensated system

$$G_o(s) = G_c(s) * G(s) = \frac{0.056(1+0.57s)*10}{s(s+1)(s+2)(s+5)}$$

$$G_o(s) = \frac{0.56(1+0.57s)}{s(s+1)(1+0.5s)(1+0.2s)}$$ —— 1M

To verify the design put $s = j\omega$ in $G_o(s)$

$$G_o(j\omega) = \frac{0.56(1+0.57j\omega)}{j\omega(j\omega+1)(j\omega 0.5+1)(1+0.2j\omega)}$$

$$= \frac{0.56\sqrt{1+(0.57\omega)^2}\angle\tan^{-1}0.57\omega}{\omega\angle 90^\circ\sqrt{1+\omega^2}\tan^{-1}\omega\sqrt{1+(0.5\omega)^2}\angle\tan^{-1}0.5\omega\sqrt{1+0.2\omega)}^2\angle\tan^{-1}0.2\omega}$$ —— 1M

$|G(j\omega)| = 1.$

$\angle G(j\omega) = \tan^{-1}0.57\omega - 90 - \tan^{-1}\omega - \tan^{-1}0.5\omega - \tan^{-1}0.2\omega$

$= 120$

Phase margin $\gamma_0 = 180 + \phi_{01} = 180 - 120 = 60$

i) TF of PI Controller $= G_c(s) = 0.032 + \frac{0.056}{s}$

ii) Open loop TF of compensated system:

$$G_0(s) = \frac{0.56(1+0.57s)}{s(1+s)(1+0.5s)(1+0.2s)}$$

1M

3b) $\Rightarrow G(s) = \frac{K}{s(s+2)(s+3)}$

No/. of poles P = 3

No/. of zeros Z = 0

The no/. of root locii terminates to infinity.

Centroid $\sigma = \frac{\Sigma P - \Sigma Z}{P - Z} = \frac{(0-2-3)-0}{3} = \frac{-5}{3} = -1.67$

Angle of assymptode, $\theta = \frac{n \times 180}{P - Z}$ put $n = 1, 3, 5$

$\theta = 60°, 180°, 300°.$

The root locii exists from $S = 0$ & $S = -2$

To find breakaway point equate $\frac{dK}{ds} = 0$

1M

The characteristics eqⁿ is given by:

$1 + G(s)H(s)$

$$1 + \frac{K}{s(s+2)(s+3)} = 0$$

$s(s+2)(s+3) + K = 0$

$s^3 + 5s^2 + 6s + K = 0$

$K = -[s^3 + 5s^2 + 6s]$

$\frac{dK}{ds} = 0 \Rightarrow 3s^2 + 10s + 6 = 0$

$$S = \frac{-10 \pm \sqrt{10^2 - 4(3)(6)}}{6}$$

$S = -2.59$ & $S = -0.78$ — 1M

select $S = -0.78$ as breakaway point

To find point of Intersection
put $s=j\omega$ in CE:

$$s^3+5s^2+6s+k=0$$

$$(j\omega)^3+5(j\omega)^2+6(j\omega)+k=0$$

$$-j\omega^3-5\omega^2+6j\omega+K=0$$

$$(K-5\omega^2)+j(6\omega-\omega^3)=0$$

s^3	1	6
s^2	5	K
s^1	$\frac{30-K}{5}$	0
s^0	K	

— 1M

$\Rightarrow 5s^2+k=0$

$k=-5s^2$

$s^2=-\frac{K}{5}=-\frac{30}{5}$

$s^2=-6$

$K=5\omega^2$

$\underline{\underline{K=30}}$

— 1M

$\frac{30-K}{5}=0$

$30-K=0$

$\underline{\underline{K=30}}.$

— 1M

$6\omega=\omega^3$

$\omega^2=6$

At K=30, the system is just stable. $\omega=\pm 2.449$ — 1

[illegible] $\Rightarrow$ To find magnitude & phase of $[G(j\omega)]$

Given that $G(s)=\frac{100}{(s+1)(s+2)(s+10)}=\frac{100}{(s+1)^2\left(\frac{s}{2}+1\right)\left(\frac{s}{10}+1\right)}$

$G(s)=\frac{5}{(s+1)(0.5s+1)(0.1s+1)}$ put $s=j\omega$ — 1M

$G(j\omega)=\frac{5}{(j\omega+1)(0.5j\omega+1)(0.1j\omega+1)}$

$=\frac{5}{\sqrt{1+\omega^2}\tan^{-1}\omega\sqrt{1+(0.5\omega)^2}\tan^{-1}0.5\omega\sqrt{1+(0.1\omega)^2}\tan^{-1}0.6.}$

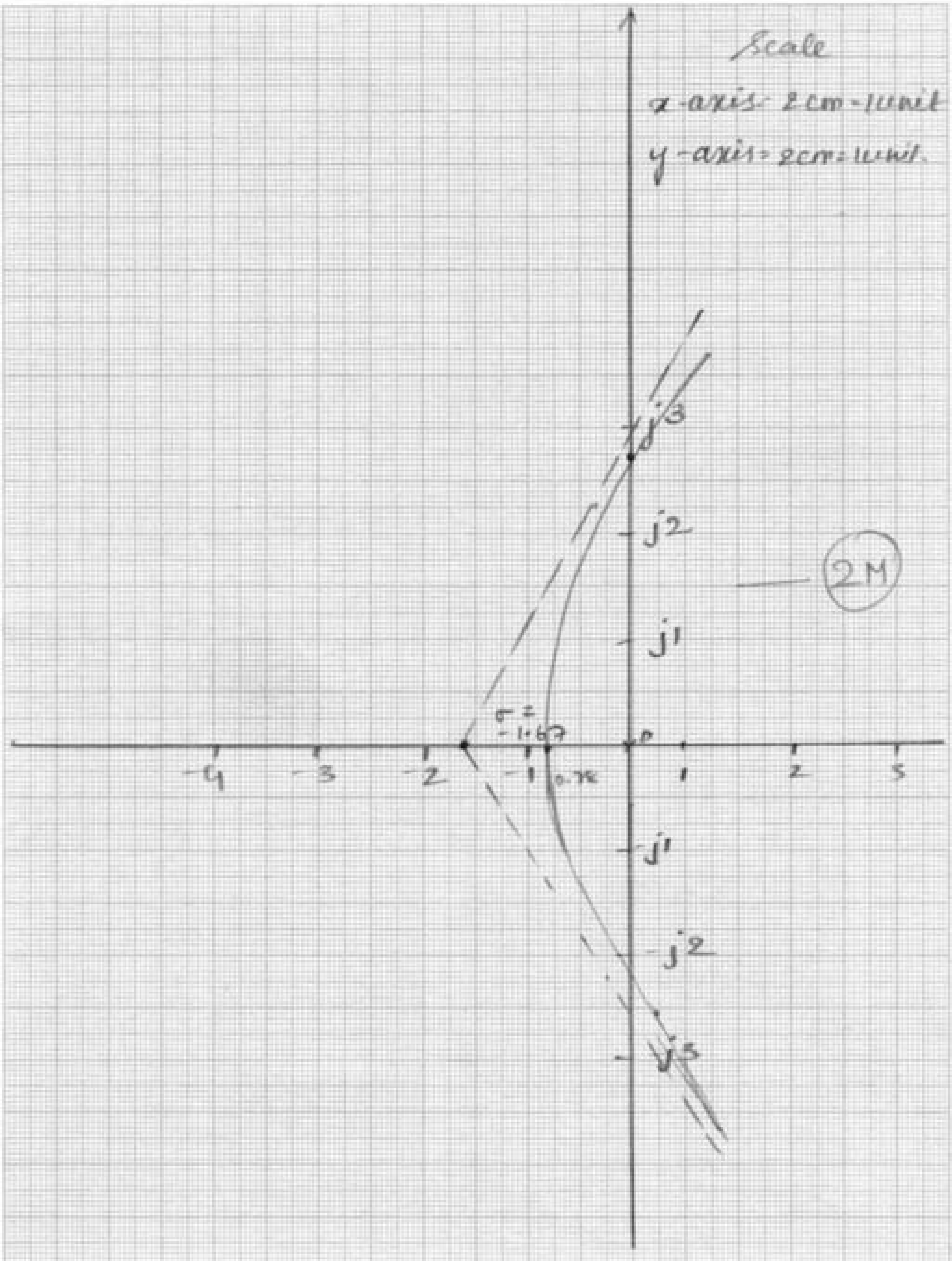
$|G(j\omega)|=\frac{5}{\sqrt{1+\omega^2}\sqrt{1+(0.5\omega)^2}\sqrt{1+(0.1\omega)^2}}$

At $\omega=4$ rad/sec.

$|G(j\omega)|=0.503$. — 1M

$\underline{|G(j\omega)}=-\tan^{-1}\omega-\tan^{-1}0.5\omega-\tan^{-1}0.1\omega=-161.19$

— 1M



Scale

x-axis: 2cm=1unit

y-axis=2cm=1unit.

2M

2) To find γ_u & θ.

$\gamma_u = 180 + \phi = 180 - 161.19 = 19^{\circ}$

$\theta = \gamma_d - \gamma_u = 45 - 19 = 26$ — (1M)

3) TF of PID Controller

Given $e_{ss} = 0.1$ for unit ramp i/p

∴ Velocity error constant $K_v = \frac{1}{e_{ss}} = \frac{1}{0.1} = 10$

Velocity error constant of compensated system is given by. $K_v = \lim_{s \to 0} s\, G_c(s)\, G(s)$

$$G_c(s) = K_p + \frac{K_i}{s} + sK_d$$

$$G_c(s) = \frac{5}{(1+s)(1+0.5s)(1+0.1s)}$$ — (1M)

$$K_v = \lim_{s \to a} \frac{s^2 K_d + s K_p + K_i}{s} \cdot \frac{5}{(1+s)(1+0.5s)(1+0.1s)}$$

$K_v = K_i \cdot 5$

$K_i = \frac{K_v}{5} = \frac{10}{5} = 2$.

Derived constant $K_d = \frac{\sin\theta}{\omega_1 A_1} + \frac{K_i}{\omega_1^2}$

$= \frac{\sin 26}{4 \times 0.503} + \frac{2}{4^2}$

$\boxed{K_d = 0.3428}$ — (1M)

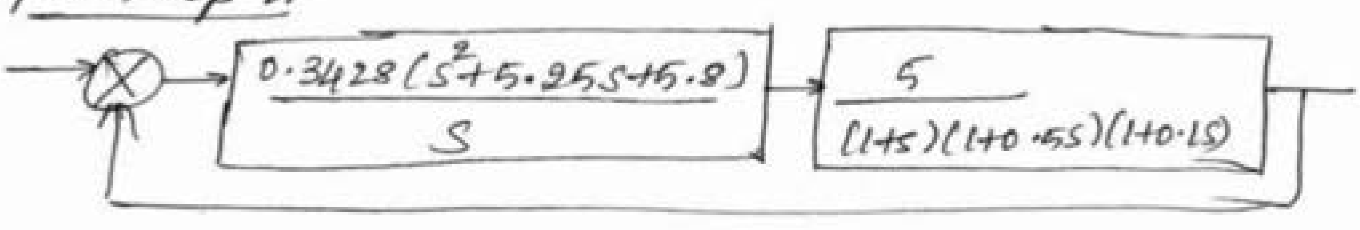
TF of PID Controller

$$G_c(s) = K_p + \frac{K_i}{s} + sK_d$$

$$= 1.8 + \frac{2}{s} + 0.3428s = \frac{1.8s + 2 + 0.3428s^2}{s}$$

$$G_c(s) = \frac{0.3428(s^2 + 5.25s + 5.8)}{s}$$ — [illegible]

Open loop TF



Open loop TF = $G_0(s) = G_c(s) \cdot G(s)$

$$G_0(s) = \frac{0.344(s^2+5.25s+5.8)}{S} \cdot \frac{5}{(1+s)(1+0.5s)(1+0.1s)}$$

$$G_0(s) = \frac{1.72(s^2+5.25s+5.8)}{s(1+s)(1+0.5s)(1+0.1s)}$$ —— (1M)

Verify: put $S = j\omega$ in $G_0(s)$

$$G_0(j\omega) = \frac{1.72(j\omega)^2+5.25j\omega+5.8}{j\omega(1+j\omega)(1+0.5j\omega)(1+j0.1\omega)}$$

$$|G_0(j\omega)| = \frac{1.72\sqrt{(5.8-\omega^2)^2+(5.25\omega)^2}}{\omega\sqrt{1+\omega^2}\sqrt{1+(0.5\omega)^2}\sqrt{1+(0.1\omega)^2}} = A_0$$

$G_0(j\omega) = 1$

At $\omega = \omega_1$, $A_0 = A_{01}$ —— (1M)

$$\angle G(j\omega) = \tan^{-1}\frac{5.25\omega}{5.8-\omega^2} - 90 - \tan^{-1}\omega - \tan^{-1}0.5\omega - \tan^{-1}0.4\omega$$

$\angle G(j\omega) = -315.28$

for $\omega > \sqrt{5.8}$ $\phi_0 = 180 + \angle G(j\omega)$

At $\omega = \omega_1$

$\phi = \phi_{01} = 180 - 315.28$

$\phi_{01} = -135$ —— (1M)

Phase margin of compensated system $= \gamma_0 = 180 + \phi_{01}$

$= 180 - 135 = 45°$

i) The TF of PID controller is $G(s) = 1.5 + \frac{2}{5} + 0.34285$

ii) Open loop TF of compensated system

$$G_0(s) = \frac{1.72(s^2+5.25s+5.8)}{s(1+s)(1+0.5s)(1+0.1s)}$$ —— (1M)

4b) → $GH(s) = \dfrac{K(s+0.4)}{s(s+0.01)(s+4)(s+10)}$

$$= \frac{K(0.4)\left(\frac{s}{0.4}+1\right)}{s(0.01)\left[\frac{s}{0.01}+1\right]4\left(\frac{s}{4}+1\right)10\left(\frac{s}{10}+1\right)}$$

$$= \frac{K\left(\frac{s}{0.4}+1\right)}{s\left(\frac{s}{0.01}+1\right)\left(\frac{s}{4}+1\right)\left(\frac{s}{10}+1\right)}$$

— (1M)

Cross over frequency: CF = 0.01, 0.4, 4, 10.

Factor	CF	slope	Resultant slope
$\frac{K}{s}$	—	-20 dB/dec	-20 dB/dec.
$\frac{1}{s+0.01}$	0.01	-20 db/dec	-40 dB/dec.
$s+0.4$	0.4	20 dB/dec	-20 dB/dec.
$\frac{1}{s+4}$	4	-20 dB/dec	-40 dB/dec.
$\frac{1}{s+10}$	10	-20 dB/dec	-60 dB/dec

— (2M)

$\omega = 0.001$, $K = 1$

Magnitude $= 20\log K - 20\log\omega$

$= 20\log 1 - 20\log 0.001$

$= 60.$

— (1M)

Phase plot

$$\phi = \tan^{-1} 2.5\omega - [90 + \tan^{-1} 100\omega + \tan^{-1} 0.25\omega + \tan^{-1} 0.1\omega]$$

ω	ϕ
0.001	−95.58
0.01	−133.76
0.1	−162.26
0.4	−141.56
1	−130.975
3	−150.972
4	−162.36
5	−172.36
8	−194.88
10	−205.43

— 2M

Graph — 2M

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering

Power System Analysis I(18EE62)
THIRD INTERNAL ASSESSMENT

VI Semester **Duration: 90 Minutes**
Max Marks: 40 **date: 14.07.22**

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)**

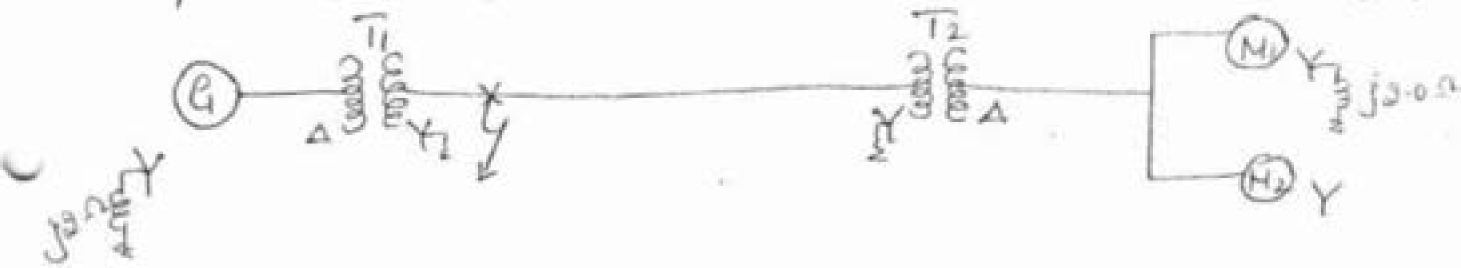
b) A 400V star connected neutral grounded three phase generator is subjected to various types of faults. The fault currents for various types of faults are

i) Three phase---120amperes
ii) L-L Fault ----150amperes
iii)L-G Fault---250amperes
determine the sequence impedances. **10M(co4)**

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) Derive an expression for the fault current when an LG fault occurs on an unloaded generator. Draw the inter connection of sequence networks. **10M(co4)**

3.a) 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. The 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. **20M(co4)**



——x——

IA - III 14.07.22

Power System Analysis - 1 (18EE62)

Scheme of Evaluation:

1.a) Derivation : LLG fault :

Circuit diagram
Terminal conditions.
Symmetrical component Relations.
Interconnection of Sequence N/w
Sequence quantities
Expression for fault current.

$\rightarrow \boxed{\text{10 M}}$

b)

$$\left.\begin{array}{l} X_1 = 1.924\,\Omega \\ X_2 = 0.743\,\Omega \\ X_0 = 0.105\,\Omega \end{array}\right\} \longrightarrow \text{10 M.}$$

2.a) Circuit diagram
Terminal conditions
Symmetrical component relations
Interconnection of Sequence N/w
Sequence quantities
Expression for fault current.

$$|I_f| = \sqrt{3}\, I_{a1} = \sqrt{3}\,\frac{E_a}{Z_1+Z_2+Z_f}.$$

$\longrightarrow \boxed{\text{10 M}}$

b) LG fault :

Circuit diagram
Terminal conditions
Symmetrical component Relations.
Interconnection of Sequence N/w.
Sequence quantities.
Expression for fault current.

$$I_f = 3 I_{a0} = 3 \times \frac{E_a}{Z_1 + Z_2 + Z_0}$$

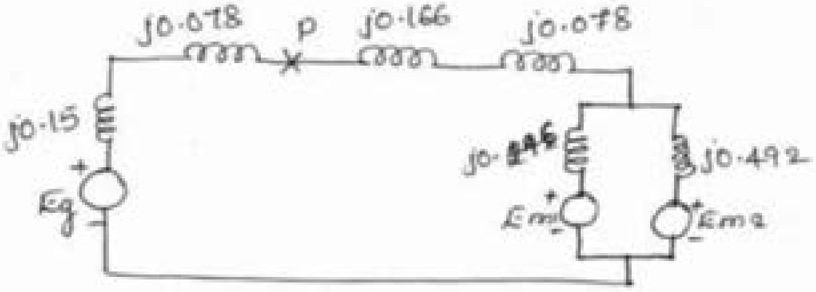
$\longrightarrow \boxed{\text{10 M}}$

3.a) Calculation of $(kV)_B$ values. $\longrightarrow \boxed{\text{2M}}$

Calculation of Reactances (+ve, -ve & Zero seq)

$\longrightarrow \boxed{\text{4M}}$

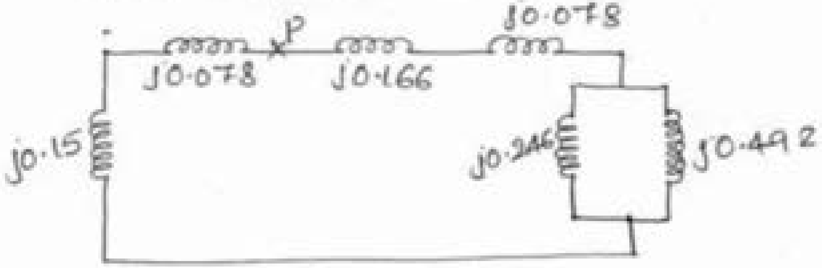
+ve Seq N/w



$\longrightarrow \boxed{4M}$

$Z_{1th} = j0.146$ pu

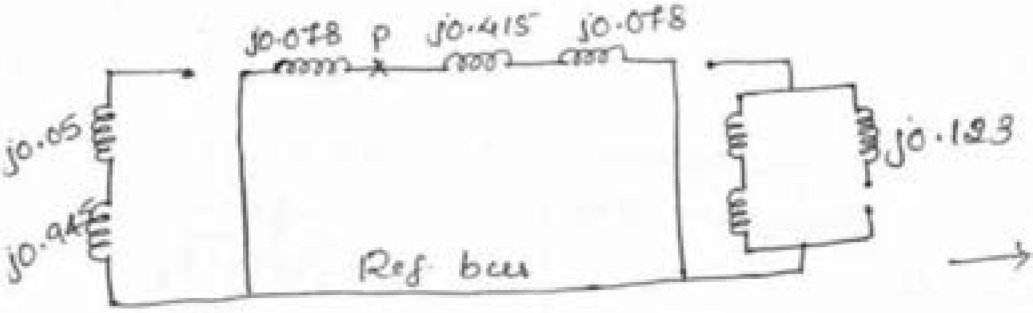
~~Zero~~ -ve Seq N/w



$Z_{2th} = j0.146$ pu

$\longrightarrow \boxed{4M}$

Zero Seq N/w



$\longrightarrow \boxed{4M}$

$Z_{0th} = j0.0678$ pu

LG fault $I_f = \frac{3V_{th}}{Z_{1th} + Z_{2th} + Z_{0th}}$ $\longrightarrow \boxed{2M}$

$I_f = \underline{8.839}$ pu

Shridevi Institute of Engineering and Technology, Tumkur -06
Department of Electrical and Electronics

INTERNAL ASSESSMENT – II

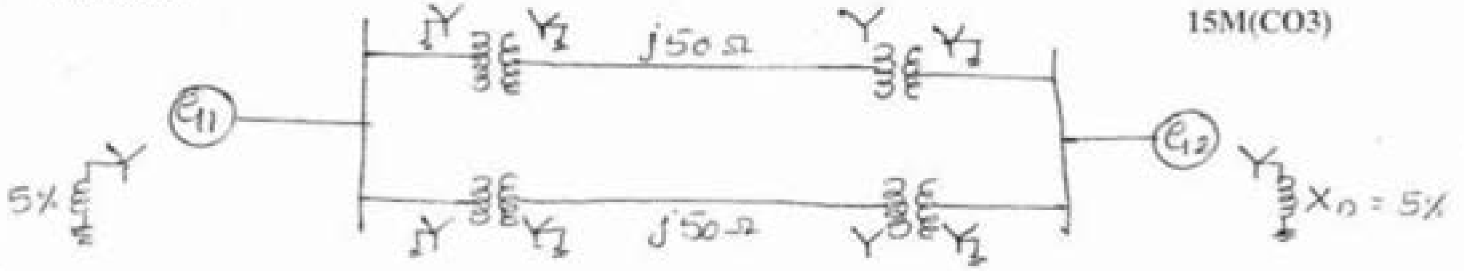
Answer any two full questions

Sub: Power System Analysis 1 — **Sub code:** 18EE62
Sem: VI sem — **Date:** 27/06/22
Max Marks: 40 — **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)



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 complex power interms of symmetrical components. **8M(CO3)**

b) In a 3Φ, 4 wire system, the sequence voltages and currents are Va1=$0.9\angle 10^\circ$pu, Va2=$0.25\angle 110^\circ$ pu, Va0=$0.12\angle 300^\circ$pu. Ia1=$0.75\angle 25^\circ$pu, Ia2= $0.15\angle 170^\circ$pu, Ia0 = $04\angle 330^\circ$pu. Find the complex power in p.u. If the neutral gets disconnected, find the new power. **6M(CO3)**

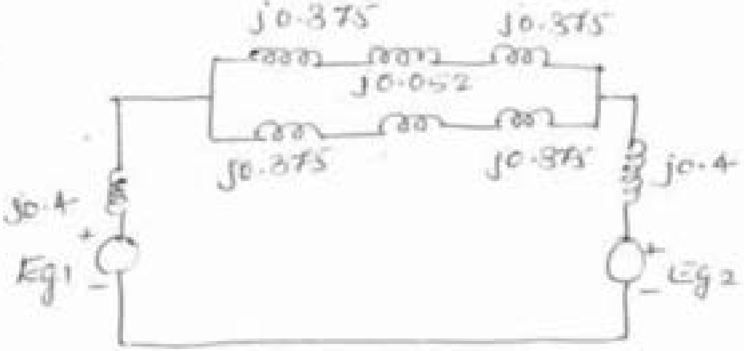
c) Draw the positive, negative & zero sequence networks for the power system shown in the figure. **6M(CO3)**

2.(a)

3.(c)

3.(C)

(1.b)



IA - II

Power System Analysis (18EE62)

27/06/22.

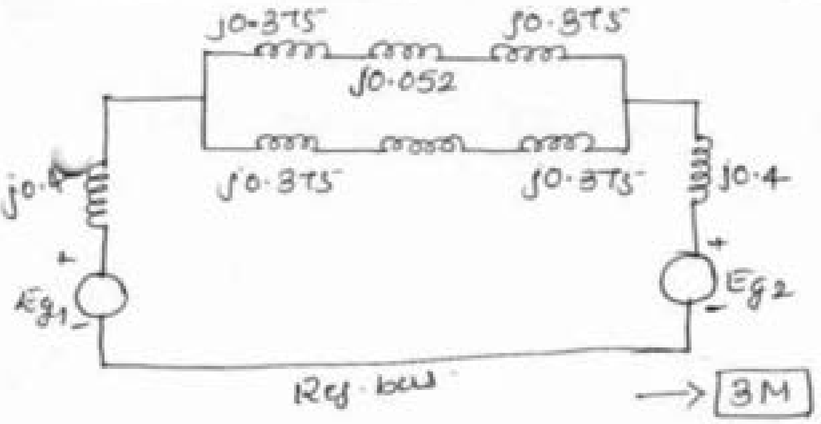
Scheme of Evaluation

1. a) Each → $\boxed{1M}$ ⟶ 1×5 = 5M.

b) $(kV)_B$ for G_1 s/c → 11 kV
$(kV)_B$ for G_2 s/c → 11 kV } → 1M.

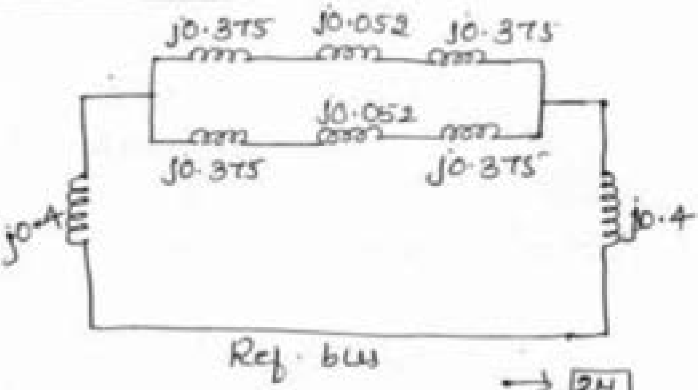
Calculation of Reactances → 3M.

+ve Seq N/w



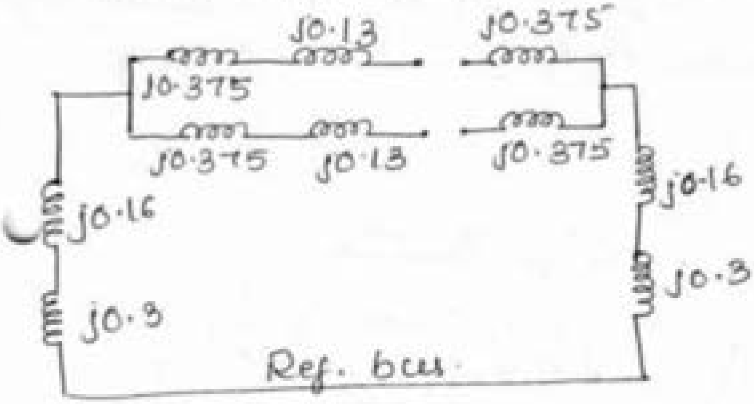
⟶ $\boxed{3M}$

-ve Seq N/w



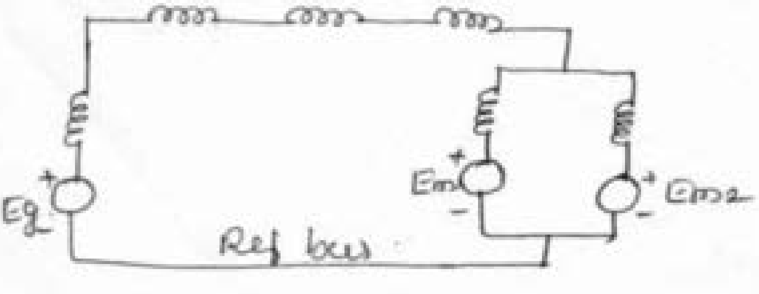
→ $\boxed{3M}$

Zero Seq N/w

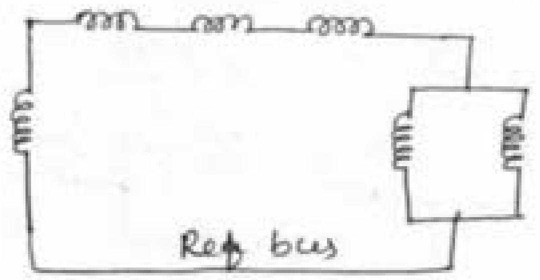


⟶ $\boxed{5M}$

2. a) +ve Seq N/w

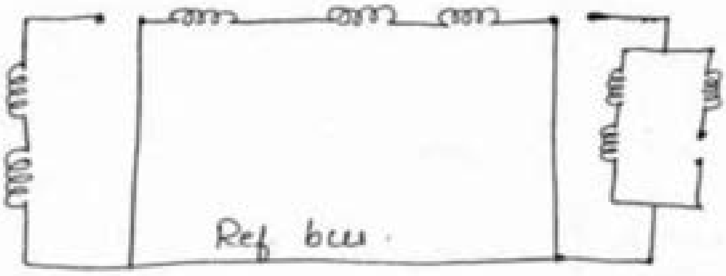


-ve Seq N/w



Calculation of Reactances ⟶ $\boxed{3M}$

Zero Seq. N/w.



→ $\boxed{4M}$

2.b) Definitions :

+ve sequence impedance
−ve " "
Zero " "
+ve sequence Network
−ve " "
Zero " "
→ each $\boxed{1M}$ 1 × 6 = 6M.

3. a) Derivation :

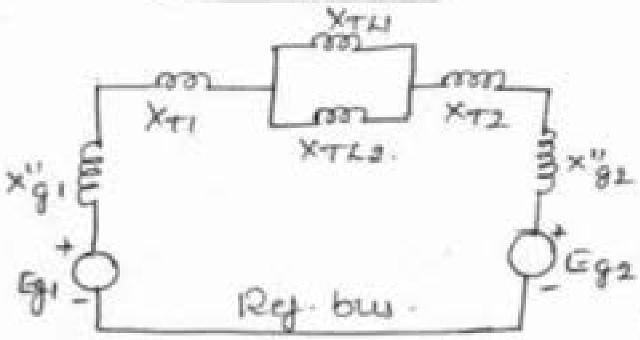
$$P = 3\left[V_{a0} I_{a0}^{*} + V_{a1} I_{a1}^{*} + V_{a2} I_{a2}^{*}\right].$$

b). Total 3-φ power $S_{pu} = (0.68 - j0.212)$ pu → $\boxed{3M}$

When neutral gets disconnected, $I_{a0} = 0$. → $\boxed{5M}$.

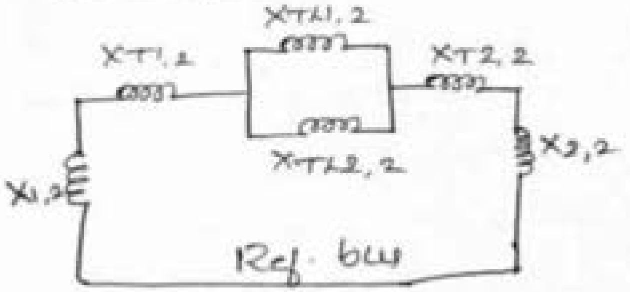
$S_{pu} = (0.67 - j0.206)$ p.u.

c) +ve seq N/w.



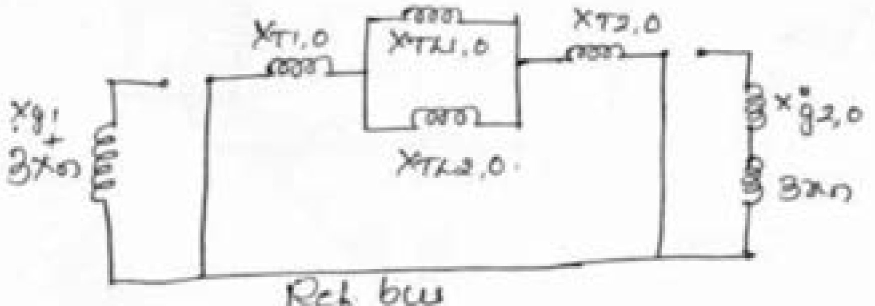
→ 2M

−ve Seq N/w.



→ 2M

Zero Seq. N/w



→ 2M.

Shridevi Institute of Engineering and Technology, Tumkur -06
Department of Electrical and Electronics

INTERNAL ASSESSMENT - 1

Sub: Power System Analysis-1
Sem: VI sem
Max Marks: 40

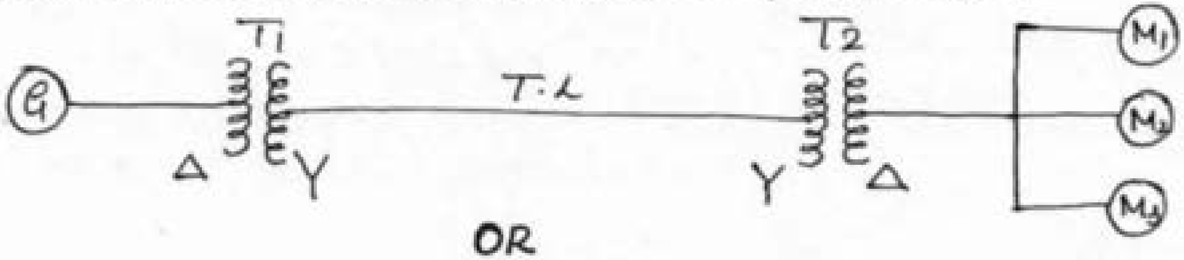
Sub code: 18EE62
Date: 20.05.22
Duration: 90 Minutes

***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**

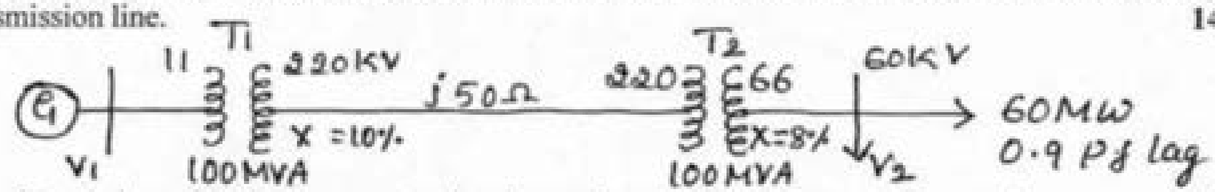
c) A 100MVA, 33KV, 3-phase generator has a subtransient reactance of 15%. The generator is connected to motors through a transmission line and transformers as shown in fig. The motors have a rated inputs of 30MVA, 20MVA & 50MVA at 30 kV with 20% subtransient reactance. The 3-phase transformers are rated 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 baase quantities in the generator circuit, determine the base quantities in the other parts f the system. 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 $I_a = 100\angle 0^\circ$ A & $I_b = 100\angle -100$ A. determine the sequence components of line currents. **8M**

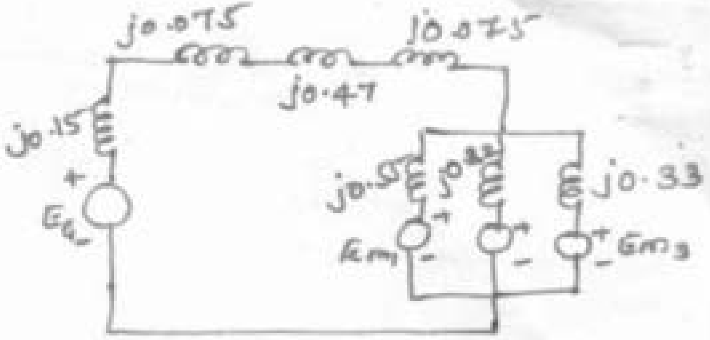
Signature of Staff

G. H. Rame
Signature of H.O.D

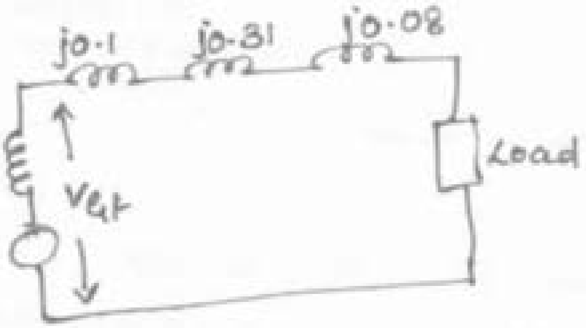
1.c) $(kV)_B$ for G = 33kV

T.L = 103.125kV

M = 33kV.



2.b)



$V_L = 0.909$ pu

$I_L = 641.5 \angle -25.84$

$I_B = 874.77A$

$I_L = 0.733 \angle -25.84$ pu

$V_{Gt} = 1.112 \angle 16.87$ V

3.a) $\alpha = 82.82$

$\beta = 55.77$

$V_B = 500 \angle 262.92$ V

$V_C = 600 \angle 124.23$ V

$V_{A0} = 0$

$V_{A1} = 492.84$ v $\angle 9.27$ v

$V_{A2} = 117.34 \angle -137.4$ v

$V_{a1} = 284.54 \angle -80.73$ v

$V_{a2} = 67.75 \angle -47.4$ v

8

IA - 1

Power System Analysis - 1 (18EE62)

20.05.22

Scheme of Evaluation :-

1. a) Definition of p.u → 1M

Advantages of p.u (Any 4) → 4M.

b) Derivation :-

$(Z_{eq_1})_{pu} = (Z_{eq_2})_{p.u} \rightarrow 5M.$

c) $(kV)_B$ for G = 33 kV

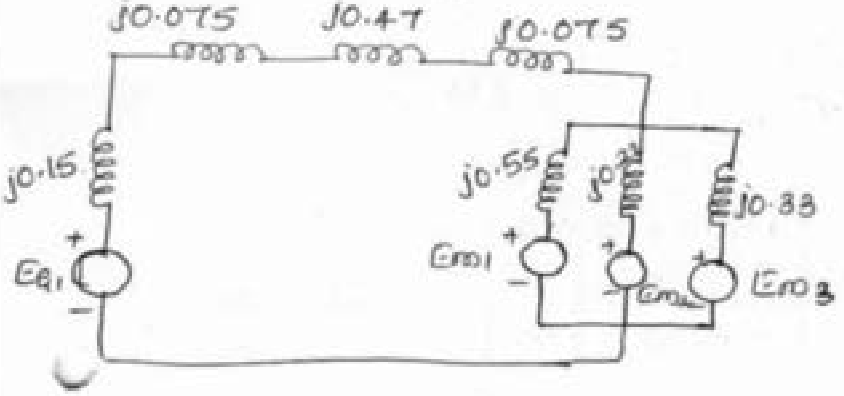
" " T.L = 103.125 kV

" " M = 33 kV

→ 1M

Calculation of Reactances :- → $\boxed{3M}$

Reactance diagram.



→ $\boxed{6M}$

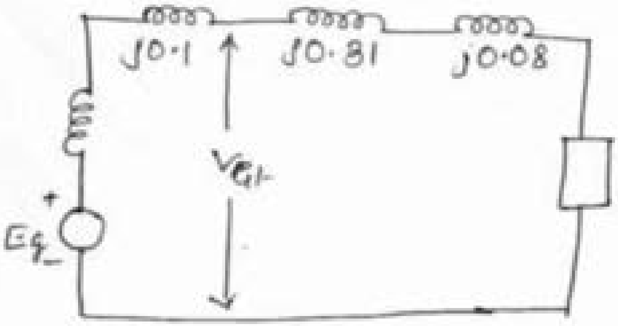
2. a) Procedure :-

3 Steps. → $\boxed{6M}$

To calculate $(kV)_B$ & Reactances.

b) Calculation of Reactances — $\boxed{3M}$

Reactance diagram :-



→ $\boxed{5M}$

Calculation of Terminal Voltage : (V_{gt}) :-

$V_L = 0.909$ pu $\longrightarrow$ 1M

$$\left.\begin{array}{l} I_L = 641.5 \angle -25.84 \text{ A} \\ I_B = 874.77 \text{ A} \\ I_L = 0.733 \angle -25.84 \text{ pu.} \end{array}\right\} \text{2M}$$

$V_{Gt} = 1.112 \angle 16.87$ pu. $\longrightarrow$ 3M

3. a) ~~Deferent~~ Derivation :- $\begin{bmatrix} V_{a0} \\ V_{a1} \\ V_{a2} \end{bmatrix} = \begin{bmatrix} 0 \\ V_a \\ 0 \end{bmatrix}$ $\longrightarrow$ 6M.

b)
$$\left.\begin{array}{l} \alpha = 82.82^\circ ;\ \beta = 55.77 \\ V_B = 500 \angle 262.92 \text{ V} \\ V_C = 600 \angle 124.23 \text{ V} \end{array}\right\} \rightarrow \text{4M}$$

$V_{A0} = 0$

$$\left.\begin{array}{l} V_{A1} = 492.84 \angle 9.27 \text{ V} \\ V_{A2} = 117.34 \angle -137.4 \text{ V} \\ V_{a1} = 284.54 \angle -80.73 \text{ V} \end{array}\right\} \rightarrow \text{4M.}$$

$V_{a2} = 67.75 \angle -47.4$ V

c) Derivation :-
$$\left.\begin{array}{l} V_{a1} = j\sqrt{3}\, V_{A1} \\ V_{a2} = -j\sqrt{3}\, V_{A2} \\ V_{a0} = 0 \end{array}\right\} \rightarrow \text{6M.}$$

4. a) Derivation :- $\begin{bmatrix} V_{a0} \\ V_{a1} \\ V_{a2} \end{bmatrix} = \frac{1}{3} \begin{bmatrix} 1 & 1 & 1 \\ 1 & a & a^2 \\ 1 & a^2 & a \end{bmatrix} \begin{bmatrix} V_a \\ V_b \\ V_c \end{bmatrix}$ $\longrightarrow$ 6M.

b) Derivation :-
$$\left.\begin{array}{l} I_{A1} = j\sqrt{3}\, I_{a1} \\ I_{A2} = -j\sqrt{3}\, I_{a2} \\ I_{A0} = 0 \end{array}\right\} \longrightarrow \text{6M}$$

c)
$$\left.\begin{array}{l} I_C = (128.56 \angle 130^\circ) \text{ A} \\ I_{a0} = 0 \\ I_{a1} = 108.5 \angle 10^\circ \text{ A} \\ I_{a2} = 20.05 \angle -110^\circ \text{ A} \end{array}\right\} \text{Each} \rightarrow 2M \times 4 \longrightarrow \boxed{8M}.$$

21-22 odd

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, OCTOBER 2020

Semester : V **Subject:POWER ELECTRONICS** **Sub Code: 18EE-53**

Max Marks: 40 Date: 21-11-2021 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) What is power electronics? Mention the applications of power electronics [CO1]10 Marks

b) With neat circuit diagram and input, output waveforms explain the different types of power electronics converter circuits. [CO1]10 Marks

OR

2 a) With the help of neat block diagram, explain briefly peripheral effect associated with power converters [CO1]10 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]10 Marks

3 a) 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]12 Marks

b) List the parameters on which the performance of rectifier is evaluated [CO1]08 Marks

OR

4 a) With circuit diagram and wave forms explain the operation of single phase full wave rectifier with RL load [CO2]12 Marks

b) The bridge rectifier has an AC source with Vm = 100 volt at 60 Hz and a series load RL with R = 10Ω and L = 10mH. Calculate i) Average current in the load ii) Average currents in the diodes [CO2]08 Marks

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, OCTOBER 2020

Semester : V Subject:POWER ELECTRONICS Sub Code: 18EE-53

Max Marks: 40 Date: 21-11-2021 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) What is power electronics? Mention the applications of power electronics [CO1]10 Marks

b) With neat circuit diagram and input, output waveforms explain the different types of power electronics converter circuits. [CO1]10 Marks

OR

2 a) With the help of neat block diagram, explain briefly peripheral effect associated with power converters [CO1]10 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]10 Marks

3 a) 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]12 Marks

b) List the parameters on which the performance of rectifier is evaluated [CO1]08 Marks

OR

4 a) With circuit diagram and wave forms explain the operation of single phase full wave rectifier with RL load [CO2]12 Marks

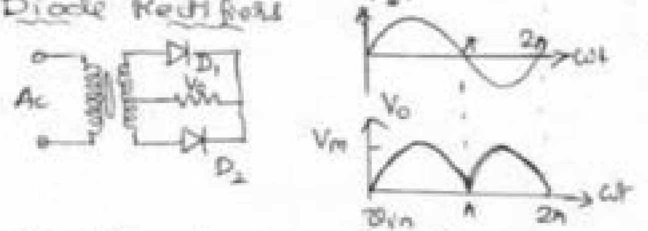
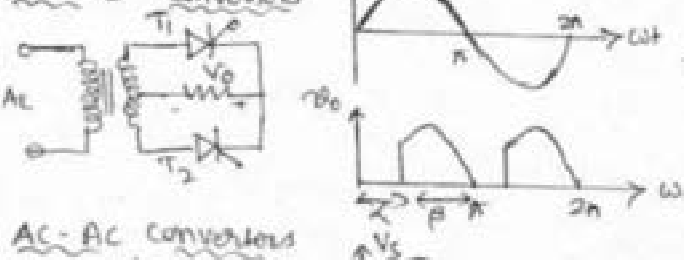
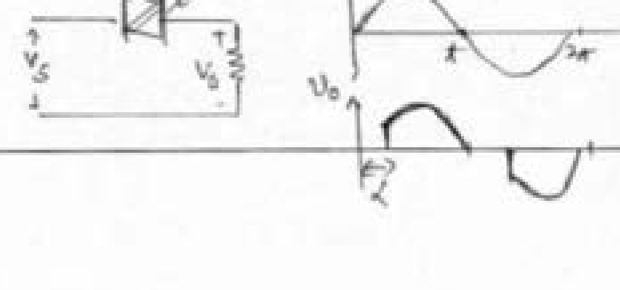
b) The bridge rectifier has an AC source with Vm = 100 volt at 60 Hz and a series load RL with R = 10Ω and L = 10mH. Calculate i) Average current in the load ii) Average currents in the diodes [CO2]08 Marks

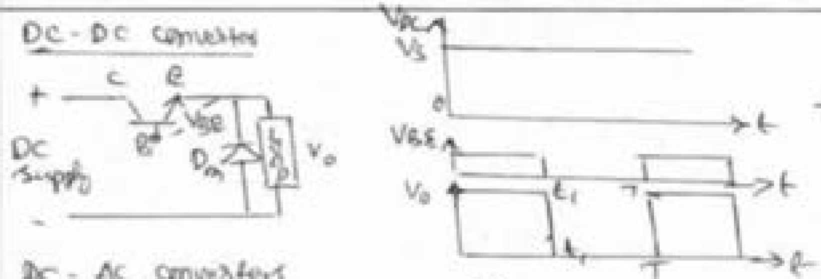
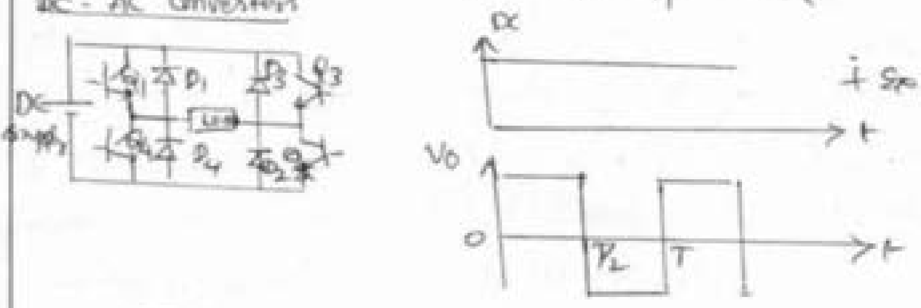
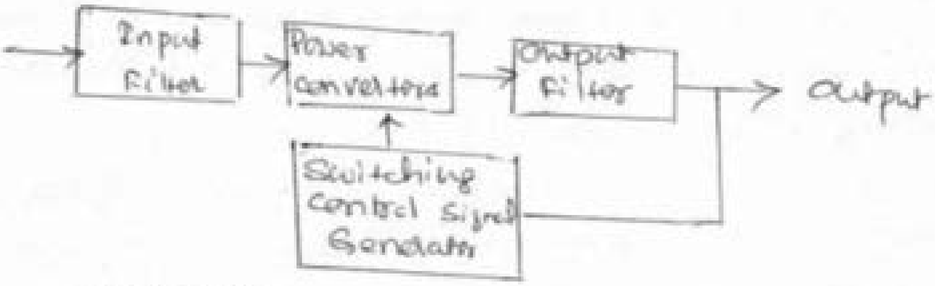
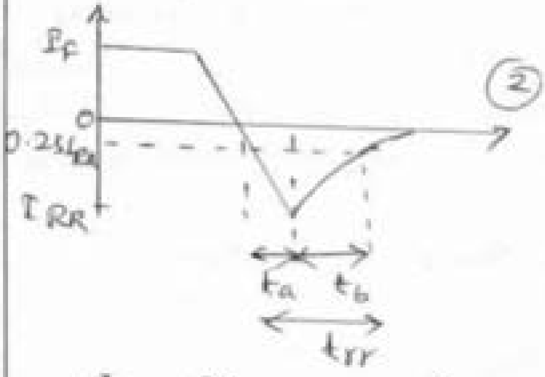
G. H. Ram

PREPARED BY
Mr. G. H. RAVIKUMAR

APPROVED BY
Dr. NARENDRA VISWANATH
PRINCIPAL

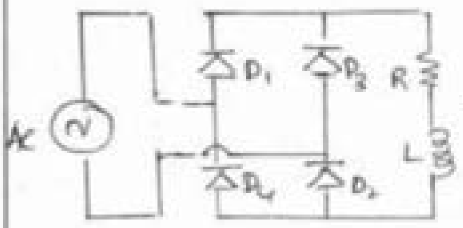
Course Title: POWER ELECTRONICS **Scheme & Solution** **Course Code:** 18EE53

Question Number	Solution	Marks Allocated
1 a)	Power Electronics deals with conversion and control of electrical power with the help of electronic switching devices	02
	1 Lighting: Light dimmer, light flasher, fluorescent lamps and compact fluorescent lamps (CFL) display copiers traffic signal controls, electronic toys	02
	2 Heating/cooling: Electric dryers, electronic ignition of automobiles, furnaces, heat controllers, temperature controllers, ovens, resistance heating ovens/furnaces electric arc furnaces ~~and refrigerators~~ high frequency heating, air conditioners, freezers & refrigerators	02
	3 Welding: Electric arc welding	01
	4 Power supplies: Switch mode power supply (SMPS) ~~dc~~ air craft power supply, battery chargers. Uninterrupted power supply (UPS) AC voltage regulators	01
	5 Speed control: Fans, exhaust fans, food blenders, grinders, blowers, air conditioning & refrigeration plants, conveyers, cranes & hoists, electric vehicles elevators, door openers, electric traction motor controls	02
b)	Diode Rectifiers  + Explanation	02
	AC-DC Converters  + Explanation	02
	AC-AC Converters 	02

Question Number	Solution	Marks Allocated
	 + Explanation	02
	 + Explanation.	02
2 a)		03
	Explanation	07
b)	 ② $t_{rr} = t_a + t_b$ $I_{RR} = t_a \frac{di}{dt}$	02
	Explanation	06
3 a)	$t_{rr}^2 = \frac{2Q_{RR}}{di/dt}$ $Q_{RR} = 1 \times 10^{-5}$ coulombs	04
	$I_{RR} = 8.944$ Amps	04
b)	$\eta = \frac{P_{dc}}{P_{ac}}$	02
	AC component (ripple) $V_{ac} = \sqrt{V_{rms}^2 - V_{dc}^2}$	02
	Form factor $\frac{V_{rms}}{V_{dc}}$	01
	Ripple factor $= \frac{V_{ac}}{V_{dc}} = \frac{\sqrt{V_{rms}^2 - V_{dc}^2}}{V_{dc}} = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$	02

$RF = \sqrt{(FF)^2 - 1}$ 02

$TUF = \frac{P_{dc}}{V_s I_s}$ 02

Question Number	Solution	Marks Allocated
4 a)	 —② $V_0 = \frac{2V_m}{\pi}$ Explanation	④ ⑥
b)	i) $V_0 = \frac{2V_m}{\pi} = 63.66$ Volts $I_0 = 6.33$ Ampr ii) $I_{D\,avg} = 3.183$	④ ④

Shridevi Institute of Engineering andTechnology
Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF Electrical& Electronics

INTERNAL ASSESMENT TEST NO-3

Sub:Renewable Energy Resource **Subcode**: 18EE653
Sem: 6th Sem **Date**: 216/07/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a)With a neat diagram explain working of solar cell. [07M]
(b)Explain I-V characteristics of solar cell and power output. [07M]
(c)Define Altitude angle, Latitude angle, Zenith angle, Solar constant. [06M]

Or

Q-2(a)With a neat diagram explain solar thermal energy storage. [10M]
(b)Explain production of Hydrogen by Thermo chemical reaction process. [10M]

Q-3(a) Define Solar collector.Explain different types of Solar collector. [07M]
(b)With a neat diagram explain Solar cooker and solar water heating system. [07M]
(c) Explain Declination angle. [06M]

Or

Q-4 (a) With a neat diagram explain Brayton heat engine system. [10M]
(b)With a neat diagram explain Solar Dryers and crop dryer system. [10M]

Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF Electrical& Electronics

INTERNAL ASSESMENT TEST NO-3

Sub:Renewable Energy Resource **Subcode**: 18EE653
Sem: 6th Sem **Date**: 216/07/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a)With a neat diagram explain working of solar cell. [07M]
(b)Explain I-V characteristics of solar cell and power output. [07M]
(c)Define Altitude angle, Latitude angle, Zenith angle, Solar constant. [06M]

Or

Q-2(a)With a neat diagram explain solar thermal energy storage. [10M]
(b)Explain production of Hydrogen by Thermo chemical reaction process. [10M]

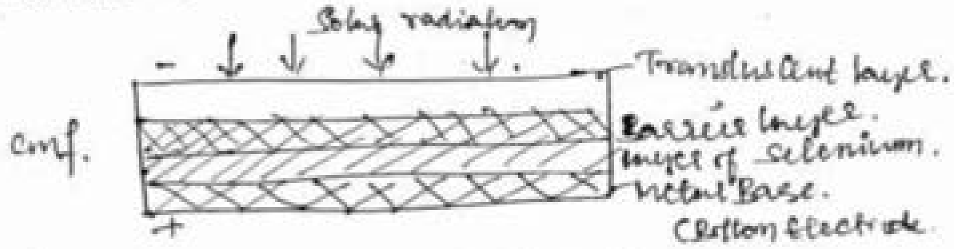
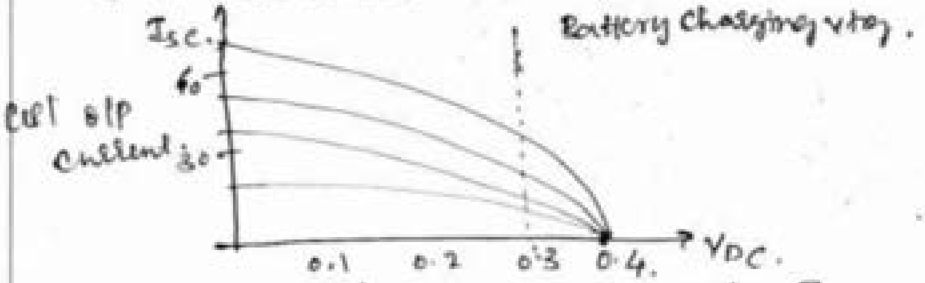
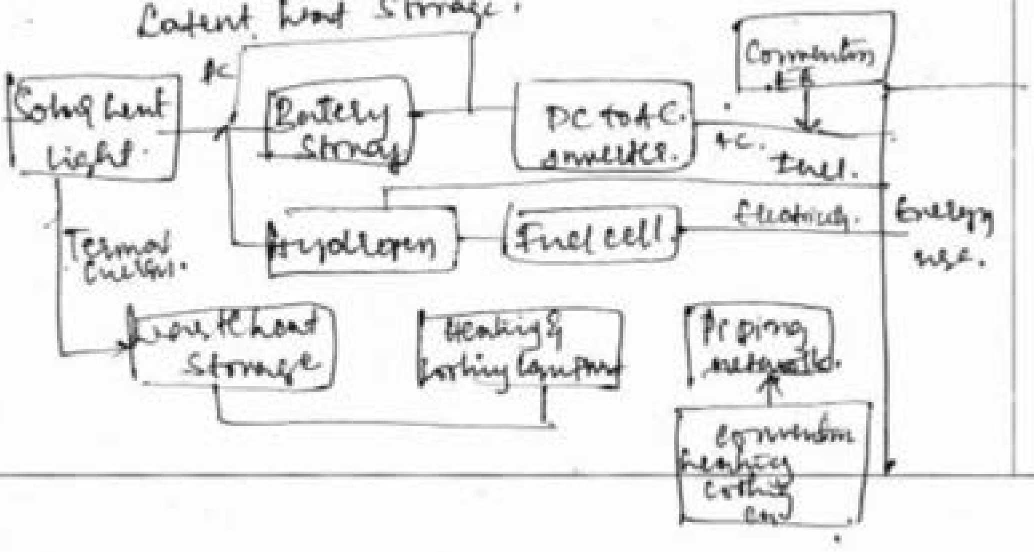
Q-3(a) Define Solar collector.Explain different types of Solar collector. [07M]
(b)With a neat diagram explain Solar cooker and solar water heating system. [07M]
(c) Explain Declination angle. [06M]

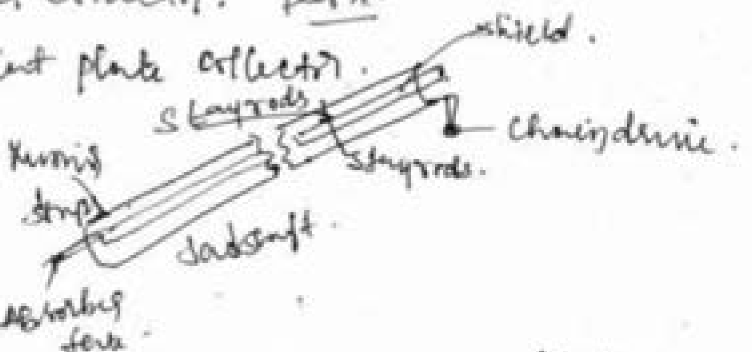
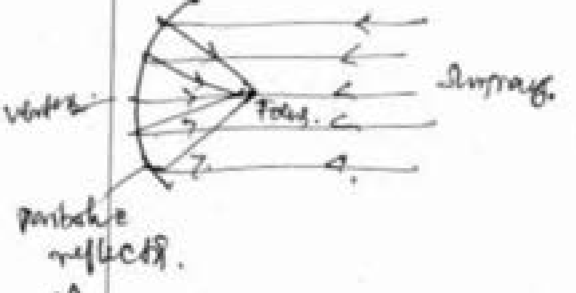
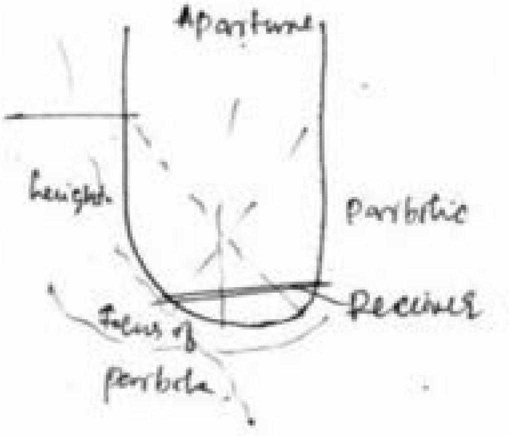
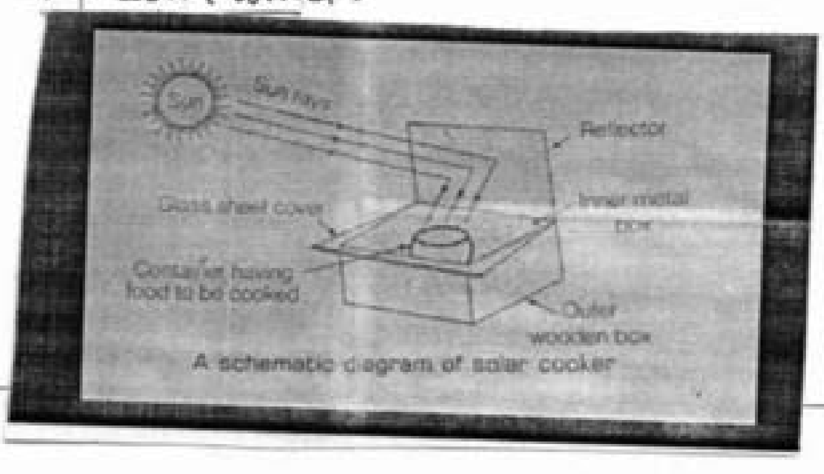
Or

Q-4 (a) With a neat diagram explain Brayton heat engine system. [10M]
(b)With a neat diagram explain Solar Dryers ~~and~~ crop dryer system. [10M]

Signature of staff **Signature of HOD**

Course Title: Renewable Energy Resources **Scheme & Solution** **Course Code:** 18EE653

Question Number	Solution	Marks Allocated
1) a)	Solar Cell.  working principle of solar cell PN junction Emf Based.	4M. 7 M 3M
b)	I-V Characteristics of Solar Cell.  $V = (KT/e) \log_e [1 + (I - I)/I_0]$ I_{SC} - SC Current	3M 7M 2 2
c)	Altitude angle, Latitude, Zenith, Solar constant Definition 2×4	6 M
Q 2) a)	Solar thermal energy Storage. sensible heat storage. Passive Active System. Latent heat Storage. 	

Question Number	Solution	Marks Allocated
Q 2) b)	Hydrogen by Thermo Chemical reaction Process.	
	Thermo production technology.	
	Steam Reforming. $CH_4 + H_2O \rightarrow CO_2 + H_2$	2 10M
	partial oxidation $CH_4 + 1/2 O_2 \rightarrow CO + 2H_2$	2
	Biomass Gassification $2H_2O - O_2 + 4H^+ + 4e^-$	2
	Water and Steam Electrolysis	4
Q 3.	Solar collector. Defn	2M
	Flat plate collector.  	3½
	Concentrating   	PM 7M 3½
b)	solar cooker.  A schematic diagram of solar cooker	3M.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - I, MAY 2022

Semester : **VIII** **Subject:** **POWER SYSTEM OPERATION & CONTROL** **Sub Code: 18EE81**

Max Marks: 40 Date: 20-05-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) With block diagram, explain the digital computer configuration of the SCADA system. 10 Marks

b) What is Automatic Load Frequency Control (ALFC)? Obtain the mathematical modeling to close the ALFC loop 10 Marks

2 a) Explain with block diagram, the modeling of (i) Speed governing system (ii) Turbine (iii) Generator and load 10 Marks

b) Two generating units rated 200 MW and 400MW are operating in parallel. The drop characteristics of their governors are 4% and 5% respectively from no load to full load. Assuming that the generators are operating at 50Hz at no load, how would a load of 600 MW is shared between them? What will be the system frequency at this load? Assume the governor operation. Repeat the problem if both governors have drop of 4%. 10 Marks

3 a) With usual notations, explain following with reference to SCADA systems, EMS, DMS, LMS, AMR. 10 Marks

b) Explain the major components of energy management center. 10 Marks

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - I, MAY 2022

Semester : **VIII** **Subject:** **POWER SYSTEM OPERATION & CONTROL** **Sub Code: 18EE81**

Max Marks: 40 Date: 20-05-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) With block diagram, explain the digital computer configuration of the SCADA system. 10 Marks

b) What is Automatic Load Frequency Control (ALFC)? Obtain the mathematical modeling to close the ALFC loop 10 Marks

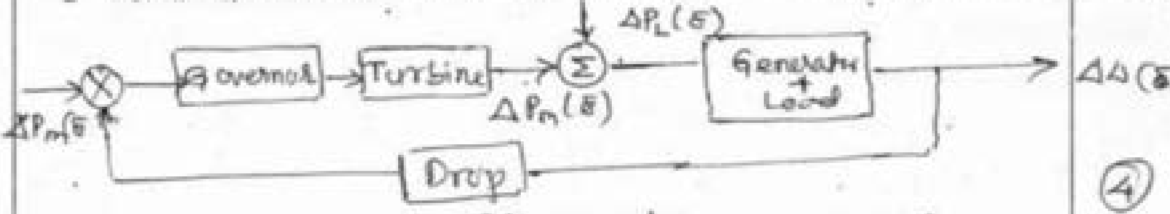
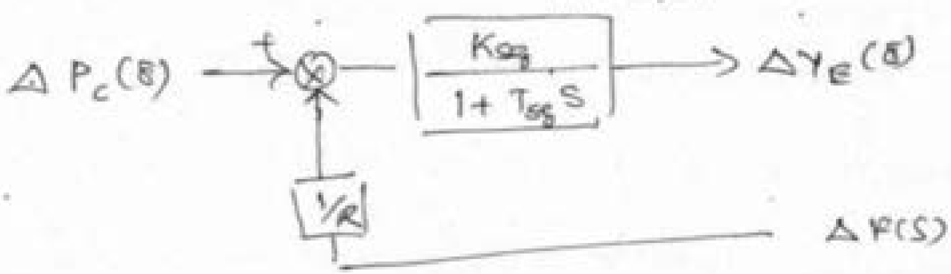
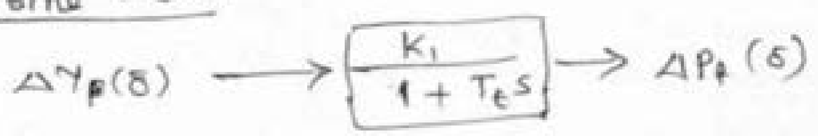
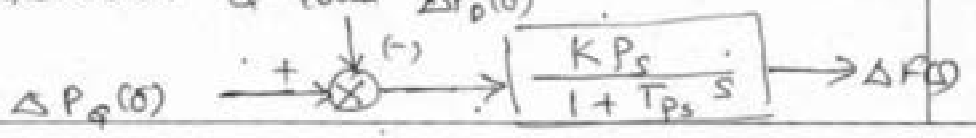
2 a) Explain with block diagram, the modeling of (i) Speed governing system (ii) Turbine (iii) Generator and load 10 Marks

b) Two generating units rated 200 MW and 400MW are operating in parallel. The drop characteristics of their governors are 4% and 5% respectively from no load to full load. Assuming that the generators are operating at 50Hz at no load, how would a load of 600 MW is shared between them? What will be the system frequency at this load? Assume the governor operation. Repeat the problem if both governors have drop of 4%. 10 Marks

3 a) With usual notations, explain following with reference to SCADA systems, EMS, DMS, LMS, AMR. 10 Marks

b) Explain the major components of energy management center. 10 Marks

****

Question Number	Solution	Marks Allocated
1 a)	SCADA system collect information from the site & the equipment & transfer it to a central computer & display the information to the operator to control of the entire system from the central control centre in a SCADA system. Major components of a SCADA system are 1 Field instrumentation 2. Remote station 3 Communication network 4. Central monitoring station, 5 software	⑯
b)	 Functional Block diagram of ALFC Explanation	④ ⑥
2a)	i) Speed Governing system $\Delta Y_E(s) = \frac{K_1 K_3 \Delta P_c(s) - K_2 K_3 \Delta F(s)}{\left(K_4 + \frac{s}{K_5}\right)}$ $= \left[\Delta P_c(s) - \frac{1}{R}\Delta F(s)\right] \times \left[\frac{K_{sg}}{1+T_{sg}s}\right]$ 	④
	ii) Turbine Model 	③
	iii) Generator & load 	③

Question Number	Solution	Marks Allocated
2 b)	200 MW drop = 4 % 400 MW drop = 5% Load 600 MW Reduction in freq Δf Gen 1 $= \left(0.04 \times \frac{50}{200}\right) x$ — ① Reduction in freq Δf Gen 2 $= \left(0.05 \times \frac{50}{400}\right)(600-x)$ — ② equating eqn ① & ② $\left(0.04 \times \frac{50}{200}\right) x = \left(0.05 \times \frac{50}{400}\right)(600-x)$	⑤
	$0.002x = (0.00025 \times 600) - 0.000125 \times 0.000325x = 0.071$ $\therefore x = 230.76$ MW $\Rightarrow$ $x = 231$ MW load on generator 1 Load on generator 2 $= (600-x) = 600-231 = 369$ MW	⑤
3 a)	Explanation about BMS, DMS, LMS, AMR	2+2+3+3
b)	Explanation about Components of energy management center	10 Mar

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - II, JUNE 2022

Semester : VIII **Subject: POWER SYSTEM OPERATION & CONTROL** **Sub Code: 18EE81**

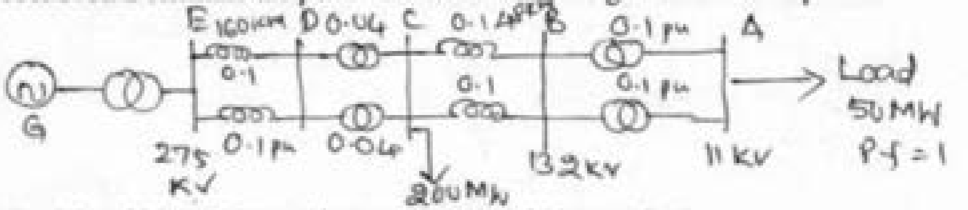
Max Marks: 40 Date: 10-06-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Explain briefly the components/equipments of power system that can generate and/or absorb reactive power. 06 Marks

b) Derive the equation to get the relation between voltage, power and reactive power at a node. 06 Marks

c) In the radial transmission system shown in figure, all p u values are referred to the voltage buses shown and 100MVA. Determine the power factor at which the generator must operate. 08 Marks



2 a) Explain with flow chart unit commitment solution method. 06 Marks

b) Define unit commitment problem 06 Marks

c) Discuss the constraints in unit commitment for thermal plants. 08 Marks

3 a) Explain single master, multiple sub master, multiple remote configuration with a neat diagram 10 Marks

b) Explain the state space model of two area system 10 Marks

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - II, JUNE 2022

Semester : VIII Subject: POWER SYSTEM OPERATION & CONTROL Sub Code: 18EE81

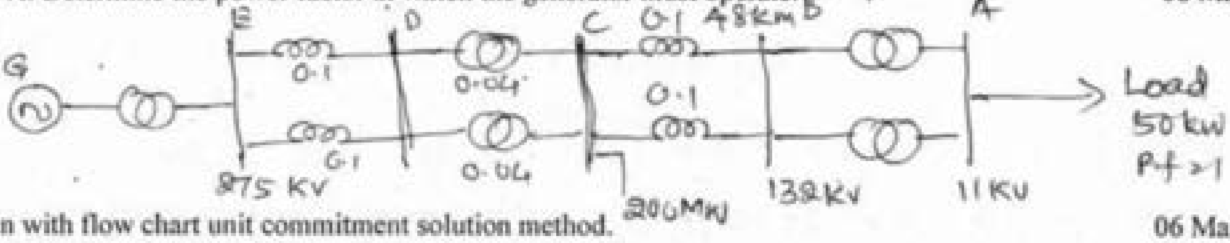
Max Marks: 40 Date: 10-06-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Explain briefly the components/equipments of power system that can generate and/or absorb reactive power. 06 Marks

b) Derive the equation to get the relation between voltage, power and reactive power at a node. 06 Marks

c) In the radial transmission system shown in figure, all p u values are referred to the voltage buses shown and 100MVA. Determine the power factor at which the generator must operate. 08 Marks



2 a) Explain with flow chart unit commitment solution method. 06 Marks

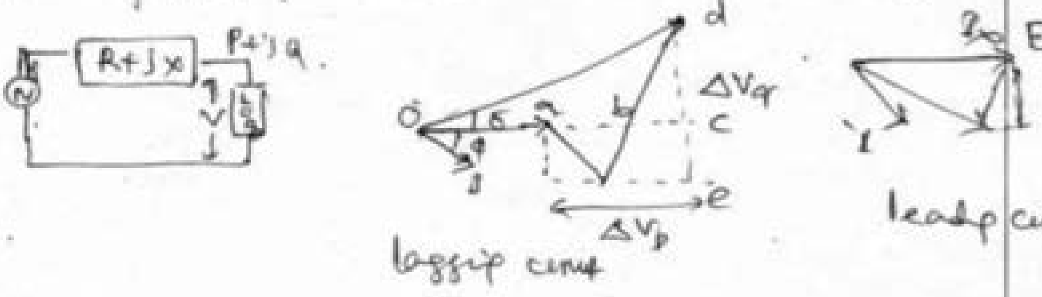
b) Define unit commitment problem 06 Marks

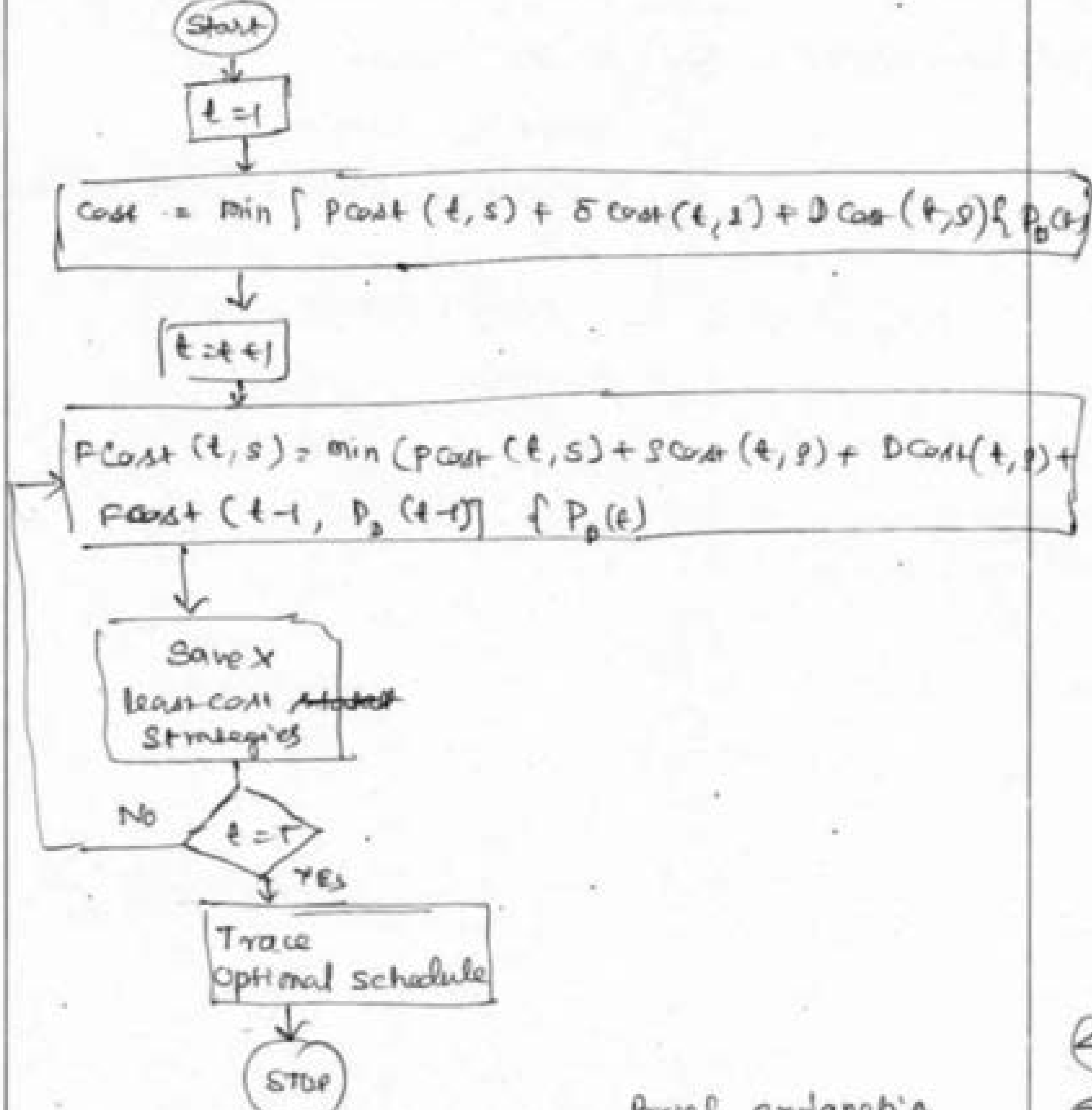
c) Discuss the constraints in unit commitment for thermal plants. 08 Marks

3 a) Explain single master, multiple sub master, multiple remote configuration with a neat diagram 10 Marks

b) Explain the state space model of two area system 10 Marks

Course Title: **Scheme & Solution** **Course Code:**

Question Number	Solution	Marks Allocated
1 a)	i) Synchronous Generator ii) over load lines iii) Under ground cables iv) Transformer v) Loads vi) compensating devices Brief Explanation	Each [illegible] Mark 6 marks
b)		②
	$P = VI\cos\phi$ and $Q = VI\sin\phi$ ~~$E^2 = (V + \frac{RQ}{V})$~~ $E^2 = (V + \Delta p)^2 + (\Delta V_q)^2$ $E - V = \frac{X_q}{V}$ $V = E\left[1 - \frac{Q}{S_{sc}}\right]$	④
c)	Reactance C-A $= \frac{0.1 + 0.1 + 0.04}{2} = 0.12$ Reactance E-C $= \frac{0.1 + 0.04}{2} = 0.07$ $P = 100$ MW $= 1$ pu $I^2 = \frac{P^2 + Q^2}{V^2} = \frac{1^2 + 0}{1^2} = 1$ pu	②
	Reactive power C-A loop is $1 + j0.75$ pu $Q = 0.75 + 0.125 = 0.875$ pu $P = 1 + 1 = 2$ pu A-C $= 2 + \frac{(0.875)^2}{1^2} \times 0.075 = 0.33$ pu	④
	$Q = 0.875 + 0.33 = 1.28$ pu $P = 2$ pu and $Q = 1.208$ pu Generator p.f $= 0.856$	②

Question Number	Solution	Marks Allocated
2 a)	 Brief explanation	4 2
b)	It is required to select optimally out of the available generating sources to operate to se expected load over a specified time + explanation	2 + 4
c)	i) Network constraints ii) Emission constraints iii) Capacity limits of Generations iv) Fuel constraints v) Security constraints vi) Hydel plant constraints + Brief Explanation	8

Question Number	Solution	Marks Allocated
3 a)	Explanation of single master	③
	Explanation of multiple sub master	③
	Explanation of multiple remote configuration	④
b)	Explanation of state space model of two area system	⑩

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - III, JUNE 2022

Semester : VIII **Subject:** POWER SYSTEM OPERATION & CONTROL **Sub Code: 18EE81**

Max Marks: 40 Date: 27-06-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Explain different sources of reactive power generation and absorption of reactive power in a power System. 10 Marks

b) What is system security? Explain the security constrained optimal power flow. 10 Marks

2 a) Derive the equations to get the relation between voltage, power and reactive power at a node. 10 Marks

b) A 220 kV line has tap changing transformer at both ends. The transformer at sending end has a nominal ratio of 11/220kV and that at receiving end 220/11 kV. The line impedance is 20+j60 Ω and the load at the receiving end is 100MVA, 0.8 p.f lag. If the product of two off nominal tap setting is Is. Find the tap setting to give 11kV at load bus. 10 Marks

3a) Explain the factors affecting power system security. 10 Marks

b) Explain the formulation and state estimate using linear least square estimation. Also explain the condition for observability in least square estimation. 10 Marks

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - III, JUNE 2022
Semester : VIII Subject: POWER SYSTEM OPERATION & CONTROL
Sub Code: 18EE81
Max Marks: 40 Date: 27-06-2022 Duration: 1½ Hours
NOTE: Answer two full questions

1 a) Explain different sources of reactive power generation and absorption of reactive power in a power System. 10 Marks

b) What is system security? Explain the security constrained optimal power flow. 10 Marks

2 a) Derive the equations to get the relation between voltage, power and reactive power at a node. 10 Marks

b) A 220 kV line has tap changing transformer at both ends. The transformer at sending end has a nominal ratio of 11/220kV and that at receiving end 220/11 kV. The line impedance is 20+j60 Ω and the load at the receiving end is 100MVA, 0.8 p.f lag. If the product of two off nominal tap setting is Is. Find the tap setting to give 11kV at load bus. 10 Marks

3a) Explain the factors affecting power system security. 10 Marks

b) Explain the formulation and state estimate using linear least square estimation. Also explain the condition for observability in least square estimation. 10 Marks

****

Course Title: PSOC **Scheme & Solution** **Course Code:** 18EE81

Question Number	Solution	Marks Allocated
1a)	i) Synchronous Generators	
	ii). Synchronous compensators	Each ② Mark
	iii) Capacitive & inductive compensators	2⊗5 = 10 Ms
	iv) overhead lines & Underground cables	
	v) Transformers & consumers load	
b)	Protect the system devices in the system is System Security	②
	Major function are	
	i) System monitoring	②
	ii) contigency analysis	②
	iii) Security constrained optimal power flow	④
2a)	$dV = \frac{\delta V}{\delta P} d_P + \frac{\delta V}{\delta Q} dQ = \frac{dP}{\delta P/\delta V} + \frac{dQ}{\delta Q/\delta V}$	④
	$E = \left[V + \frac{RP + XQ}{V}\right]$ $E - V = \frac{RP + XQ}{V}$	③
	$\Delta\delta = \frac{XP - RQ}{V}$ $\delta P = \frac{XP}{V}$	②
b)	$S_R = 0.884 \angle 25$ pu $I_R = \frac{S_R}{V_R = 1} = 0.858$ pu $I_R = 0.888 \angle -25.84 = 0.8 - j0387$	②
	$I_{cable} = I_R - I_{line} = 0.8 - j0.387 - 0.565 - j0.38$ $= 0.566 \angle -348$	②
	Total impedance = $j0.1 + (0.014 + j0.04) // (0.03 + j0.01)$ $= 0.114 \angle 82.3$ pu	②

Question Number	Solution	Marks Allocated
	$V_S = V_R - I Z_{eq}$ $= 1.059 \angle 4.548$	①
	Power loss $= I^2 R_{eq} = (0.888)^2 0.0153 = 0.012$ pu $Q_{loss} = I^2 X_{eq} = (0.888)^2 0.11305 = 0.089$ pu $\phi_s = \tan^{-1} \frac{Q_s}{P_c} = \tan^{-1} \frac{0.475}{0.810} = \underline{\underline{30}}.3$	②
	Sending end p.f $= 0.8\underline{\underline{63}}$	①
3 a)	Explanation of what are the factors effects power system security	⑩
b)	Explanation about state estimate	⑥
	condition for observability	④

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - I, MAY 2022

Semester : VIII **Subject: POWER SYSTEM PLANNING** **Sub Code: 18EE824**

Max Marks: 40 Date: 20-05-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1-a) Explain the planning principles. 10 Marks

b) What do you mean by planning process? Mention the step by step procedure to planning action with block diagram. 10 Marks

2 a) Explain integrated resources planning 10 Marks

b) With a structural model, explain different organizations in power system. 10 Marks

3 a) With the aid of schematic diagram explain various strategies of load management. 10 Marks

b) Explain the different demand forecasting techniques used in power system planning. 10 Marks

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - I, MAY 2022

Semester : VIII **Subject: POWER SYSTEM PLANNING** **Sub Code: 18EE824**

Max Marks: 40 Date: 20-05-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Explain the planning principles. 10 Marks

b) What do you mean by planning process? Mention the step by step procedure to planning action with block diagram. 10 Marks

2 a) Explain integrated resources planning 10 Marks

b) With a structural model, explain different organizations in power system. 10 Marks

3 a) With the aid of schematic diagram explain various strategies of load management. 10 Marks

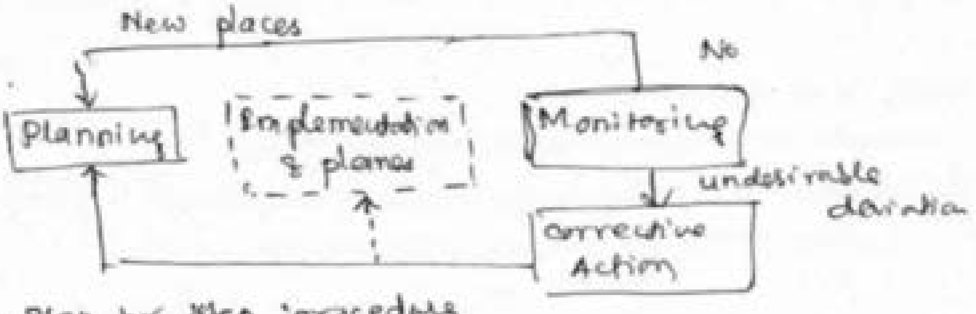
b) Explain the different demand forecasting techniques used in power system planning. 10 Marks

****

P. T. O

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: Power System Planning **Scheme & Solution** **Course Code:** 18EE824

Question Number	Solution	Marks Allocated
1 a)	*Total generation at any moment must be kept equal to total electricity consumption & losses *Reaches consumers, Reaches final distribution * Economically transmit power at higher voltage * Electricity is allowed to flow through the transmission system in accordings with physical occurs & cannot be directed to flow through specific lines. * The system must be designed with reserve capability generation & transmission to allow for unit [illegible] services when contingencies occur * Parallel path flows. Power flows over multiple between supply & use according to least impedances * Location matters: Distribution of generation across the network is necessary to offset voltage drop & & provide reactive power to operate the system of control voltage * Security: The ability of the electric system to withstand sudden disturbances such as electric short circuit * Smart power system: planning for smart power system is necessary for the 21st century	10 Marks
b)	 Step by Step procedure	2 Marks 8 Marks
2 a)	Explanation of integrated resources planning Supply side options, Demand side options	③ ③ + ④
b)	Figure – ② Vertically integrated model Integrated model Open access model	② ③ ③

Question Number	Solution	Marks Allocated
3 a)	Schematic diagram	③ Marks
	Explanation q various strategies q load management	⑦ Marks
b)	Forecasting - continues to gain importance due to the increasing scarcity q electricity along with the availability q lower cost & more powerful computating equipment & software trends identified nowdays are - Industrial to information society - National to world economy - Centralization to decentralization - Either to multiple options The above trends underline the importance q continuing development	5 Marks
	1 Time series 2 Moving Avelage 3 Regression Model 4 Trend Projection 5 Econometric model	5 Marks

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - II JUNE 2022

Semester : VIII **Subject:** POWER SYSTEM PLANNING **Sub Code: 18EE824**
Max Marks: 40 Date: 10-06-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) What is generation mix? Explain importance of pumped storage system.	06 Marks
b) Explain clean coal technologies used in coal based plants.	06 Marks
c) Explain the criteria for transmission planning in power system.	08 Marks
2 a) What are the reasons & advantages favoring HVDC transmission lines	06 Marks
b) Mention and explain different types of conductors used in transmission system	06 Marks
c) What are the national rural electrification policies and main components of rural electrification?	08 Marks
3a) Explain in detail the transmission planning criteria.	10 Marks
b) Explain the benefits of deregulation.	10 Marks

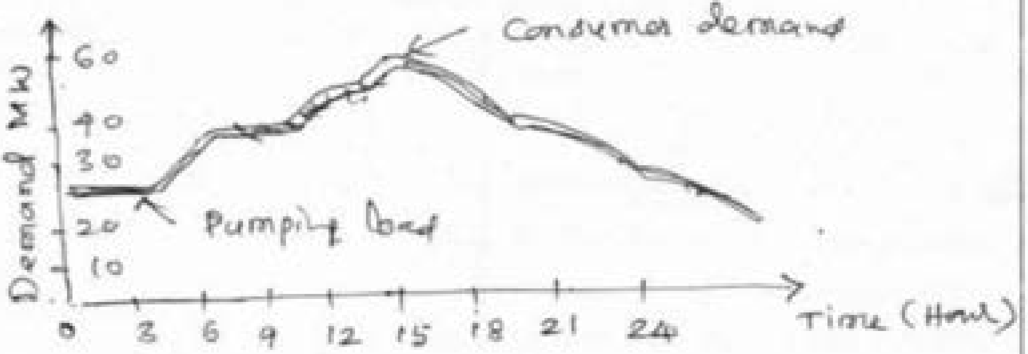
****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - II JUNE 2022
Semester : VIII Subject: POWER SYSTEM PLANNING Sub Code: 18EE824
Max Marks: 40 Date: 10-06-2022 Duration: 1½ Hours
NOTE: Answer two full questions
1 a) What is generation mix? Explain importance of pumped storage system. 06 Marks
b) Explain clean coal technologies used in coal based plants. 06 Marks
c) Explain the criteria for transmission planning in power system. 08 Marks
2 a) What are the reasons & advantages favoring HVDC transmission lines 06 Marks
b) Mention and explain different types of conductors used in transmission system 06 Marks
c) What are the national rural electrification policies and main components of rural electrification? 08 Marks
3a) Explain in detail the transmission planning criteria. 10 Marks
b) Explain the benefits of deregulation. 10 Marks
****

P.T.O

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: PSP **Scheme & Solution** **Course Code:** 18EE824

Question Number	Solution	Marks Allocated
1 a)	 	③
	Figure shows typical pump storage showing generation during peak hours & pumping during off - peak hours Generation mix is decided on the basis of load curve duration, peak, intermediate & base loads. Excess power available during night can be used to pump water up it can be hydro plants there are called pumped storage system & are ideal peaking stations. During peak hours, power plants can be used economically at a constant load.	③
b)	& CGCC / IGCC Coal Gas combined cycle system coal gas washed coal - 30 to 50% ash present only 10 - 15% coal is used The coal washing process reduce the cost of coal by about 10% as washed coal burn longer & provides more energy	03
	circulatory fluidised bed combustion Advantages High combustion η low SO_2 emission ability to burn low grade fuels, fuel flexibility	③
c)	Explanation of criteria for transmission planing in power system	⑧

Question Number	Solution	Marks Allocated
2 a)	Explanation ·· 1. Lower line costs 2. lower losses 3. Asynchronous connection 4 controllability 5. Back bone system 6 Costs 7 long cables 8 Submarine cables	06 Marks
b)	ACCC [Aluminium composite core conductor ACSS {Aluminium conductor steel supported ACSS/TW (Aluminum conductor steel supported stranded wire] + Explanation	06 Marks
c)	Micro/Mini - grids Management of local distribution ⊕ Explanation Distribution circles & Village electrification, Pump set energisation Load development System Improvement	⑧
3 a)	Explanation of transmission planning criteria	⑩
b)	Explanation of Benefits of deregulation	10

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - III, JUNE 2022

Semester : VIII **Subject: POWER SYSTEM PLANNING** **Sub Code: 18EE824**

Max Marks: 40 Date: 28-06-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Explain the principles for electricity market. 10 Marks

b) Explain power pool model (Indian Power Market). 10 Marks

2 a) Explain the settlement software requirement. 10 Marks

b) Explain the planning principles of distribution planning. 10 Marks

3 a) Explain the Electricity supply rules(as per sec 50 of electricity act 2003). 10 Marks

b) Explain the up gradation of existing lines & sub stations. 10 Marks

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - III, JUNE 2022

Semester : VIII Subject: POWER SYSTEM PLANNING Sub Code: 18EE824

Max Marks: 40 Date: 28-06-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Explain the principles for electricity market. 10 Marks

b) Explain power pool model (Indian Power Market). 10 Marks

2 a) Explain the settlement software requirement. 10 Marks

b) Explain the planning principles of distribution planning. 10 Marks

3 a) Explain the Electricity supply rules(as per sec 50 of electricity act 2003). 10 Marks

b) Explain the up gradation of existing lines & sub stations. 10 Marks

****

PTO

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: PSP **Scheme & Solution** **Course Code:** 18EE824

Question Number	Solution	Marks Allocated
1 a)	Electricity markets provide generations with incentives to reduce costs & increases productivity Electricity flows from the power plants to the consumers charge the [illegible]	(10)
b)	Power pool model	③
	explanation about power pool model	⑦
2 a)	Settlement software requirements 1 Procurement phase 2 Method data reporting 3 Settlement phase 4 Invoicing phase 5 Settlement system	(10)
b)	More economical to transport power at high voltage Electricity flows the least resistance/impedance path in the network Every network has nodes & connections operation & maintanance of service	(10)
3 a)	Explanation about the Electricity supply rules	(10)
b)	Explanation of up gradation of existing lines	⑤
	Explanation of [illegible] up gradation of Sub stations	⑤

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEGREE :UG	**AY:2021-2022**	**SEM : I**	**TITLE: Internal Assessment Test-II**	**DATE:25-03-2022**

SUB NAME /CODE: BASIC ELECTRICAL ENGINEERING /21ELE13

Answer two full questions choosing one full question from each Part

Time: 90 Minutes **PART-A** **Max Marks:** 40

1. a) What are the advantages of three phase system over a single phase system? **[CO2] (6Marks)**

b) In three phase star connection, show that $V_L=\sqrt{3}Vph$ explain with circuit diagram, vector diagram of line voltage and phase voltage. **[CO2] (6 Marks)**

c) A coil of resistance 10Ω and inductance of 0.1 H is connected in series with a 150μF capacitor across a 200V , 50Hz supply calculate
(i)inductive reactance (ii) capacitive reactance (iii) Impedance (iv) current (v) power factor
(vi) voltage across coil (vii) voltage across capacitor (viii) energy stored in inductor and capacitor. **[CO2] (8 Marks)**

OR

2. a) In three phase Delta connection, show that $I_L=\sqrt{3}Iph$ explain with circuit diagram,vector diagram of line voltage and phase voltage. **[CO2] (6 Marks)**

b) A circuit consisting of brancha A & B connected in parallel, is connected across a 220V, 50Hz supply

Branch A : A resistance of 7 Ω in series with 0.0125 H inductor,
Branch B : A resistance of 8 Ω in series with 1000 μF, capacitor

Find the branch currents and the total current. Draw the phasor diagram **[CO2] (6 Marks)**

c) show that two wattmeter are sufficient to measure power in 3ϕ balanced star connected circuits with a aid of neat circuit diagram and phasor diagram . **[CO2] (8 Marks)**

PART-B

3. a) What is electric power supply system? Draw a single line diagram of a typical ac power supply scheme **[CO5] (6 Marks)**

b) what are the precautions to be taken to prevent electric shock? **[CO5] (6 Marks)**

c) A 440 V, 3ϕ AC Motor has an output of 80 HP and operates at a pf of 0.866 with an efficiency of 90% calculate (i) The current in each phase of motor if the motor is delta connected
(ii) The readings of the two wattmeters connected in the lines to measure the input power **[CO2] (8 Marks)**

OR

4. a) What is earthing ?why earthing is required? With the help of neat sketch, explain plate earthing. **[CO5] (6 Marks)**

b) Explain working principle of fuse and MCB **[CO5] (6 Marks)**

c) A delta connected load consists of a resistance of 10Ω and capacitance of 100 μF in each phase. A supply of 410V at 50Hz a applied to the load . Find line current, power consumed by the load and power factor **[CO2] (8 Marks)**

Scheme and Solution
Internal Assessment - II   25|03|2022
Basic Electrical Engg - 21ELE13.

1 a) Advantages of three phase system over single phase system.

6 points —

b) Fig
Explanation
vectordiagram
Hence prove $V_L = \sqrt{3} V_{ph}$.

c) (i) $X_L = 2\pi f L$

$= 2 \times \pi \times 50 \times 0.1$

$X_L = 31.41 \Omega$

(ii) $X_C = \frac{1}{2\pi f C}$

$= \frac{1}{2\pi \times 50 \times 150 \times 10^{-6}}$

$= 21.22 \Omega$

(iii) $X_L > X_C$

$Z = \sqrt{R^2 + (X_L - X_C)^2}$

$= \sqrt{10^2 + (31.41 - 21.22)^2}$

$Z = 14.27 \Omega$

(IV) $I = \frac{V}{Z} = \frac{200}{14.27}$

$I = 14.01$ Amps

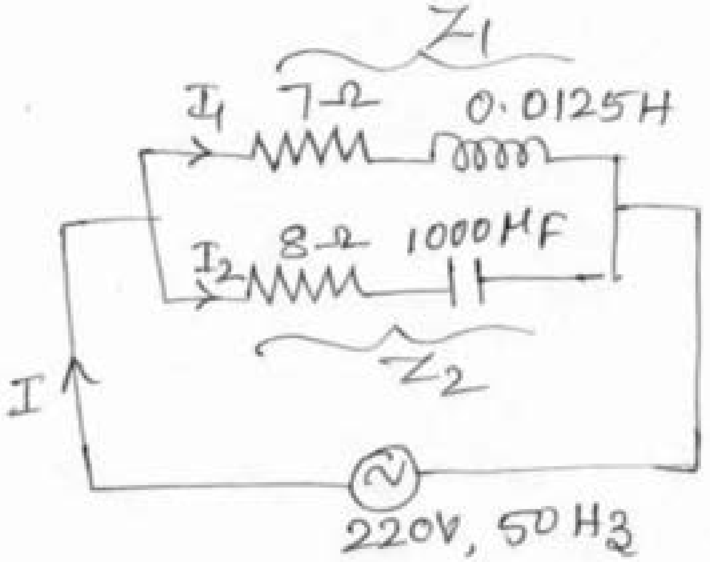
2 a) Fig

Explanation

Vector diagram

Hence proved $I_L = \sqrt{3} I_{ph}$.

b)



— ½ M

$X_L = 2\pi f L$

$= 2\pi \times 50 \times 0.0125$

$X_L = 3.929\,\Omega$ — ½ M

$Z_1 = (7 + j3.929)\,\Omega = 8.027\angle 29.29^\circ$ — ½ M

$X_C = \frac{1}{2\pi f c} = \frac{1}{2\pi 50 \times 1000 \times 10^{-6}}$

$X_C = 3.18\,\Omega$ — ½ M

$Z_2 = (8 - j3.18) = 8.61\angle -21.7^\circ$ — ½ M

$I_1 = \frac{V}{Z_1} = \frac{220\angle 0}{7 + j3.929} = \frac{220\angle 0}{\cancel{8.61\angle -21.7}\ 8.027\angle 29.29}$ — 1M

$I_1 = 27.41\angle -29.29^\circ = (23.9 - j13.4)$ A

$I_2 = \frac{V}{Z_2} = \frac{220\angle 0^\circ}{8.61\angle -21.7} = 25.55\angle 21.7$ — 1M

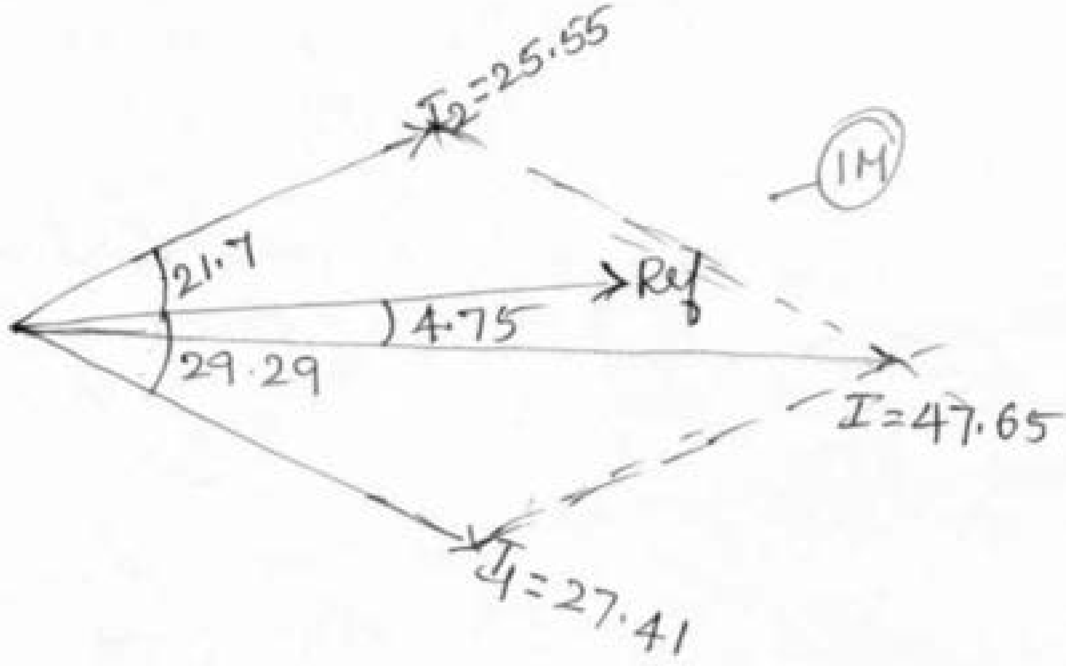
$= (23.75 + j9.45)$ A

$I = I_1 + I_2$

$I = 23.9 - j13.4 + 23.75 + j9.45$

$I = (47.65 - j3.95)$ Amps

$I = 47.65\angle{-4.75}$ — (1/2 M)



3 a) Definition of power supply system

Single line diagram.

Explanation

b) precautions to be taken to prevent Electric shock

6 points

c) $o/p = 80\,HP = 80 \times 746 = 59.68\,KW$

$$\text{Motor } i/p = \frac{o/p}{\eta} = \frac{59.68}{0.9} = 66.3\,KW$$

$\cos\phi = 0.866 \quad \phi = 30^\circ$

Total power $P = 66300\,\text{watts} = \sqrt{3}\,V_L I_L \cos\phi$

$$I_L = \frac{66300}{\sqrt{3} \times 440 \times 0.866}$$

$I_L = 100.5\,A$

(V) $pf = \cos\phi = \frac{R}{Z}$

$= \frac{10}{14.01}$

$= 0.7007$

(VI) voltage across coil

$V_{coil} = I Z_{coil}$

$= 14.01 \times 32.96$

$V_{coil} = 461.76$ volts

$Z_{coil} = \sqrt{R^2 + X_L^2}$

$= \sqrt{10^2 + (31.41)^2}$

$= 32.96 \Omega$

(VII) voltage across capacitor

$V_{cap} = I X_C$

$= 14.01 \times 21.22$

$= 297.29$ volts

(VIII) Energy stored in inductor

$E_{ind} = \frac{1}{2} L I^2$

$= \frac{1}{2} \times (0.1)(14.01)^2$

$= 9.81$ Joules

Energy stored in capacitor

$E_{cap} = \frac{1}{2} C V^2$

$= \frac{1}{2} \times 150 \times 10^{-6} \times (297.29)^2$

$E_{cap} = 6.628$ Joules

(i) $I_{ph} = \frac{I_L}{\sqrt{3}} = \frac{100.5}{\sqrt{3}} = 58$ Amps

(ii) $W_1 + W_2 = 66.3$ KW

$W_1 - W_2 = 22.1$ KW

By solving above eqn:

$$\boxed{\begin{array}{l} W_1 = 44.2\ KW \\ W_2 = 22.1\ KW \end{array}}$$

4 a) definition of earthing

why earthing is required

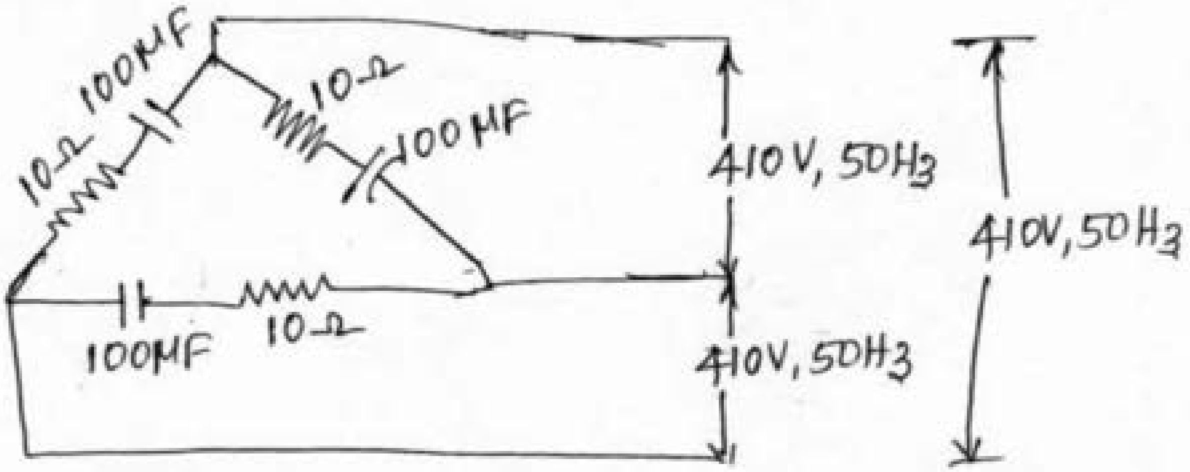
sketch.

Explanation

b) Working principle of fuse

MCB

c)



$Z = R - jX_C$

$X_C = \frac{1}{2\pi f c} = \frac{1}{2\pi \times 50 \times 100 \times 10^{-6}}$

$X_C = 31.83\ \Omega$

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
[An Institution Affiliated to VTU Belagavi, Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD TUMKUR - 572106

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
DEGREE :UG	***AY:2021-2022***	***SEM V***	***TITLE: Internal Assessment Test-I***	***DATE:22-11-21***
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)**
b. What are the desirable properties of conducting material **[CO1](6 Marks)**
c. Compare aluminium and Copper wires **[CO1](6 Marks)**

OR

2 .a) What are the major consideration to evolve a good design. What are the factors for good design **[CO1](6 Marks)**
b. Describe the modern trends in electrical machine design. **[CO1](6 Marks)**

c. Describe the classification of insulating material based on their thermal consideration. **[CO1](8 Marks)**

PART-B

3. a) List out the desirable properties of magnetic material. **[CO1](6 Marks)**
b) Explain the classification of magnetic material related to the value of permeability and distinguish between soft and hard magnetic material **[CO1](8 Marks)**
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)**

OR

4. a) List out the desirable properties of insulating material. **[CO1](6 Marks)**
b) What are ferromagnetic material and solid core material **[CO1](4 Marks)**
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)**

Tanujak.s
Tanuja K.S
(Asst Professor)

G. H. Rame
Prof. G.H Ravikumar
(H.O.D)

Dr.Narendra Vishwanath
(Principal)

Scheme 18EE55

1 a> Explanation of Limitations

8 limitation 1 X 8 8marks.

b> properties of conducting material

6 properties 1X6 6Marks.

c> compare aluminium and copper

3 points each type 2X3 6 Marks.

2 a> major consideration 3M 6Marks

Factors for good design 3M

b> Modern trends in electrical m/c

6 points 1X6 6Marks.

c> classification 8 Marks.

1X8

3> a> desirable properties 1X6 6 marks

b> classification of magnetic material 4M 8Marks.

soft magnetic material 2M

Hard magnetic material 2M

c> specific electric loading —1M 6Marks

specific magnetic loading 1M

Advantages 2M

disadvantages 2M

4 a) properties of insulating material 1X6 6 Marks

b) Ferromagnetic material 2M 4 Marks

solid core material 2M

c) specific electrical loading —2M

magnetic loading —2M

Derivation of o/p eqn. 4M 10 Marks

as Generator 1M

as motor 1M

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - III, MARCH 2022

Semester : III **Subject:** ELECTRIC CIRCUIT ANALYSIS **Sub Code: 18EE-32**

Max Marks: 40 Date: 04-04-2022 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Show that resonant frequency is the geometric mean of cut-off frequencies. 06 Marks

b) A series RLC circuit has a resistance of 100Ω, an inductance of 0.5 H and capacitance of0.4μF. Find the resonant frequency, half power frequencies, band width and quality factor. 08 Marks

c) For the circuit shown in figure 1©, find the value of inductance, take ω = 500 rad/sec 06 Marks

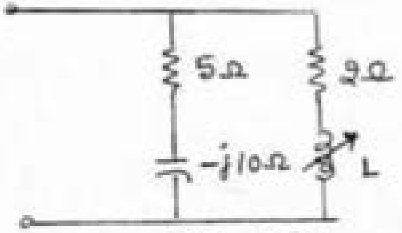


FIG 1 ⓒ

2 a) In the network of figure 2(a), 'k' is changed from position a to b at t=0. Solve for i, $\frac{di}{dt}$, $\frac{di^2}{dt^2}$ at t=0+ if R=1000Ω, L=1H, C=0.1μF and V=100 Volt. 10 Marks

b) The network shown in the accompanying figure 2(b) is in steady state with the switch k is closed. At t=0, the switch is opened. Determine the voltage across the switch, v_k, $\frac{dvk}{dt}$ at t=0+ 10 Marks

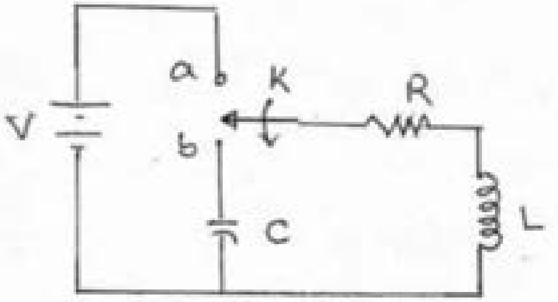


FIG 2 ⓐ

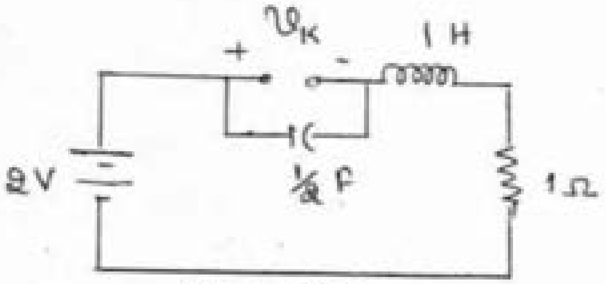


FIG 2 ⓑ

3 a) Find the Laplace transform of a full rectified sine wave. Show that F(S)= $\frac{E}{s^2+1}$ coth(πs/4) 08 Marks

b) Find the Laplace transform of periodic waveform shown in figure 3(b) 06 Marks

c) Find the Laplace transform of periodic waveform shown in figure 3(c) 06 Marks

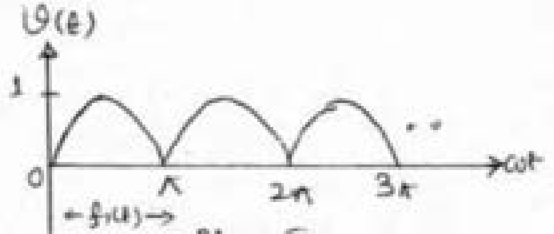


FIG 3 ⓐ

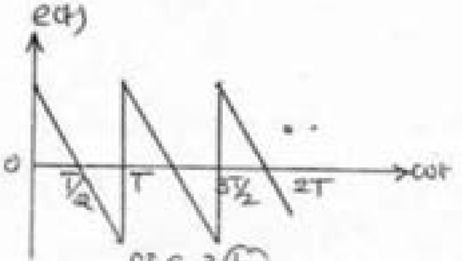


FIG 3 ⓑ

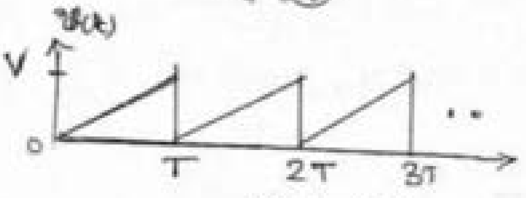


FIG 3 ⓒ

Course Title: ECA **Scheme & Solution** **Course Code:** 18EE32

Question Number	Solution	Marks Allocated
1 a)	Reactance at f_1 $\frac{1}{\omega_1 C}-\omega_1 L = R$ ① At f_2 $\omega_2 L-\frac{1}{\omega_2 C} = R$ ②	②
	① - ② $\frac{1}{\omega_1 C}-\omega_1 L-\omega_2 L+\frac{1}{\omega_2 C}=0$ $\frac{1}{C}\left(\frac{1}{\omega_1}+\frac{1}{\omega_2}\right) = L(\omega_1+\omega_2)$	- ②
	$LC = \frac{1}{\omega_1\omega_2}$ $\omega_r^2 = \omega_1\omega_2$ $\omega_r = \sqrt{\omega_1\omega_2}$ $f_r = \sqrt{f_1 f_2}$	- ②
b)	$f_r = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{0.1\times 0.5\times 10^{-6}}}$ = ~~796.77~~ Hz 355.87	②
	339.95	371.86
	$f_1 = f_r - \frac{R}{4\pi L} = 355.87 - \frac{100}{4\pi(0.5)}$ = 716.19 $f_2 = f_r + \frac{R}{4\pi L}$ = ~~875.34~~	②
	BW = $f_2 - f_1$ = 39.97 $Q = \frac{\omega L}{R}$ = ~~4.99~~ ≃ 5 22.36	④
c)	$Y = Y_L + Y_C = \left(\frac{2}{4+(X_L)^2}+\frac{5}{125}\right)+j\left(\frac{10}{185}-\frac{X_L}{4+X_L^2}\right)$; $\frac{10}{185} = \frac{X_L}{4+X_L^2}$	④
	$X_L = 12.17\,\Omega$ $L = 0.02434$ ④ 6.6×10^{-4} H	②
2 a)	$i(0-) = \frac{V}{R} = 0.1$ Amp $\frac{1}{C}\int i\,dt + Ri + L\frac{di}{dt} = 0$ $\frac{di}{dt}(0+) = -100$ A/s	⑥
	$i(0+) = 0.1$ Amp $\frac{d^2 i(0+)}{dt^2} = -900,000$ Amp/sec^2	④
b)	$i(0+) = 2$ amp. $v = \frac{1}{C}\int i\,dt + L\frac{di}{dt} + Ri$ $v_k(0+) = 0$	②
	$\frac{di}{dt}(0+) = 0$ $\frac{dv_k}{dt} = \frac{1}{C}$, $i(0+) = 2 = 2\times 2 = 4$ Volt/sec	④
	$\frac{d^2 v_k}{dt^2} = \frac{1}{C}\frac{di(0+)}{dt} = \frac{1}{1/2}(0) = 0$ Volt/sec	②
3 a)	$x(t) = \sin t\,u(t) + \sin(t-\pi)\,u(t-\pi)$ $= V(s) = \frac{1}{s^2+1^2}+\frac{e^{-\pi s}}{s^2+1^2}$	③
	$F(s) = \frac{1}{(1-e^{-\pi s})}\frac{1+e^{-\pi s}}{s^2+1}$ ③ $= \frac{1}{s^2+1}\frac{e^{-\frac{\pi s}{2}}\left(e^{\frac{\pi s}{2}}+e^{-\frac{\pi s}{2}}\right)}{e^{-\frac{\pi s}{2}}\left(e^{\frac{\pi s}{2}}-e^{-\pi s/2}\right)} = \frac{\coth\left(\frac{\pi s}{2}\right)}{s^2+1}$	②
b)	$E u(t) - \frac{2E}{T} r(t)\,u(t) + \frac{2E}{T} r(t-T)\,u(t-T) + E u(t-T)$	③
	$E(s) = \left[\frac{E}{s}(1+e^{-Ts}) - \frac{2E}{Ts^2}(1-e^{-Ts})\right] / 1-e^{-Ts}$	③

c) $\frac{V}{T} r(t)u(t) - \frac{V}{T} r(t-T)u(t-T) - V u(t-T)$ $F(s) = \frac{V}{Ts^2}\left[1 - e^{-Ts} - sTe^{-Ts}\right]$

⑥

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, OCTOBER 2020

Semester : V **Subject: SIGNALS & SYSTEMS** **Sub Code: 18EE-54**

Max Marks: 40 Date: 21-11-2021 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Distinguish between the following signals
- i) Continuous time & Discrete time signals
- ii) Even & Odd signals
- iii) Periodic & Non periodic signals
- iv) Energy & Power signals v) Deterministic & Random signals [CO1] 10 Marks

b) Find the even & odd components of $x[n] = \{3, 2, \underset{\uparrow}{1}, 4, 5\}$. [CO 1] 10 Marks

OR

2 a) Determine and sketch the even and odd part of the signal shown in figure 2(a) [CO1] 08 Marks

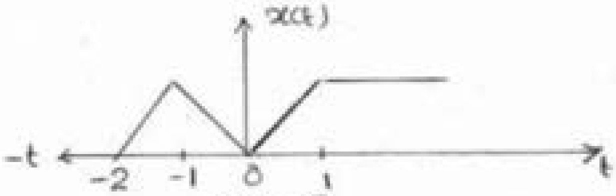


FIG 2(a)

b) State whether the following signals given are periodic or not. If periodic, find the fundamental period

i) $x[n] = \text{Cos}\left[\frac{\pi n}{3}\right] + \text{Sin}\left[\frac{\pi n}{4}\right]$ ii) $x(t) = \text{Cos}(3\pi t)\sin(4\pi t)$ [CO2] 06 Marks

c) 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] 06 Marks

3 a) The raised cosine pulse x(t) shown in figure 3(a) is defined as

Determine the total energy of x(t) $= \begin{cases} \frac{1}{2}[\cos \omega t + 1] & -\frac{\pi}{\omega} < t < \frac{\pi}{\omega} \\ 0 & \text{otherwise} \end{cases}$ [CO2] 10 Marks

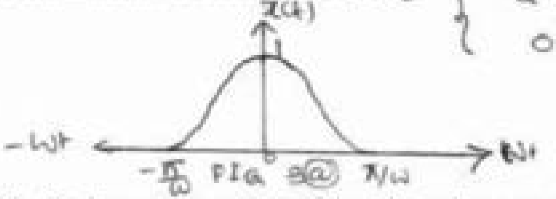


FIG 3(a)

b) What is the average power of the triangular wave shown in figure 3(b) [CO2] 10 Marks

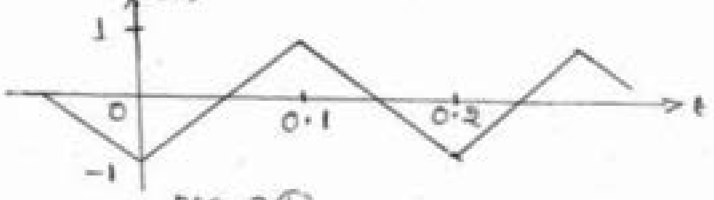


FIG 3(b)

OR

4 a) The trapezoidal pulse shown in figure 4(a), find the total energy of x(t) [CO2] 10 Marks

b) For the signal x(t) shown in figure4(b), sketch i) x[2(t-2)] ii)x[-2t-1] ii)x(-t) [CO2] 10 Marks

****

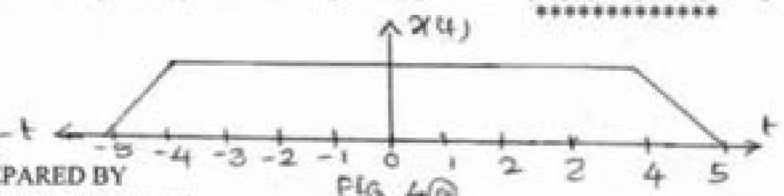


FIG 4(a)

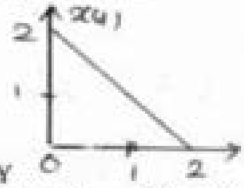
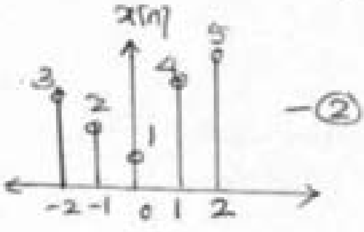
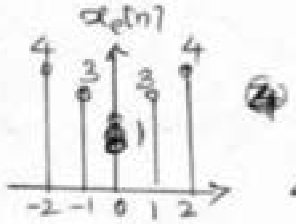
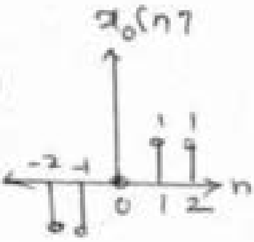
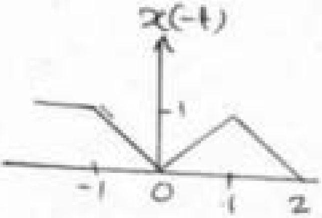
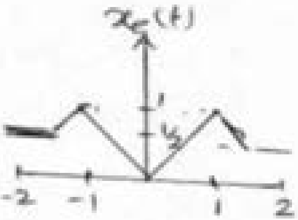
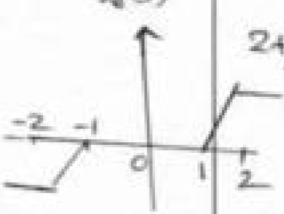


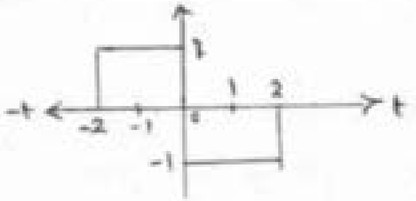
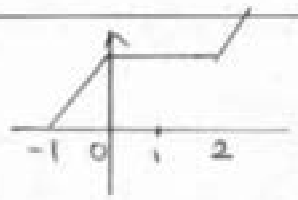
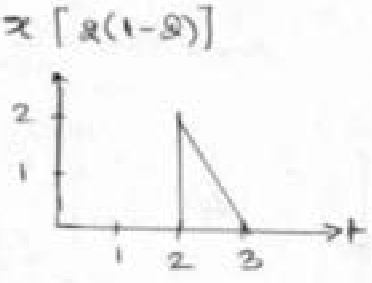
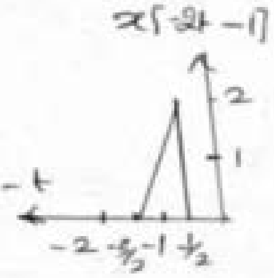
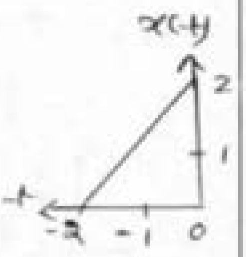
FIG 4(b)

PREPARED BY
Mr. G. H. RAVIKUMAR

APPROVED BY
Dr. NARENDRA VISWANATH
PRINCIPAL

Course Title: SIGNALS & SYSTEMS **Scheme & Solution** **Course Code:** 15EE54

Question Number	Solution	Marks Allocated
1 a)	→ A signal is said to be continuous time signal, the amplitude of signal varies continuously w.r.t time. A discrete time signal is defined only at discrete instants of time → Even $x(t) = x(-t)$ for all 't' Odd $x(-t) = -x(t)$ for all t → Signal is periodic it satisfies the condition $x(t) = x(t+T)$ for all t. Non periodic $x(t) \neq x(t+T)$ for all 't' → 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" → $E = \lim_{T \to \infty} \int_{-T/2}^{T/2} x^2(t)\,dt$; $E = \sum_{n=-\infty}^{\infty} x^2(n)$ $P = \lim_{T \to \infty} \frac{1}{T} \int_{-T/2}^{T/2} x^2(t)\,dt$ $P = \lim_{N \to \infty} \frac{1}{2N+1} \sum_{n=-N}^{N} x^2(n)$	5⊗2 10 Marks
b)	  	④
2a)	  	2+3+3
b)	i) $N_1 = 4$ $N_2 = 8$ $\frac{N_1}{N_2} = \frac{1}{2}$ ∴ N = 8 samples ii) $T_1 = 1$ sec $T_2 = \frac{1}{3}$ sec $\frac{T_1}{T_2} = \frac{3}{1}$ T = 1 sec	3+3

Question Number	Solution	Marks Allocated
2 a)	 	2+2
3 a)	$E = \int_{-\pi/\omega}^{\pi/\omega} \left\{\frac{1}{2}\left[\cos\omega t+1\right]\right\}^{2} dt = \frac{3\pi}{4\omega}$ Joules	2+8
b)	$x(t) = \begin{cases} 20t-1 & 0<t<0.1 \\ -20t+3 & 0.1<t<0.2 \end{cases} \quad T=0.2$	⑤
	$P = \underset{T\to\infty}{Lt} \frac{1}{T}\left[\int_{0}^{0.1}(20t-1)^2 dt + \int_{0.1}^{0.2}(-20t+3)^2 dt\right] = \frac{1}{3}$ watt < 10	⑤
4 a)	$x(t) = \begin{cases} t+5 & -5<t<-4 \\ 1 & -4<t<4 \\ -t+5 & 4<t<5 \end{cases}$	⑤
	$E = \int_{-5}^{-4}(t+5)^2 dt + \int_{-4}^{4}1^2 dt + \int_{4}^{5}(-t+5)^2 dt = \frac{26}{3}$ Joule < 10 ⑤	
b)	  	2+2+2

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
Department of Electrical & Electronics Engineering
INTERNAL ASSESSMENT -II, DECEMBER 2021

Semester : V Subject: **SIGNALS & SYSTEMS** Sub Code: **18EE-54**
Max Marks: **40** Date: 28-12-2021 Duration: **90** Minutes

NOTE: Answer any two full questions

NOTE: 1. Answer any two full questions

1 a) State and prove the following properties of Fourier-transform i) Time shift ii) Frequency shift iii) Time Differentiation iv) Parseval,s Theorem 12 Marks

b) Find the Fourier Transform of $x(t) = \begin{cases} 1 & -T \le t \le T \\ 0 & |t| > T \end{cases}$ 08 Marks

2 a) The SINC function. Find the inverse FT of the rectangular pulse and is given by 10 Marks

$X(jw) = \begin{cases} 1 & -W \le w \le W \\ 0 & |w| > W \end{cases}$

b) Use partial fraction expansion to determine the inverse FT for the following signals

i) $X(j\omega) = \frac{-(j\omega)^2-4j\omega-6}{[(j\omega)^2+3j\omega+2][jw+4]}$ ii) $X(j\omega) = \frac{2j\omega+1}{(j\omega+2)^2}$ 10 Marks

3 a) Use appropriate properties to determine the inverse Fourier Transform of $X(j\omega) = \frac{j\omega}{(j\omega+2)^2}$ 08 Marks

b) Find the frequency response and impulse response of the system described by the differential equation $\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = -\frac{dx(t)}{dt}$ 06 Marks

c) Find the FT of the following signals i) $x(t) = e^{-2t}u(t-3)$ ii)) $x(t) = e^{-4|t|}$ 06Marks

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
Department of Electrical & Electronics Engineering
INTERNAL ASSESSMENT -II, DECEMBER 2021

Semester : V Subject: **SIGNALS & SYSTEMS** Sub Code: **18EE-54**
Max Marks: **40** Date: 28-12-2021 Duration: **90** Minutes

NOTE: Answer any two full questions

NOTE: 1. Answer any two full questions

1 a) State and prove the following properties of Fourier-transform i) Time shift ii) Frequency shift iii) Time Differentiation iv) Parseval,s Theorem 12 Marks

b) Find the Fourier Transform of $x(t) = \begin{cases} 1 & -T \le t \le T \\ 0 & |t| > T \end{cases}$ 08 Marks

2 a) The SINC function. Find the inverse FT of the rectangular pulse and is given by 10 Marks

$X(jw) = \begin{cases} 1 & -W \le w \le W \\ 0 & |w| > W \end{cases}$

b) Use partial fraction expansion to determine the inverse FT for the following signals

i) $X(j\omega) = \frac{-(j\omega)^2-4j\omega-6}{[(j\omega)^2+3j\omega+2][jw+4]}$ ii) $X(j\omega) = \frac{2j\omega+1}{(j\omega+2)^2}$ 10 Marks

3 a) Use appropriate properties to determine the inverse Fourier Transform of $X(j\omega) = \frac{j\omega}{(j\omega+2)^2}$ 08 Marks

b) Find the frequency response and impulse response of the system described by the differential equation $\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = -\frac{dx(t)}{dt}$ 06 Marks

c) Find the FT of the following signals i) $x(t) = e^{-2t}u(t-3)$ ii)) $x(t) = e^{-4|t|}$ 06Marks

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR
Department of Electrical & Electronics Engineering
INTERNAL ASSESSMENT -II, DEC- 2021

Semester : V
Subject: **POWER ELECTRONICS**
Sub Code: **18EE53**
Max Marks: **40**
Date: 28-12-2021
Duration: **90** Minutes

NOTE: Answer any two full questions

1 a) Explain the V-I characteristics of SCR, also define i) Latching current and ii) Holding current. 06 Marks

b) Using two-transistor model, explain the turn ON mechanism of a SCR, and derive an expression for anode current in terms of transistor parameters. 08 Marks

c) A thyristor operating at 220Volt is gated with a pulse width of 40μSec, the latching current of thyristor is 36mA, for a load of 60Ω and 2H will the thyristor gets triggered? If not find the width of pulse for successful triggering of SCR, thyristor operating at 220V. 06 Marks

2 a) Explain the different types of turning ON of thyristors. 06 Marks

b) Ten thyristors are used in string withstand of DC voltage of Vs=150kV. The maximum leakage current and recovery charge differences of thyristors are 10mA and 150μC respectively. Each thyristor has a voltage sharing resistor of R=56kΩ and capacitance of C=0.5μF. Determine i) The maximum steady state voltage sharing ii) Steady state voltage DRF iii) The maximum voltage sharing iv) The transient voltage DRF 06 Marks

c) With the circuit and waveforms explain the working of UJT triggering circuit 08Marks

3 a) With circuit diagram & waveforms, explain the of protection of SCR 10 Marks

b) With current & voltage waveforms, explain the dynamic turn ON and turn OFF characteristics of SCR. 10 Marks

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR
Department of Electrical & Electronics Engineering
INTERNAL ASSESSMENT -II, DEC- 2021

Semester : V
Subject: **POWER ELECTRONICS**
Sub Code: **18EE53**
Max Marks: **40**
Date: 28-12-2021
Duration: **90** Minutes

NOTE: Answer any two full questions

1 a) Explain the V-I characteristics of SCR, also define i) Latching current and ii) Holding current. 06 Marks

b) Using two-transistor model, explain the turn ON mechanism of a SCR, and derive an expression for anode current in terms of transistor parameters. 08 Marks

c) A thyristor operating at 220Volt is gated with a pulse width of 40μSec, the latching current of thyristor is 36mA, for a load of 60Ω and 2H will the thyristor gets triggered? If not find the width of pulse for successful triggering of SCR, thyristor operating at 220V. 06 Marks

2 a) Explain the different methods of turning ON of thyristors. 06 Marks

b) Ten thyristors are used in string withstand of DC voltage of Vs=150kV. The maximum leakage current and recovery charge differences of thyristors are 10mA and 150μC respectively. Each thyristor has a voltage sharing resistor of R=56kΩ and capacitance of C=0.5μF. Determine i) The maximum steady state voltage sharing ii) Steady state voltage DRF iii) The maximum voltage sharing iv) The transient voltage DRF 06 Marks

c) With the circuit and waveforms explain the working of UJT triggering circuit 08Marks

3 a) With circuit diagram & waveforms, explain the of protection of SCR 10 Marks

b) With current & voltage waveforms, explain the dynamic turn ON and turn OFF characteristics of SCR. 10 Marks

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY

(An ISO 9001:2000 Certified Institution)

Sira Road TUMKUR-572106

Course Title: S & S **Scheme & Solution** **Course Code:** 18EE54

Question Number	Solution	Marks Allocated
1 a)	i) $x(t-t_0) \leftrightarrow e^{-j\omega t_0} X(j\omega)$	3
	ii) $e^{j\theta t} x(t) \leftrightarrow X[j(\omega-\theta)]$	3
	iii) $\frac{dx(t)}{dt} \longleftrightarrow j\omega X(j\omega)$	3
	iv) $\int_{-\infty}^{\infty} \lvert x(t) \rvert^2 dt \longleftrightarrow \frac{1}{2\pi} \int_{-\infty}^{\infty} \lvert X(j\omega) \rvert^2 d\omega$	2
b)	$\int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt = \int_{-T}^{T} 1 e^{-j\omega t} dt = \left(\frac{e^{-j\omega t}}{-j\omega} \right)_{-T}^{T}$	②
	$X(j\omega) = \frac{2}{\omega} \sin(\omega T)$ for $\omega \neq 0$	
	$X(j\omega) = 2T$ for $\omega = 0$	④
	FIG	
	$\omega = \pm \frac{n\pi}{T}$	②
2 a)	$x(t) = \frac{1}{2\pi} \int_{-W}^{W} X(j\omega) e^{+j\omega t} d\omega = \frac{1}{2\pi} \left[\frac{e^{j\omega t}}{jt} \right]_{-W}^{W}$	
	$x(t) = \frac{1}{\pi t} \left[\frac{e^{jWt} - e^{-jWt}}{2j} \right] = \frac{1}{\pi t} \sin(Wt)$ for $t \neq 0$	⑥
	$x(t) = \frac{W}{\pi}$ for $t = 0$ and $t = \pm \frac{n\pi}{W}$	②
	$x(t) = \frac{W}{\pi} \frac{\sin(Wt)}{Wt}$	②
b)	i) $x(t) = [-1 e^{-t} + 1 e^{-2t} - 1 e^{-4t}] u(t)$	5
	ii) $x(t) = [2 e^{-2t} - 3 e^{-2t}] u(t)$	5

Question Number	Solution	Marks Allocated
3 a)	$\frac{1}{(2+j\omega)} \longleftrightarrow e^{-2t}u(t)$ Freq · shift $\frac{dX(j\omega)}{d\omega} = -jt\,x(t)$	
	$-jt\,e^{-2t}u(t) = \frac{d}{d\omega}\frac{1}{(2+j\omega)} = \frac{(2+j\omega)0-1(0+j1)}{(2+j\omega)}$	
	$t\,e^{-2t}u(t) = \frac{1}{-j}\,\frac{-j}{(2+j\omega)^2}$ $t\,e^{-2t}u(t) = \frac{1}{(2+j\omega)^2}$	
	$\frac{dx(t)}{dt} = j\omega\,X(j\omega)$	4
	$\frac{d}{dt}\left[t\,e^{-2t}u(t)\right] = j\omega\frac{1}{(j\omega+2)^2} = \frac{j\omega}{(2+j\omega)^2}$	
	$\left[t\,e^{-2t}(-2)+e^{-2t}(1)\right] = \frac{j\omega}{(2+j\omega)^2} \rightarrow (1-\underline{2t})\,e^{-2t}u(t)$	4
b)	$Y(j\omega)\left[j\omega^2+5j\omega+6\right] = -j\omega\,X(j\omega)$	2
	$\frac{Y(j\omega)}{X(j\omega)} = \frac{A}{j\omega+2}+\frac{B}{j\omega+3}$ $h(t) = \left[2e^{-2t}-3e^{-3t}\right]u(t)$	4
c)	i) $\int_3^\infty e^{-2t}e^{-j\omega t}dt = \int_3^\infty e^{-(2+j\omega)t}dt = \left[\frac{e^{-(2+j\omega)t}}{-(2+j\omega)}\right]_3^\infty$	
	$X(j\omega) = \frac{e^{-3(2+j\omega)}}{2+j\omega} = \frac{e^{-6-j3\omega}}{2+j\omega}$	3
	ii) $\int_{-\infty}^0 e^{4t}e^{-j\omega t}dt + \int_0^\infty e^{-4t}e^{-j\omega t}dt = \left(\frac{e^{(4-j\omega)t}}{4-j\omega}\right)_{-\infty}^0 + \left(\frac{e^{-(4+j\omega)}}{-(4+j\omega)}\right)_0^\infty$	
	$\frac{1}{4-j\omega}+\frac{1}{4+j\omega}$ $X(j\omega) = \frac{8}{16+\omega^2}$	3

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
Department of Electrical & Electronics Engineering
III-INTERNAL ASSESSMENT, FEBRUARY 2022

Semester : **V** Subject: **POWER ELECTRONICS** Sub Code: **18EE-53**
Max Marks: **40** Date: 8-02-2022 Duration: **90** Minutes

NOTE: Answer any two full questions

1 a) With neat circuit diagram and waveforms, explain the working principle of single phase full wave AC voltage controller with RL load. Derive the expression for rms output voltage 10 Marks

b) The single phase full wave AC voltage controller has an input voltage of 230V and a load resistance of 10Ω. The firing angle is 45°. Calculate i) RMS output voltage ii) The output power iii) the input p.f 10 Marks

2 a) Explain the principle of step-down chopper and derive an expression for average and output rms voltage 10 Marks

b) A chopper is feeding an RL load with Vs=220 volts, R=5Ω, L=7.5mH,f=1kHz, k=0.5 and E=0volts. Calculate i) the minimum instantaneous load current I_1 ii) the peak instantaneous load current I_2 iii) maximum peak to peak load ripple current (iv) the average value of load current I_a (v) the rms load current I_0 (vi) the effective input resistance 10 Marks

3 a) Classify the different types of choppers with the help of circuit diagram & waveforms. Explain the Operation of four quadrant chopper[redacted] 10 Marks

b) Explain the working of step-up chopper. Derive an expression for average output voltage 10 Marks

4 a) With the help of switching model and switching waveforms explain the switching characteristics of power BJT 10 Marks

b) The ß of Bipolar transistor varies from 12 to 75. The load resistance is 1.5Ω. The supply voltage Vcc=40V and base input voltage is 6V. If $V_{CE(sat)}$ =1.2V, $V_{BE(sat)}$ =1.6V and Ra=0.7Ω. Calculate i) ODF ii) Forced ß iii) total power loss in transistor. 10 Marks

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
Department of Electrical & Electronics Engineering
III-INTERNAL ASSESSMENT, FEBRUARY 2022

Semester : V Subject: POWER ELECTRONICS Sub Code: 18EE-53
Max Marks: 40 Date: 8-02-2022 Duration: 90 Minutes

NOTE: Answer any two full questions

1 a) With neat circuit diagram and waveforms, explain the working principle of single phase full wave AC voltage controller with RL load. Derive the expression for rms output voltage 10 Marks

b) The single phase full wave AC voltage controller has an input voltage of 230V and a load resistance of 10Ω. The firing angle is 45°. Calculate i) RMS output voltage ii) The output power iii) the input p.f 10 Marks

2 a) Explain the principle of step-down chopper and derive an expression for average and output rms voltage 10 Marks

b) A chopper is feeding an RL load with Vs=220 volts, R=5Ω, L=7.5mH,f=1kHz, k=0.5 and E=0volts. Calculate i) the minimum instantaneous load current I_1 ii) the peak instantaneous load current I_2 iii) maximum peak to peak load ripple current (iv) the average value of load current I_a (v) the rms load current I_0 (vi) the effective input resistance 10 Marks

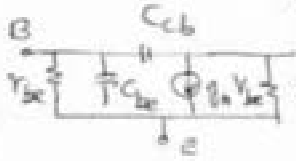
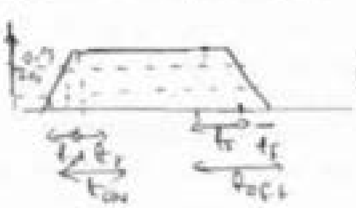
3 a) Classify the different types of choppers with the help of circuit diagram & waveforms. Explain the Operation of four quadrant chopper[redacted] 10 Marks

b) Explain the working of step-up chopper. Derive an expression for average output voltage 10 Marks

4 a) With the help of switching model and switching waveforms explain the switching characteristics of power BJT 10 Marks

b) The ß of Bipolar transistor varies from 12 to 75. The load resistance is 1.5Ω. The supply voltage Vcc=40V and base input voltage is 6V. If $V_{CE(sat)}$ =1.2V, $V_{BE(sat)}$ =1.6V and Ra=0.7Ω. Calculate i) ODF ii) Forced ßiii) total power loss in transistor. 10 Marks

Course Title: PE **Scheme & Solution** **Course Code:** 18EE53

Question Number	Solution	Marks Allocated
1 a)	Circuit Diagram - ② wave forms - ② Explanation ②	
	$V_{o(rms)} = V_{s(rms)} \sqrt{\frac{1}{\pi}\left(\beta - \alpha + \frac{\sin 2\alpha}{2} - \frac{\sin 2\beta}{2}\right)}$ - ②	
b)	i) $V_{o(rms)} = V_{s(rms)} \frac{1}{\pi}\sqrt{\left(\pi - \alpha + \frac{\sin 2\alpha}{2}\right)} = 219.3$ volts	— ③
	ii) $P_o = I_o^2 R = \left(\frac{V_o}{R}\right)^2 R = \frac{V_o^2}{R} = \frac{(219.3)^2}{10} = \overset{5290 \text{ watt}}{4809.24 \text{ watt}}$	—③
	iii) $P.f = \frac{P_o}{V_s I_s \cdot I_o} = \frac{4809.24}{230(21.93)} = 0.9534$	— ④
2 a)	Circuit Diagram - ②, Explanation ② + waveform ②	
	$V_a = KV_s$ -② RMS $V_o = \sqrt{K} V_s$ -②	
b)	$I_1 = \frac{V_s}{R}\frac{(e^{Ton/c} - 1)}{e^{T/c} - 1} = 18.36A$ $I_2 = \frac{V_s}{R}\frac{(1 - e^{-Ton/m})}{1 - e^{-T/m}} = 25.626A$ ②②	
	$\tau = L/c$	
	$\Delta I = I_2 - I_1 = 7.26$ Amps ① $I_a = \frac{I_1 + I_2}{2} = 21.99 \approx 22$ Amp	—①
	RMS load current $I_o = \left[\frac{1}{KT}\int_0^{KT} i_1^2 dt\right]^{1/2} = \sqrt{I_1^2 + \frac{(\Delta I)^2}{3} + I_1 \Delta I}$	
	$I_o = 22.08$ Amp -③ $R_i = \frac{V_s}{I_s} = \frac{V_s}{KI_a} = \frac{220}{0.5(22)} = 20\Omega$	— ①
3 a)	class A, class B, class C, class D & Class E + Explanation 5 × 2 Marks	10 Marks
b)	Circuit diagram -② + waveform ② + Explanation + $V_o = V_s\left(\frac{1}{1-K}\right)$	⑥
4 a)	  ②+② + Explanation ⑥	
b)	i) $ODF = \frac{I_B}{I_{B(sat)}}$ $I_{C(sat)} = \frac{V_{CC} - V_{CE(sat)}}{R_C} = \frac{40 - 1.2}{1.5} = 25.86A$	
	$ODF = \frac{25.86}{12} = 2.155A$ $I_{B(sat)} = \frac{I_{C(sat)}}{\beta_{min}} = \frac{25.86}{12} = 2.155A$	

$I_B = \frac{V_B - V_{BE}}{R_B} = \frac{6 - 1.6}{0.7} = 6.285A$ $ODF = \frac{I_B}{I_{B(sat)}} = 2.915$

Forced $\beta_f = \frac{I_{C(sat)}}{I_B} = \frac{25.86}{6.285} = 4.114$ $P_T = V_{BE} I_B + V_{CE} I_C$

$P_T = 41.088$ watt

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
Department of Electrical & Electronics Engineering
INTERNAL ASSESSMENT - III, FEBRUARY 2022

Semester : **V** Subject: **SIGNALS & SYSTEMS** Sub Code: **18EE-54**
Max Marks: **40** Date: 8-02-2022 Duration: **90** Minutes

NOTE: Answer any two full questions

1 a) Determine graphically, the output of an LTI system whose impulse response is h(t) = 3u(t-1)- 3u(t-3) and input is x(t) = u(t+1) -2u(t-1) + u(t-3) 10 Marks

b) Given x[n] = β^n u(n) and h[n] = α^n u(n). Find the output of LTI system using convolution sum when i) $\alpha \neq \beta$ ii) $\alpha = \beta$ 10 Marks

2 a) Determine the convolution sum of two sequences x[n]={$\underset{\uparrow}{3}$, 2, 1, 2} and h[n]={1,$\underset{\uparrow}{2}$, 1, 2} 10 Marks

b)) Find the output response of the system described by a differential equation $\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + 2x(t)$. The input signal x(t) = e^{-t}u(t) and initial conditions are y(0)=2, $\frac{dy(0)}{dt} = 3$ 10 Marks

3 a) Draw the direct form-I and direct form-II implementation of the following differential equation $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = \frac{d^2x(t)}{dt^2} + \frac{dx(t)}{dt}$ 06 Marks

b) What is ROC? Mention the properties of ROC. 06 Marks

c) Determine the Z-transform and ROC of the following sequence x(n) = $-b^n u(-n-1)$ 08 Marks

4 a) Determine the inverse Z-transform of X(Z) = $\frac{1}{1-1.5Z^{-1}+0.5Z^{-1-2}}$ i) |Z|>1 ii) ½<|Z|<1 iii) |Z|< ½ 10 Marks

b) Determine the Z-transform of x(n)=-u(n-1)+ $(½)^n$u(n) and plot pole zero location of X(z) in the Z-plane 10 Marks

---

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
Department of Electrical & Electronics Engineering
III-INTERNAL ASSESSMENT, FEBRUARY 2022

Semester : **V** Subject: **SIGNALS & SYSTEMS** Sub Code: **18EE-54**
Max Marks: **40** Date: 8-02-2022 Duration: **90** Minutes

NOTE: Answer any two full questions

1 a) Determine graphically, the output of an LTI system whose impulse response is h(t) = 3u(t-1)- 3u(t-3) and input is x(t) = u(t+1) -2u(t-1) + u(t-3) 10 Marks

b) Given x[n] = β^n u(n) and h[n] = α^n u(n). Find the output of LTI system using convolution sum when i) $\alpha \neq \beta$ ii) $\alpha = \beta$ 10 Marks

2 a) Determine the convolution sum of two sequences x[n]={$\underset{\uparrow}{3}$, 2, 1, 2} and h[n]={1,$\underset{\uparrow}{2}$, 1, 2} 10 Marks

b)) Find the output response of the system described by a differential equation $\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + 2x(t)$. The input signal x(t) = e^{-t}u(t) and initial conditions are y(0)=2, $\frac{dy(0)}{dt} = 3$ 10 Marks

3 a) Draw the direct form-I and direct form-II implementation of the following differential equation $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = \frac{d^2x(t)}{dt^2} + \frac{dx(t)}{dt}$ 06 Marks

b) What is ROC? Mention the properties of ROC. 06 Marks

c) Determine the Z-transform and ROC of the following sequence x(n) = $-b^n u(-n-1)$ 08 Marks

4 a) Determine the inverse Z-transform of X(Z) = $\frac{1}{1-1.5Z^{-1}+0.5Z^{-1-2}}$ i) |Z|>1 ii) ½<|Z|<1 iii) |Z|< ½ 10 Marks

b) Determine the Z-transform of x(n)=-u(n-1)+ $(½)^n$u(n) and plot pole zero location of X(z) in the Z-plane 10 Marks

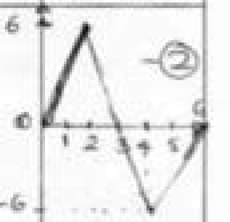
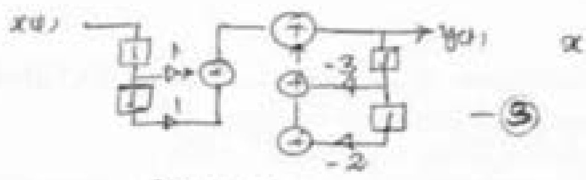
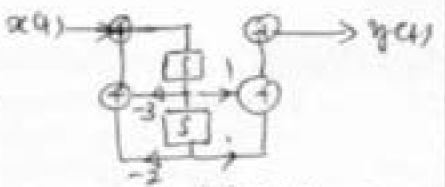
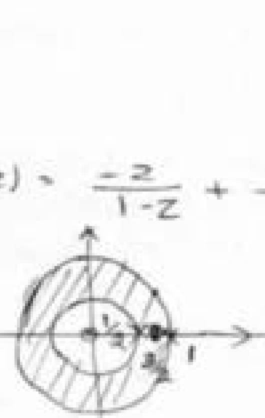
****

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY

(An ISO 9001:2000 Certified Institution)

Sira Road TUMKUR-572106

Course Title: Signals & Systems **Scheme & Solution** **Course Code:** 18EC54

Question Number	Solution	Marks Allocated
1 a)	 ② $y(t) = 3t \quad 0 \le t \le 2$ –② $y(t) = 18 - 6t \quad 2 < t < 4$ –② $y(t) = 3t - 18 \quad 4 < t < 6$ –②	–②
b)	i) $y(n) = \frac{\alpha^{n+1} - \beta^{n+1}}{\alpha - \beta}$ for $\alpha \neq \beta$ ii) $y(n) = \alpha^n[n+1]$ for $\alpha = \beta$	⑤+⑤
2 a)	$y(n) = \{3, \underset{\uparrow}{9}, 8, 12, 9, 4, 4\}$	
b)	$\lambda_1 = -2, \ \lambda_2 = -4 \quad y^h(t) = c_1 e^{-2t} + c_2 e^{-4t}$ $y_p(t) = e^{-t}u(t) \quad ce^{-t} - 6ce^{-t} + 8ce^{-t} = -e^{-t} + 2e^{-t}$ $C = e^{-t}/3e^{-t}$ $\boxed{C = 1/3}$ $y(t) = c_1e^{-2t} + c_2e^{-4t} + \frac{1}{3}e^{-t}$ $c_1 + c_2 = \frac{5}{3}$ $\frac{dy(t)}{dt} = -2c_1 - 4c_2 - \frac{1}{3}$ $-c_1 - 2c_2 = \frac{5}{3}$ }② $c_1 = 5 \quad c_2 = -\frac{10}{3}$ –② $y(t) = 5e^{-2t} - \frac{10}{3}e^{-4t} + \frac{1}{3}e^{-t}$	② ② ② ②
3 a)	 Direct Form I –③  Direct Form II	③
b)	Any six ROCs	⑥
c)	$X(z) = \frac{-z}{b-z}$ 	②
4 a)	$\frac{X(z)}{z} = \frac{z}{(z-1)(z-0.5)}$ $A = 2 \quad B = -1$ $X(z) = 2\frac{z}{z-1} - \frac{1}{z-\frac{1}{2}}$ i) $x(n) = 2u(n) - (\frac{1}{2})^n u(n)$ –② ii) $x(n) = 2(1)^n u(-n-1) - (\frac{1}{2})^n u(n)$ –② iii) $x(n) = 2(1)^n[-u(-n-1)] - (\frac{1}{2})^n[-u(n-1)]$ $= -2u(-n-1) + (\frac{1}{2})^n u(-n-1)$ –③	②+①
b)	$X(z) = \frac{-z}{1-z} + \frac{z}{z-\frac{1}{2}}$ –④ put $z = 3/4$ $x(z) = 0$ $X(z) = \frac{-2z^2 + 3/2\, z}{(1-z)(z-\frac{1}{2})}$  –③	④

SHRIDEVI INSTITUTE OF ENGINEERING ANDTECHNOLOGY

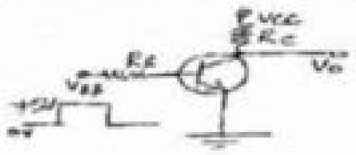
[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGNIEERING

ACADEMIC YEAR 2021-2022 (ODD SEM)

FIRST INTERNAL ASSESSMENT

COURSE CODE: 18EE34 **COURSE NAME: AEC** **MAX MARKS : 40 MARKS**
DURATION : 90 Min **SEM: III** **DATE OF TEST : 08-12-2021**

Q. NO	ANSWER ANY ONE FULL QUESTION FROM PART – A & PART - B	CO	MARKS
PART -A			
1	a) Explain the operation of transistor as switch along with suitable circuit and necessary waveforms .high light the design procedure	1	10M
	b) Explain the fixed bias, emitter bias and voltage divider bias with neat diagram	2	10M
OR			
2	a) In a voltage divider bias circuit of BJT, RC=4KΩ, RE=1.5kΩ,R1=1.5KΩ, R2=3.9 KΩ,VCC=18V and ß=70 .find ICQ and VCEQ	1	10M
	b) Design a collector to base bias circuit for the following specifications VCC=10V,VCE=5V,IC=1 mA , ß=50.If ß varies from 25 to 75 .find the changein collector Current.	3	10M
PART -B			
3	a) For a voltage divider bias circuit of, RC=1KΩ, RE=470Ω, R1=10KΩ, R2=5KΩ, ß=100, determine the stability factor S_{ICO}. Draw the circuit diagram.	1	10M
	b) Describe the hybrid equivalent model and h – parameter model for CE configuration	1	10M
OR			
4	a) Design a voltage divider biasing circuit with a supply voltage of 10V and VCE=VCC/2.the load resistance is 2 KΩ take ß=100.	2	10M
	b) For the below shown circuit calculate the value of RB that just saturatesthe transistor when Vi=+5V,given that RC=1 KΩ, ß=100, VCC=5V, VCE(sat)=0.2V. 	3	10M

PREPARED BY
Mr. V.RAJESH KUMAR
COURSE INSTRUCTOR

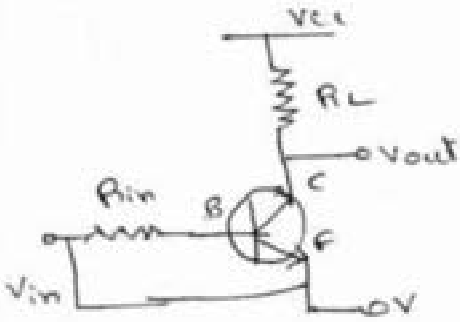
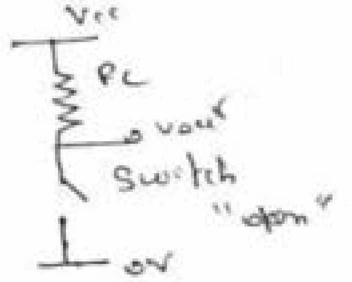
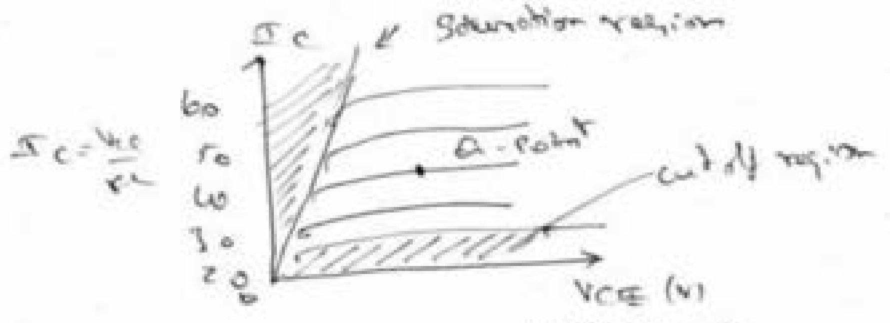
APPROVED BY
Dr. NARENDRA VISWANATH
PRINCIPAL

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

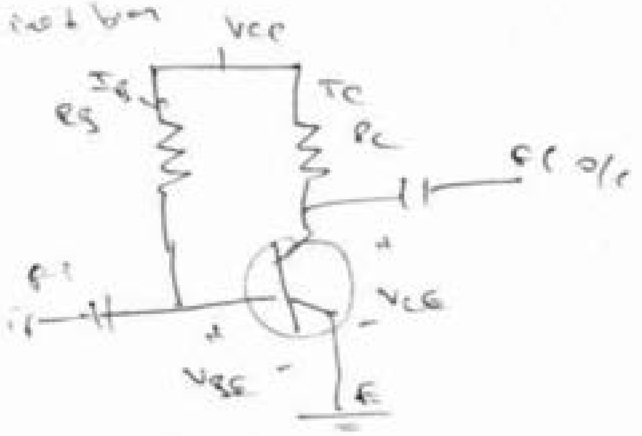
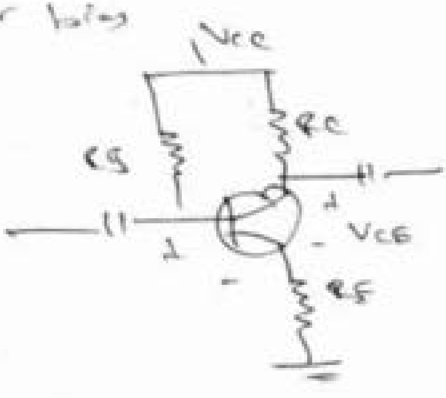
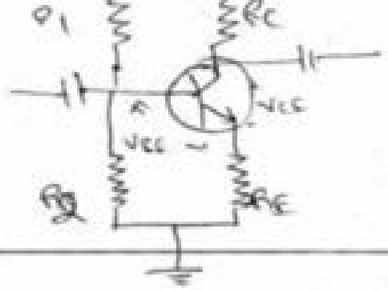
SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	3	AEC	18EE34	06-12-2021	40	2021-2022

Q.No	Solution	Marks Allocated
1a)	Transistor is mainly used for amplification. Apart from that it can be used as switches for control and computer application	1
	 	1
	Transistor switches can be used to switch a low voltage DC device (eg LED's) ON or OFF. by using a transistor in its saturated @ cut off state	2
	 when Ic = 0	2
	when transistor is used as a switch, the operating point has to move from saturation to cut-off region $V_{CE} = V_{CC}$	2

PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

Q.No	Solution	Marks Allocated
1b)	Fixed bias , Emitter bia, Voltage divider bias.	
	Fixed bias  $I_B = \frac{V_{CC}-V_{BE}}{R_B}$	2
	$V_{CE} = V_{CC} - I_C R_C$ $I_C = \beta I_B$	2
	$V_{CE} = V_C - V_E$	
	Emitter bias  $I_c = (1+\beta)I_B$ $I_B = \frac{V_{CC}-V_{BE}}{R_B+(1+\beta)R_E}$	2
	$V_B = V_{BE} + I_E R_E$, $V_{CE} = V_C - V_E$	
	voltage divider bias  $I_E = \frac{V_B - V_{BE}}{R_E}$ $R_B = \frac{R_1 R_2}{R_1+R_2}$	2
	$V_T = \frac{V_{CC} R_2}{R_1+R_2}$ $V_T = I_B R_B + V_{BE} + I_E R_E$	2

$= I_B R_B + V_{BE} + (1+\beta) I_B R_E$

$I_B = \frac{V_T - V_{BE}}{R_B + (1+\beta)R_E}$ $V_{CE} = V_{CC} - I_C R_C - I_E R_E$

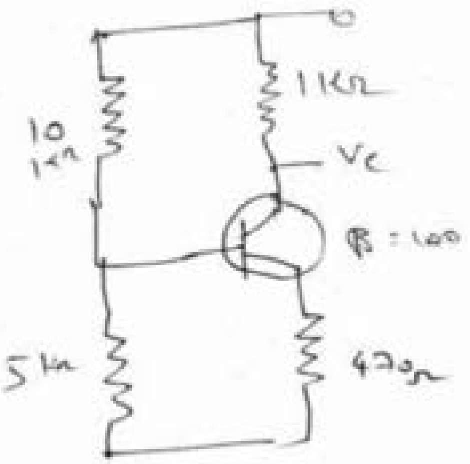
Q.No	Solution	Marks Allocated
2a)	using exact analysis:	
	$R_B = R_1 \parallel R_2$	
	$= 1.5K \parallel 3.9K$	2
	$= 1.083K\Omega$	
	$V_T = \frac{R_2 V_{CC}}{R_1 + R_2} = \frac{3.9 \times 18}{(1.5) + (39} = 13V$	
	$I_B = \frac{V_T - V_{BE}}{R_B + (1+\beta)R_E} = \frac{13 - 0.7}{1.083 + (1+70)1.5} = \frac{13 - 0.7}{1.083K + (1+70)1.5K}$	2
	$= \frac{12.3}{107.583K}$ $I_B = 114.33$	
	$I_C = \beta I_B = 8.003mA$	
	$I_E = I_B + I_C = 114.33 + 8.003$	2
	$= (114.33 \times 10^{-3}) + (8.003)$	
	$I_E = 8.117mA$ $V_{CE} = -26.27$	
	Approximate method:	
	$V_B = V_T = 13V$ $= V_E = V_B - V_{BE} = 13 - 0.7$	
	$V_E = 12.3V$	
	$I_C = V_E / R_E = \frac{12.3}{1.5k} = 8.2 mA$	2
	$V_{CE} = -26.62$	
	$I_{CQ} = 8.08 mA$	2
	$V_{CEQ} = -26.27$	

Q.No	Solution	Marks Allocated
2b	$I_C = 1mA$	
	$I_B = \frac{I_C}{\beta} = \frac{1mA}{50} = 20\mu A$	2
	$R_E = \frac{V_{CC} - V_{CE}}{I_B + I_C} = \frac{10-5}{1mA + 20\mu A} = 4.9K$	2
	$R_B = \frac{V_{CE} - V_{BE}}{I_B} = \frac{5-0.7}{20\mu A} = 215K$	
	for $\beta = 25$	
	$I_B = \frac{V_{CC} - V_{BE}}{R_B + (1+\beta)R_E} = \frac{10-0.7}{215K + (1+25)4.9K} = 27.16\mu A$	2
	$I_C = \beta I_B = 2.5 \times 27.16\mu A$	
	$I_C = 0.679\ mA$	
	$\beta = 75$	
	$I_B = \frac{V_{CC} - V_{BE}}{R_B + (1+\beta)R_E} = \frac{10-0.7}{215K + (1+75)4.9K} = 15.83\mu A$	2
	$I_B = 15.83\mu A$	
	$I_C = \beta I_B = 75 \times 15.83\mu A$	
	$\boxed{I_C = 1.187\ mA}$	
	Therefore the change in I_C is from $0.679\ mA$ to $1.187\ mA$	2

Q.No	Solution	Marks Allocated

3a)

$$S_{(ICO)} = \frac{1+\beta}{1+\left(\frac{\beta R_E}{R_C+R_B}\right)}$$ 4



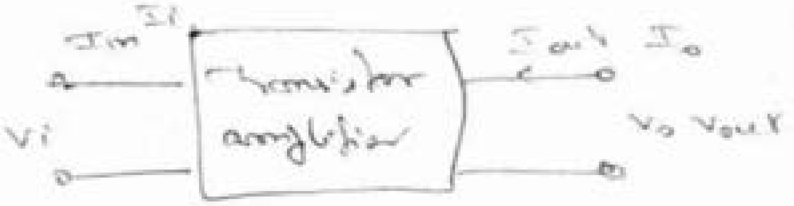
$R_B = R_1 \| R_2 = 10\|5 = 3.33k$ 2

$$S_{ICO} = \frac{1+100}{1+\left(\frac{100\times 470}{1000\times 3.333}\right)}$$ 2

2

$S_{ICO} = 8.525$

3b)



2

I_i = i/p current to the amplifier

V_i = i/p voltage to amplifier 2

I_o = output current of the amplifier

V_o = o/p voltage of amplifier

Q.No	Solution	Marks Allocated
	$V_i = f_1(I_i, V_o)$	
	$I_o = f_2(I_i, V_o)$	1
	$V_i = h_{11} I_i + h_{12} V_o$	
	$I_o = h_{21} I_i + h_{22} V_o$	
	$V_i = h_i I_i + h_r V_o$	1
	$I_o = h_f I_i + h_o V_o$	
	$h_{11} = \frac{V_i}{I_i}\Big\|_{V_o = 0}$ Short circuit impedance	2
	$h_{12} = \frac{V_i}{V_o}\Big\|_{I_i = 0}$ unitless	
	$h_{21} = \frac{I_o}{I_i}\Big\|_{V_o = 0}$ unitless	
	$h_{22} = \frac{I_o}{V_o}\Big\|_{I_i = 0}$ output admittance	2

Q.No	Solution	Marks Allocated
40)	$V_E = \frac{V_{CC}}{10} = \frac{10}{10}$ $\boxed{V_E = 1V}$	2
	$I_C = \frac{V_{CC} - V_{CE} - V_E}{R_C}$ $= \frac{10-5-1}{2K\Omega}$ $\boxed{I_C = 2mA}$	2
	$I_B = \frac{I_C}{\beta} = \frac{2mA}{100}$ $= 20\mu A$	2
	$R_E = \frac{V_E}{I_B + I_C} = \frac{1}{2\mu A + 20\mu A}$ $\boxed{R_E = 495\Omega}$	2
	$10R_2 \leq \beta R_E$ $10R_2 \leq 100 \times 495$ $R_2 \leq \frac{100 \times 495}{10}$ $R_2 \leq 4.95k\Omega$	1

Q.No | Solution | Marks Allocated

Assuming $R_2 = 5.1\,K\Omega$

$V_B = V_{BE} + V_E = 0.7 + 1$ $\boxed{V_B = 1.7V}$

$V_B = \frac{R_2}{R_1 + R_2} V_{CC}$

$1.7 = \frac{5.1 \times 10}{R_1 + 5.1k}$ 1

$1.7R_1 + 8670 = 51000$

$\boxed{R_1 = 24.9K}$

9b) Applying KVL we can write

$V_{CC} = I_C R_C + V_{CE}$ 2

$V_{CE} = 0.2\,V$

$V_{CC} = 5V$, $R_C = 1K\Omega$

$\beta = 100$ $V_i = +5V$

$I_C = \frac{5V - 0.2V}{1K\Omega} = \frac{4.8V}{1K\Omega} = 4.8mA$ 2

$\boxed{I_C = 4.8mA}$

$I_B > I_C/\beta$

$I_B > \frac{4.8mA}{100} > 48\mu A$ 1

Apply KVL of the base we can write

Q.No	Solution	Marks Allocated
	$V_{BB} = I_B R_B + V_{BE}$ (0.7 for Si)	2
	$R_B = \frac{V_{BB} - V_{BE}}{I_B}$	
	$= \frac{5 - 0.7V}{48\mu A}$	2
	$= 89.58\ k\Omega$	
	$\boxed{R_B = 89.58\ k\Omega}$	1
	— x —	

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGNIEERING

ACADEMIC YEAR 2021-2022 (ODD SEM)

FIRST INTERNAL ASSESSMENT

COURSE CODE: 18EE52
SEMESTER : V
DURATION : 2.00 PM TO 3.30 PM

COURSE NAME: MC
MAX MARKS : 40 MARKS
DATE OF TEST: 20-11-2021

Q. NO	ANSWER ANY ONE QUESTION FROM PART A AND PART B	MARKS
	PART - A	
1	a) With neat diagram explain the internal RAM organization of 8051 [CO1]	07 M
	b)With a neat diagram , explain the steps to interface 8k bytes of program RAM and 8k byte of data ROM to 8031 based system [CO1]	08 M
	c) Explain the PSW in microcontroller 8051 [CO1]	05M
	OR	
2	a)Describe about the I/O port usage in 8051 microcontroller [CO2]	05M
	b)Explain about the various memory addressing modes [CO2]	07M
	c). Explain the function of following: i)Accumulator, Register B and CPU registers ii)Program counter ,stack and stackpointer [CO2]	08 M
	PART -B	
3	a) Draw the Block diagram of 8051 microcontroller [CO1]	07M
	b)Explain and draw the diagram of memory address decoding [CO1]	07M
	c) Explain about different types of special function registers and its uses [CO1]	06M
	OR	
4	a) Explain about the assembler directive ORG ,DB, EQU [CO2]	07 M
	b) Draw the programming model of 8051 [CO1]	07 M
	c)With a neat diagram explain the range of JUMP and CALL Instructions [CO1]	06M

Prepared By
V.Rajesh Kumar
Course Instructor

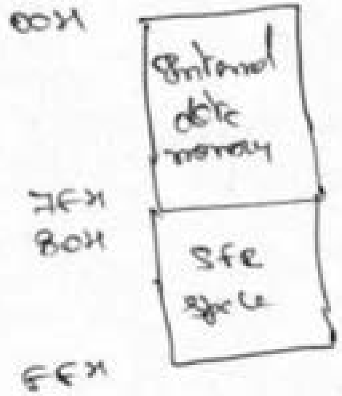
Approved By
Dr.Narendra Viswanath
Principal

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	5	MC	18EE52	20-11-2021	40	2021-2022

Q.No	Solution	Marks Allocated
1a)		3m
	First one for register bank, bit addressable memory locations, stacks. Another part is the SFR area. Only 21 addresses from the SFR area can be used in this microcontroller.	2m
	Register Banks: Bank 0 Bank 1 Bank 2 Bank 3 Each bank has 8 registers. Each bank has register R0 to R7.	2m

PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE-DEPT

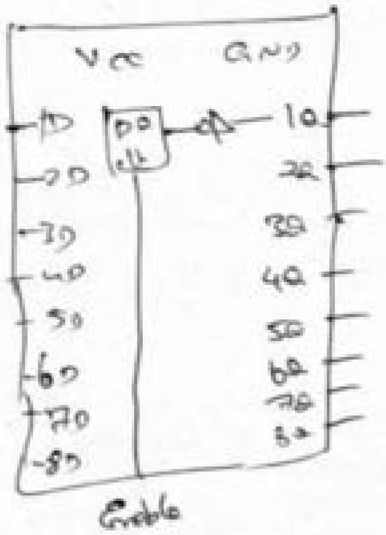
APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	5	MC	18EE52	20-11-2021	40	2021-2022

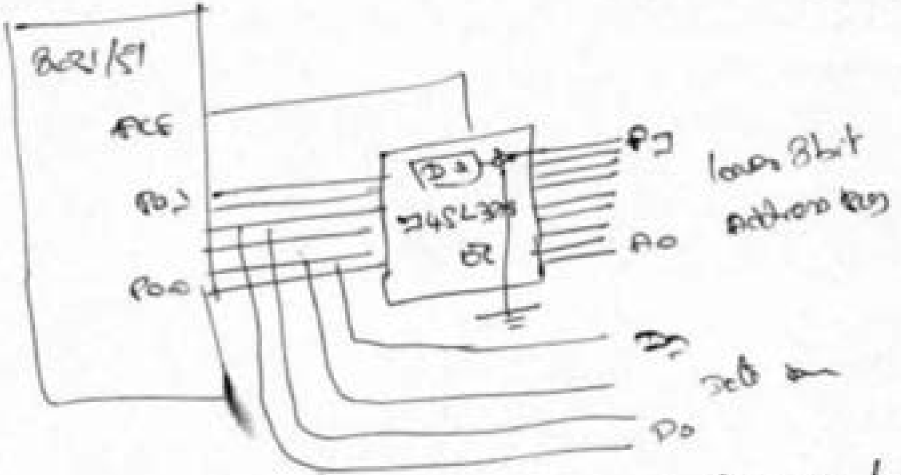
Q.No	Solution	Marks Allocated

1b)



3m

output control	Enable G	D	output
L	H	H	H
L	H	L	L
L	L	x	Q0
H	x	x	Z



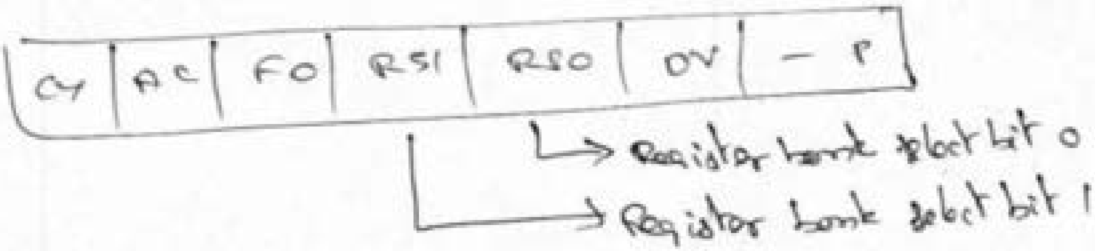
4m

1m

the data path and when ALE = 1 it was for addrs path.
Sending data out or bringing data in.
Whenever the 8031/51 wants to use P0 as an address bus

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	5	MC	18EE52	20-11-2021	40	2021-2022

Q.No	Solution	Marks Allocated
1c)	The program status word register is an 8 bit register. it is also referred to as the flag register PSW register is 8-bit wide only 6 bit of it are used by 8051.	2m
		1m
	The two unused bits are user definable flags, four of the flags are called conditional flags,	2m
	—x—	
2a)	Port zero is characterised by two functions - when the external memory is used then the lower	1m
	address byte is applied on it, also all bits of this port are configured as input/output	1m
	Port 1 - Port 1 is a true I/O port as it doesn't have any alternative functions as in P0, but this port can be configured.	2m

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

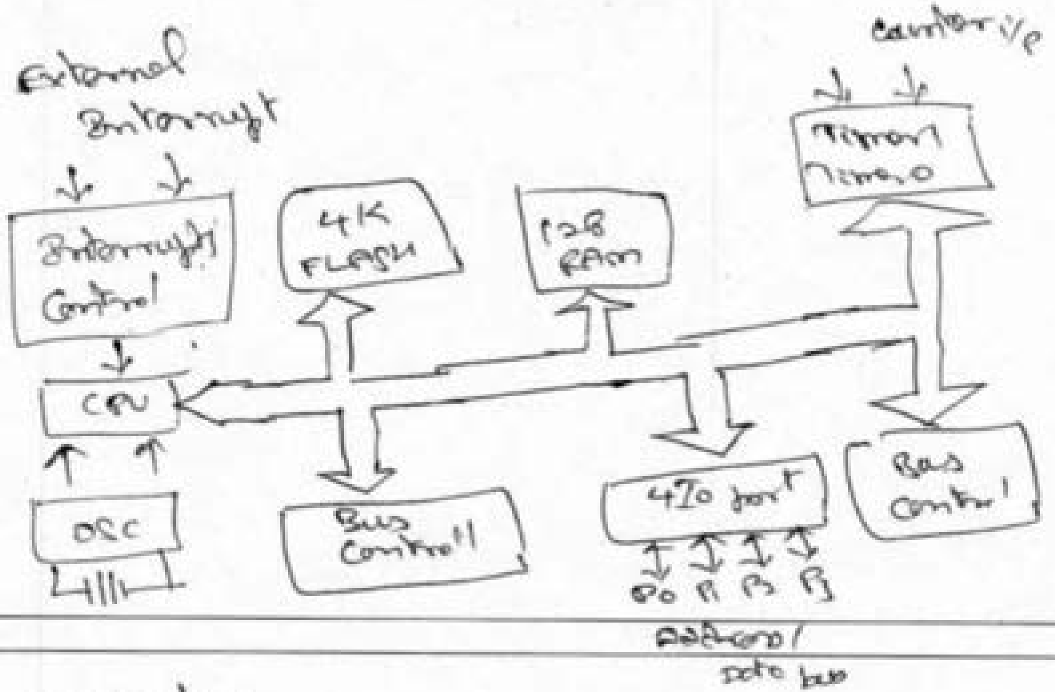
SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	5	MC	18EE52	20-11-2021	40	2021-2022

Q.No	Solution	Marks Allocated
	Port 2 - P2 is similar to P0 when the external	
	memory is used. Pins of this port occupy	1m
	addresses intended for the external memory chip.	
	Port 3 - also used for input/output with pullup	
	resistors	
2b)	Immediate addressing mode	
	The data is provided immediately after the	3m
	opcode. mov A, #0AFH:	
	Register addressing mode:	2m
	Source or destination data should be	
	present in a register (R0 to R7)	1m
	Direct Addressing mode	
	Address is specified in source or destination	1m
	Register indirect mode:	
	mov 0F5H, @R0:	

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	5	MC	18EE52	20-11-2021	40	2021-2022

Q.No	Solution	Marks Allocated
2c)	Accumulator : Temporary storage of data	3m
	Register & is used to store the mul and division result	2m
	Program Counter is 16 bits wide. This means that the 8051 can access program address 0000 to FFFFH. a total of 64K bytes of code , stack definition	3m
5c)	Block diagram of 8051 microcontroller	
		4m

Explanation 3m

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	5	MC	18EE52	20-11-2021	40	2021-2022

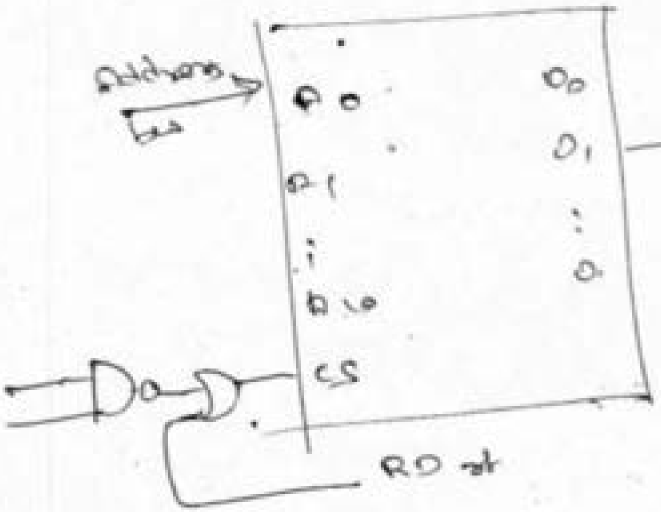
Q.No	Solution	Marks Allocated
3b)	memory Address Decoding	
	1. The data bus of the CPU is connected directly to the data pins of the memory chip	2m
	2. control signals RD and WR from the CPU are connected to the OE and WE pins of the memory chip	2m
	3. while the lower bits of the addresses from the CPU go directly to the memory chip address pins, the upper ones are used to activate the CS pin of the memory chip.	3m
	Diagram	
3c)	Different types of Special function register	
	PCON TMOD DPL IA Each defn	3m
	SCON T0 T1 DPH	
	SMOD PSW PSW	3m
	ACC B IE	

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	5	MC	18EE52	20-11-2021	40	2021-2022

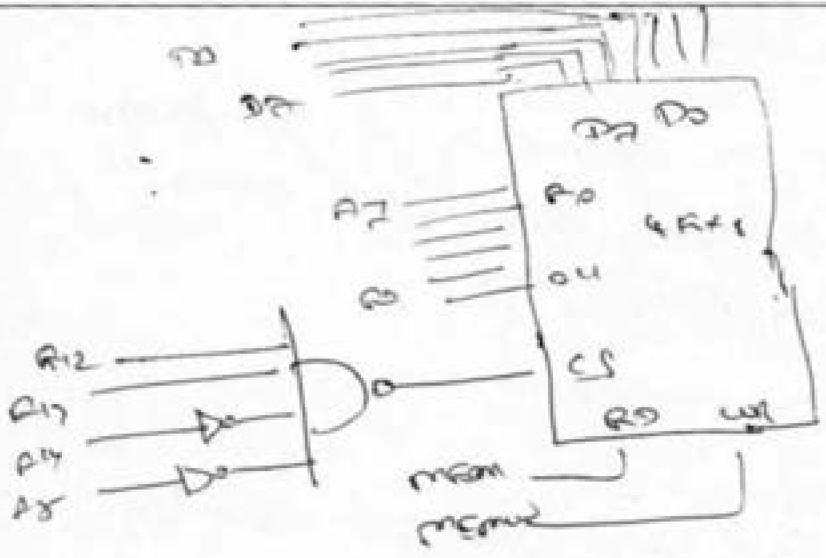
Q.No	Solution	Marks Allocated
4(a)	Assembler directive	2m
	ORG indicate the beginning of the address	
	the number that comes after ORG can be	2m
	either in hex or decimal	1m
	EQU: To define a constant	
	DB: define byte	2m
	END: To indicate the end of the source file	
4(b)	Programming model of 8051	
		3m
	Definition	1m

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	5	MC	18EE52	20-11-2021	40	2021-2022

Q.No	Solution	Marks Allocated
		3m
4) c	JUMP CALL SJMP LJMP Jz jump if accumulator = 0 JB Jump if bit is set bit = 1 JNB Jump if bit is not set bit = 0 JBC Jump if bit is set and clear the bit	2m 2m 2m

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGNIEERING

ACADEMIC YEAR 2021-2022 (ODD SEM)

SECOND INTERNAL ASSESSMENT

COURSE CODE: 18EE52 **COURSE NAME: MC** **SEMESTER : V**
MAX MARKS : 40 MARKS **TIME / SESSION : 90 MIN / AN** **DATE OF TEST: 27-12-2021**

Q. NO	ANSWER ANY ONE QUESTION FROM PART A AND PART B	CO	MARKS
	PART - A		
1	a) Explain the following instructions with an example : i)DIV AB ii)SWAP A iii)RRC A iv) XCHDA,@Rp v)MOVXA,@DPTR vi)DJNZ R3,rpt vii) ADDC A,40h viii)ANL C,P2.5	01	08M
	b) Discuss CALL and JUMP instruction types and ranges of branching in each case	03	07M
	c) Write 8051 'C' program to toggle bit D7 of port 0, 60,000 times and explain the differences between SBIT ,bit and sfr declarations	03	05M
	OR		
2	a)Write a program to find the square root of a given number	02	05M
	b)Write 8051 'C' program to convert ASCII digits '9' and '2' to packed BCD and display it on port P2	03	06M
	c)Write an assembly program to generate square wave with ON time =5ms and OFF time=20ms on all pins of port-1 .use Timer 0in Mode-1 .assume crystal frequency =11.0592 MHz. calculate the duty cycle .explain TH0,TL0 and TMOD calculations.	03	09M
	PART -B		
3	a) Write 8051 C program to toggle all the bits of P0 and P2 continuously with 250ms delay	02	08M
	b) Explain TMOD SFR with necessary format	03	08M
	c) write an 8051 C program to send values -4 to +4 to port P1	02	04M
	OR		
4	a) Write a program for counter '1' in mode '2' to count the clock pulse and display the state of TL count on P2	03	06M
	b) Write an 8051 C program to find the checksum byte of data stream 30H,4AH,65H and 10H convert the binary value of checksum into decimal and display the value of the BCD digits on ports P0, P1 and P2	03	08M
	c)) Explain the different data types supported by 8051C microcontroller	03	06M

G. H. R

PREPARED BY	REVIEWED BY	APPROVED BY
Mr. RAJESH KUMAR .V	Mr. G.H.RAVIKUMAR	Dr. NARENDRA VISWANATH
COURSE INSTRUCTOR	HoD / EEE	PRINCIPAL

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	5	MC	18EE52	27/12/2021	40	2021-2022

Q.No	Solution	Marks Allocated
1a)	DIV AB: divides the unsigned 8-bit integer in the accumulator by the unsigned 8 bit.	1
	SWAP A: swap nibbles within the accumulator swap A interchanges the low and high order nibbles	1
	RRC A: Rotate accumulator Right through carry flag the eight bits in the accumulator and the carry flag are together rotated one bit to the right	1
	XCHD A,@Ri exchanges the low order nibbles of the accumulator generally representing a hexadecimal	1
	MOVX A,@DPTR: The MOVX instruction transfer data b/w the accumulator of a byte of external data memory	1

PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE-DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

Q.No	Solution	Marks Allocated
	DJNZ : Decrement R3 & jump R3 ≠ 0 branch to yt	1
	ADD C ,#4h: This instruction indicates that A ← A + 40h + CY	1
	ANL C P2.5: And the carry flag bit P2.5 CY=1 , P2.5 = 0 ANL C, P2.5 — x —	1
1b)	Jump and call instructions may have one of the 3 ranges	2
	(i) Relative Range – +127 to -128 (ii) Absolute Range – within a page (iii) long Range – 0000h to FFFFh	1
	Relative Range: The jump can be within -128 bytes or +127 bytes of memory relative to the address of current program counter PC	1

Q.No	Solution	Marks Allocated

Absolute range : In 8051 program memory is divided into logical divisions called pages each of 2K byte 1

maximum size program memory in 64 K bytes 1
size of each page is 2K byte

long range: allows the jumps to any where in the memory location from 0000 h to FFFF h 1
The jump or all instructions with the range will be of 3 byte instructions

— x —

1(c)

```
# include <reg51.h>
sbit myBIT= P0                          1
void main (void)
{
  unsigned int z;
  for(z=0; z<=60,000 ;z++)              1
     {
       myBIT= 0;                        1
      myBIT= 1;
     }
  }
```

Q.No	Solution	Marks Allocated
	SBIT -used to access single bit addressable	
	register, allow access to the single bit	1
	of the SFR register	
	The bit data type allows access to single bit	
	to bit addressable memory spaces 20-2FH	1
	To access the byte size SFR registers	
	we use the SFR data type.	
	—x—	
2a)	ORG 0000H	
	mov R0, #40H	2
	mov R1, #01H	
	mov R2, #00H	1
	mov A, @R0	
	loop: SUBB A, R1	1
	JZ answer	
	INC R1	1
	SJMP	
	END	
	—x—	
2b)	#include <reg51.h>	
	void main (void)	

Q.No	Solution	Marks Allocated
	{	
	unsigned char K1 = '9';	2
	unsigned char K2 = '6';	
	K1 = K1 & 0x0F;	2
	K2 = K2 & 0x0F;	
	K1 = K >> 4;	2
	P1 = K.K2;	
	}	
	— x —	
2c)	Given on time = 5ms	
	OFF time = 20ms	
	To generate a 50.wave assume crystal freq = 11.0592 MHz	2
	calculate duty cycle	2
	mov TMOD ,#0'4	
	mov TL0 ,#075H	2
	mov TH0 , # 00B4	
	mov P1 ,# 004	
	acall Delay	2
	mov TL0, #BF9	
	mov TH0, = # 0EP4	
	mov P1 ,#0FFH	1

acall DELAY
SJMP BACK

Q.No	Solution	Marks Allocated
	ORG 3000H	
	DELAY : SET TR0	
	AGAIN: JNB, TF0, AGAIN	
	CLR TR0	
	CLR TF0	
	RET	
	END	
	— x —	
3c)	#include <reg51.h>	
	void delay (unsigned int);	1
	void main ()	
	{	1
	P0 = 0x55;	
	P2 = 0x55;	
	while (1)	1
	{	
	P0 = ~P0;	1
	P2 = ~P2;	
	DELAY (250);	1
	}	
	}	
	void Delay (unsigned int count)	1
	{	
	unsigned int i, j;	1
	for (i=0; i<count; i++)	
	for (j=0 ; j<count; j++)	1
	}	

Q.No	Solution	Marks Allocated
5b)	Timer / counter mode control (TMOD) in the SFR	
	function register in 8051 having format as	2
	follows	
	$\boxed{GATE}\boxed{C/\overline{T}}\boxed{M1}\boxed{M0}\boxed{GATE}\boxed{C/\overline{T}}\boxed{M1}\boxed{M0}$	1
	C/$\overline{T}$ → Timer (or) Counter selector cleared for	
	time operation C/$\overline{T}$ = 0 ; Timer mode	
	C/$\overline{T}$ = 1 ; Counter mode	2
	gate → gate = 0 means software control	
	gate = 0 ; means software control	
	M1 M0 operating mode	1
	0 0 8 bit timer / counter "THx" with "TLx" 5 bit	
	0 1 16 bit Timer / counter "THx" with "TLx" as cascaded there is no prescaler	4
	1 0 8 bit auto reload . Timer / counter	
	1 1 Timer 0 TL0 8 bit timer / counter controlled by standard Timer 0 control bits . TH0 is 8 bit timer only	1

1 1 Timer / counter 1 stopped

Q.No	Solution	Marks Allocated
3c)	# include <reg51.h>	1
	void main (void)	
	{ char mynum[]={+1,-1,+2,-2,+3,-3,+4,-4}	1
	unsigned char z;	1
	for (z=0; z<=8; z++)	
	P1 = mynum(z)	1
	}	
	— x —	
4a)	ORG 0000H	
	mov TMOD, #20H	1
	mov TH, #0	1
	SET B P3.5	
	again: SETB TR1	1
	BACK: mov A, TLx	
	mov P2, A	1
	JNB TF1, BACK	1
	CCR TR	

CLR TF1 1

SJMP AGAIN

Q.No	Solution	Marks Allocated
4b)		

```
#include <reg51.h>
void main (void)                                              1
{
unsigned char data []: {0x30, 0x4F, 0x65, 0x[illegible]};
unsigned char sum = 0;                                        1
unsigned char checksumbyte, i, d1, d2, d3;
for (i=0; i<4; i++)                                           1
  {
  sum = sum + data [i];                                       1
  }                                                           1
checksum = ~sum+1 ;
  i = checksumbyte / 10 ;
d1 = checksumbyte % 10;                                       1
d2 = i % 10
d3 = i/10                                                     1
 P0 = d1
 P1 = d2                                                      1
 P2 = d3
}
```

Q.No	Solution	Marks Allocated
4c)	unsigned char : It is an 8 bit data type that takes values from 00 to 255	1
	signed char: It is an 8 bit data, D7 bit represent + or - value.	1
	the range from -128 to +127	1
	unsigned int: Is a 16 bit data type that takes values in the range of 0000 to 65535	1
	signed int: Is 16-bit datatype that uses MSB to represent + or - value.	1
	sbit: Allows access to single bits of the SFR register & port P0-P3.	1
	— x —	

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGNIEERING

ACADEMIC YEAR 2021-2022 (ODD SEM)

THIRD INTERNAL ASSESSMENT

COURSE CODE: 18EE52 **COURSE NAME: MC** **MAX MARKS : 40 MARKS**
DURATION : 90 Min **SEM: V** **DATE OF TEST : 07-02-2022**

Q. NO	ANSWER ANY TWO FULL QUESTION	CO	MARKS
1	a) Write a program to retrieve the data serially and put them in P1.set the band rate at 4800 .8 bit data and one stop bit and Write an 8051C program to transfer the message " INDIA" serially at 9600 band rate 8 bit data and one stop bit,continuously	04	08M
	b) What is an Interrupt? list the various interrupts of the 8051 with their corresponding vector address.	05	08M
	c) What is serial data communication? Explain the significance of SCON register in detail	04	04M
2	a) A square wave is being generated at pin P1.2.This square wave is to be sent to a receiver connected in serial form to 8051.write an assembly language program for this .Explain the Calculations of TMOD ,SCON,TH1 value. assume Timer 0 and Timer 1 in mode 2.assume baud rate =9600 and XTAL=11.0592 MHz.	04	06M
	b) Write a program that continuously gets 8 bit data from "P0" and sends it to "P1" where simultaneously creating a square wave of 200 µs period on pin P2.1.use timer '0' to create square wave .assume XTAL=11.0952MHz	05	07M
	c) i)Explain the various fields of 8255 control word format. Draw the control word format. ii) Interface an LCD to 8051 and write a program using 8051-C to display message "GOOD DAY" iii)Interface an DAC to 8051 and write an program to generate triangular wave using DAC interface.	04	07M
3	a) Explain the steps to interface ADC and DAC 0808 to the 8051 microcontroller with a neat diagram	05	06M
	b) Write an ALP to rotate the stepper motor5 steps in clockwise direction and 10 steps in anticlockwise direction with a delay between each step	05	06M
	c)i) Explain the principle of opto isolator and its purpose in interfacing to 8051. ii)State advantages of LCD over multi segment LEDs. Explain the architecture and working of 14 pin LCD. draw its schematic diagram	05	08M

PREPARED BY
Mr.V.RAJESH KUMAR
COURSE INSTRUCTOR

REVIEWED BY
Mr.G.H.RAVIKUMAR
HoD / EEE

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]

SIRA ROAD, TUMKUR – 572106.

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	5	MC	18EE52	07/02/2022	40	2021-2022

Q.No	Solution	Marks Allocated
1a)		

```
# include <reg51.h>
void main (void)
{
 unsigned char mybyte;
 TMOD = 0x20
 TH1 = 0xFD
 TR1 = 1;
 while (1)
  {
   while (RI==0);
   mybyte = SBUF;
   P1= mybyte;
   RI=0
  }
 }
```

```
# include <reg51.h>
void SerTx (unsigned char);
void main(void)
 {
  TMOD = 0x20;
  TH1 = 0xFD ;
  TR1 = 1;
  while (1)
  {
   SerTx ("S");
   SerTx ('n");
   SerTx ("D" );
   SerTx ('J');
   SerTx ('A");
  }
 }
```

```
void SerTx (unsigned char x)
{
 SBUF = x;
 while (TI==0);
 TI=0;
```

PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE-DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

Q.No	Solution	Marks Allocated
1b)	whenever any device needs its service the device notifies to microcontroller by sending it an interrupt signal. upon	2
	receiving an interrupt signal the microcontroller interrupts whatever it is doing needs its service.	2
	Interrupt vector table	

Interrupt	Rom location	Pin	
			2
Reset	0000	9	
External H/W INT0	0003	P3.2(12)	
Timer 0 (TF0)	000B		2
External HW (INT1)	0013	P3.3(13)	
Timer 1 (TF1)	001B		
Serial com (RI and TI)	0023		

Q.No	Solution	Marks Allocated
1c)	The fact the serial communication uses a single data line instead of the 8 bit	1
	data line of parallel communication not only makes it much cheaper but also	1
	enables two computers located in two different cities to communicate over the telephone.	1
	This also means that at the receiving end there must be a serial in parallel out shift register to receive the serial data and parallel.	1
	If the data can go both ways at the same time	

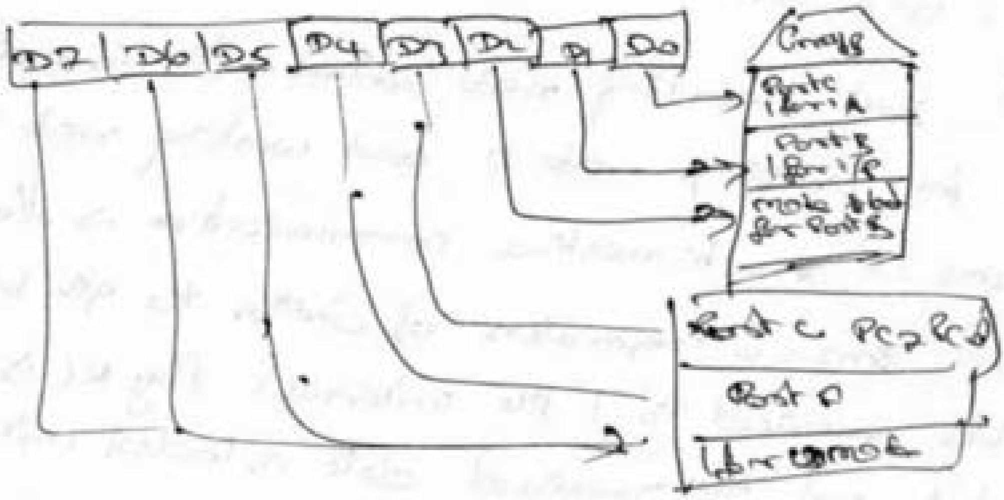
— x —

Q.No	Solution	Marks Allocated
2a)	HERE. mov TL0	1
	30FLH mov	
	TH0 ,# 0F5 H	
	CPL P1.2	1
	ACALL	1
	DELAY	
	SJMP HERE	
	DELAY: SETB TR0	
	Serial port working mode control bits is mainly	1
	used for working mode 2 and working mode 3	
	If SM2 = 1 multi-machine communication is allowed	1
	when SM2 = 0 regardless of whether the 9th bit	
	of data received is 1 the interrupt flag RI is	1
	generated and the received data is loaded into	
	SBUF.	
	— × —	
2b)	# include <reg51.h>	
	sbit P1b0 = P1^0	
	bit membit;	2
	{ unsigned char x;	
	for (x=0; x<8; x++)	2
	{ membit = P1b0;	
	ACC = ACC<<1	
	reg A1.S8= membit	2
	}	
	P2=ACC;	1
	}	

Q.No	Solution	Marks Allocated

2(c) i) mode 0 - simple or basic I/O mode : Port A, B and C can work either as input function or as output function 1

mode 1 - handshake or strobbed I/O : in this either port A or B can work and port C bits are used to provide handshaking 1



1

ii)
```
# include <reg51.h>
# include <string.h>
# define LCD P2
sbit rs=P3^0;
sbit rw=P3^1;
sbit e =P3^2;
void (const char c command)
LCD init () ;
 cols(1 )
 {
   LCD command (0X8F))
 Display message ("Good day")
```

1

1

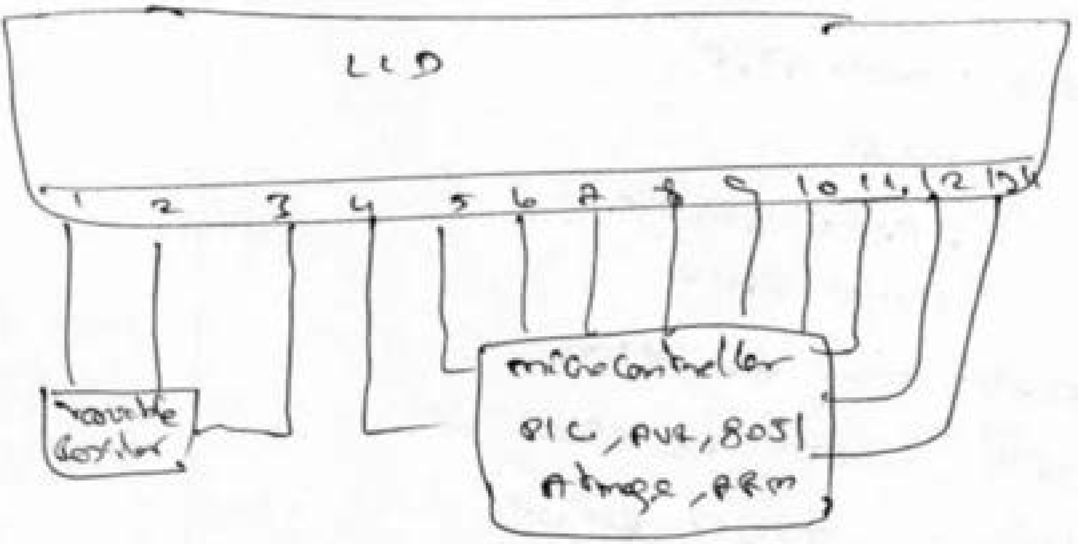
1

1

Q.No	Solution	Marks Allocated

3c) An opto isolator connects input and output 1
sides with a beam of light modulated by
input current. It transforms useful 1
input signal into light, sends it across
the dielectric channel, captures light on
the output side and transforms it back into 1
electric signal

i) Energy efficient on LCD 1
ii) long lasting
iii) LED backlighting
iv) supports small and low profile size 1



2

1

Q.No	Solution	Marks Allocated
3c)	Steps	
	1 Start	
	2. Select the channel using address pins	1
	3. low-high transition on ALE to latch in the address	1
	4. A low-high transition on start to reset the ADC's SAR	1
	5. A high-low transition on ALE	
	6. A high-low transition on start to start the conversion	1
	Diagram:	2
3b)	mov A, #66H	
	BACK : mov P1, A	2
	RR A	
	ACALL DELAY	
	SJMP BACK	2
	DELAY: mov R1 #100	
	UP1 : mov R2 #50	
	UP : DJNZ R2, UP	2
	DJNZ R1, UP1	
	RET	

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGNIEERING

ACADEMIC YEAR 2021-2022 (ODD SEM)

FIRST INTERNAL ASSESSMENT

COURSE CODE: 15/17/18EE72 **COURSE NAME: PSP**
SEMESTER : VII **MAX MARKS : 40 MARKS**
DURATION : 2.00 PM TO 3.30 PM **DATE OF TEST: 20-11-2021**

<table>
<tr><th>Q. NO</th><th>ANSWER ANY ONE QUESTION FROM PART A AND PART B</th><th>MARKS</th></tr>
<tr><td colspan="3">PART - A</td></tr>
<tr><td rowspan="3">1</td><td>a) List and Explain the essential qualities of a protective relay and draw only the diagram in zones of protection [CO-1]</td><td>07 M</td></tr>
<tr><td>b)The current rating of an over current relay is 5A. the relay has a plug setting of 150% and the time setting (TMS) of 0.4. The CT ratio is 400/5. Determine the operating time of the relay for a fault current of 6000A. At TMS=1, operating time at various PSM are given in the below table [CO-1]
<table>
<tr><td>PSM</td><td>2</td><td>4</td><td>5</td><td>8</td><td>10</td><td>20</td></tr>
<tr><td>Operating time in seconds</td><td>10</td><td>5</td><td>4</td><td>3</td><td>2.8</td><td>2.4</td></tr>
</table></td><td>05 M</td></tr>
<tr><td>c) Explain about the numerical relay with a schematic diagram and draw only the diagram of any three electromechanical relays construction [CO-2]</td><td>08 M</td></tr>
<tr><td colspan="3">OR</td></tr>
<tr><td rowspan="3">2</td><td>a)Explain the need for protection scheme [CO-2]</td><td>09 M</td></tr>
<tr><td>b) Describe the statics of fault [CO-2]</td><td>07 M</td></tr>
<tr><td>c) List the types of fault and explain in with a neat diagram [CO-2]</td><td>04 M</td></tr>
<tr><td colspan="3">PART -B</td></tr>
<tr><td rowspan="3">3</td><td>a)Explain about the torque theory of induction relay and state the merits and demerits of static relay [CO-3]</td><td>07 M</td></tr>
<tr><td>b) With a neat sketch explain about the directional over current relay [CO-1]</td><td>05 M</td></tr>
<tr><td>c)Write short notes on about the directional earth fault relay [CO-1]</td><td>08 M</td></tr>
<tr><td colspan="3">OR</td></tr>
<tr><td rowspan="3">4</td><td>a) Explain the Moving coil relay with a neat sketch [CO-2]</td><td>09 M</td></tr>
<tr><td>b)Describe in brief about the Reed relay [CO-2]</td><td>04 M</td></tr>
<tr><td>c) Explain the Induction type relay [CO-2]</td><td>07 M</td></tr>
</table>

Prepared By
V.Rajesh Kumar
Course Instructor

Approved By
Dr.Narendra Viswanath
Principal

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	7	PSP	15/17/18EE72	20-11-2021	40	2021-2022

Q.No	Solution	Marks Allocated
1a)	Selectivity - To discriminate the fault	1m
	Sensitivity - For a protected zone, the sensitivity	2m
	indicates the smallest ratio of the actuating	
	quantity	3m
	Stability - The power system network must remain	
	stable under the condition of transient,	
	disturbance and faults.	1m
	Simplicity - To maintain and install easy, the	
	protective scheme must be simple in operation.	
1b)		
	$PSM = \frac{\text{Fault current in relay coil}}{\text{Pickup current}}$	1m
	$= \frac{\text{Fault current in relay coil}}{\text{Rated CT secondary current} \times \text{current setting}}$	2m
	$= \frac{400}{5} \times 6000 = 80$ 1.25×6.25	2m
	$PSM = 10$	

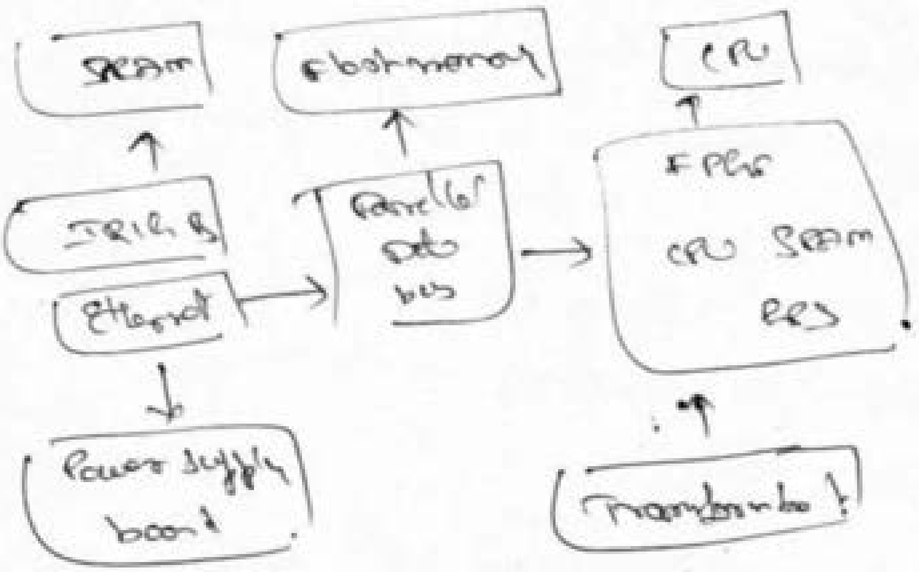
PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	7	PSP	'15/17/18EE72	20-11-2021	40	2021-2022

Q.No	Solution	Marks Allocated
1c)	Diagram of numerical Relay  	4m
	Explanation on input module, CPU memory, multiplexer, output module, Digital input	4m
2a)	The objectives of protection scheme is to keep the power system stable by isolating only the components that are under fault, whilst leaving as much of the network as possible still in operation	3m 3m 3m

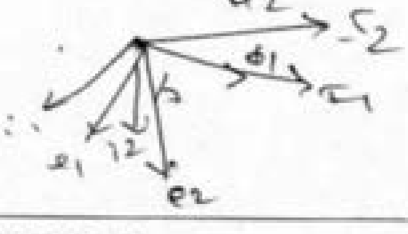
PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE-DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	7	PSP	'15/17/18EE72	20-11-2021	40	2021-2022

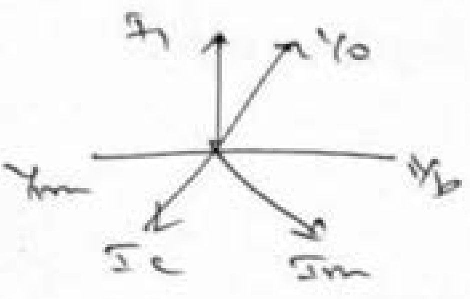
Q.No	Solution	Marks Allocated
2b)	Statistics of fault	2m
	Single phase to ground 70%.	
	phase to phase 15%.	2m
	Two phases 10%	2m
	phase to phase and third phase to gnd 2%.	1m
2c)	There are four types of faulting	
	- Normal open circuit fault	1m
	- Reverse Short circuit fault	1m
	- Strike up	
	- Oblique Fuse	1m
	circuit breaker	
	Protective relay	1m
3c)		2m

PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE-DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	7	PSP	'15/17/18EE72	20-11-2021	40	2021-2022

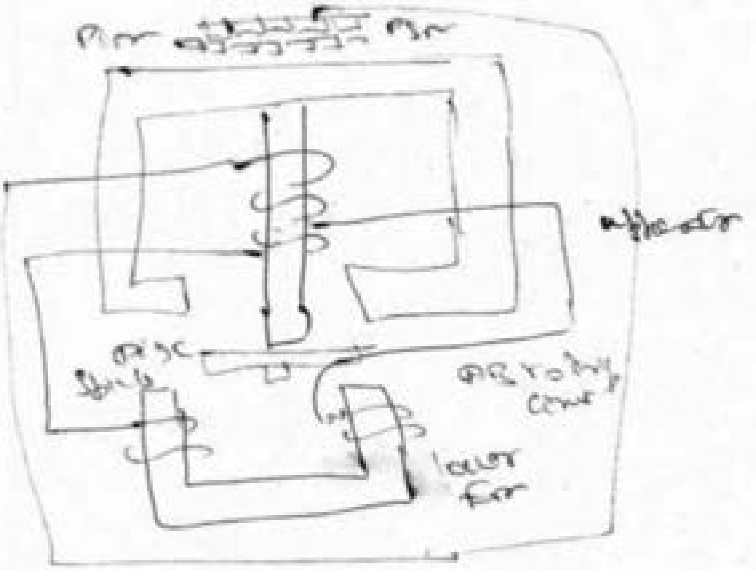
Q.No	Solution	Marks Allocated
	$\phi_1 \propto I_1 \sin \omega t$	2 m
	$\phi_2 \propto I_2 \sin \omega t + \theta$	
	$e_1 = \frac{d\phi_1}{dt} \propto \omega \lvert I_1 \rvert \cos \omega t$	2m
	$T \propto \omega \lvert I_1 \rvert I_2 \sin \theta$	1m
	$K = I^2 \phi_1 \phi_2 \sin \theta$	
	$K = \phi_{1m} \phi_{2m} I^2 \sin \theta$	
3b)	Directional overcurrent relay recognizes to direction in which fault occurs, relative to the location of the relay	1m
		1m

PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE-DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	7	PSP	15/17/18EE72	20-11-2021	40	2021-2022

Q.No	Solution	Marks Allocated
		3m
3c)	In case of directional Earth fault Relay the angular relationship of residual current and residual voltage is independent of the faulted phase and is governed by the R/x ratio of the fault earth The higher the residual voltage and if impedance is resistive the power factor is high	2m 3m

PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE-DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

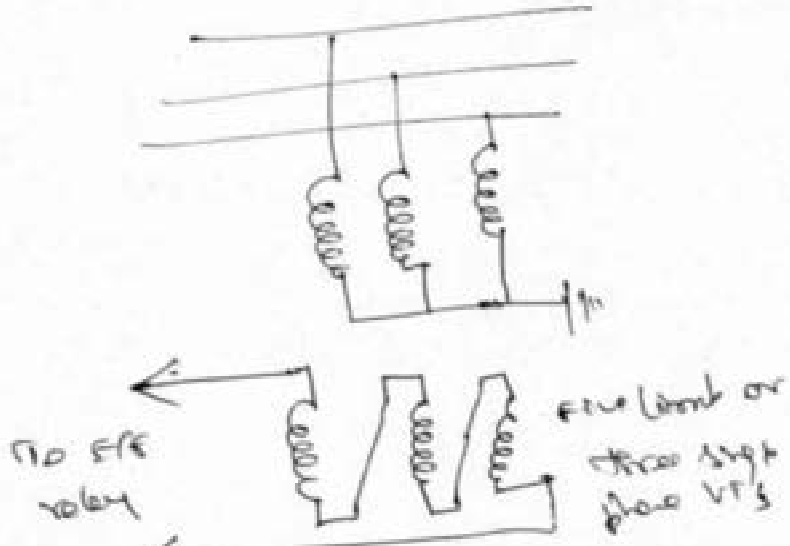
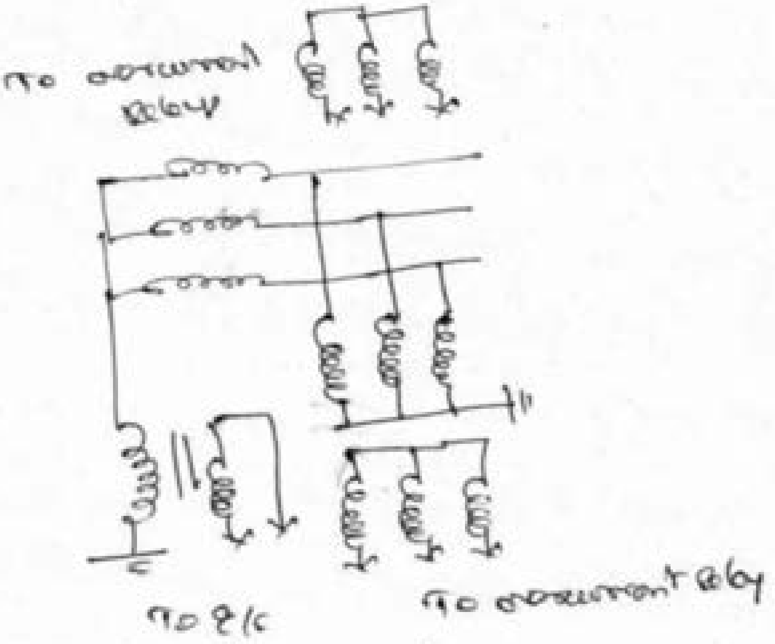
SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]

SIRA ROAD, TUMKUR – 572106.

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	7	PSP	15/17/18EE72	20-11-2021	40	2021-2022

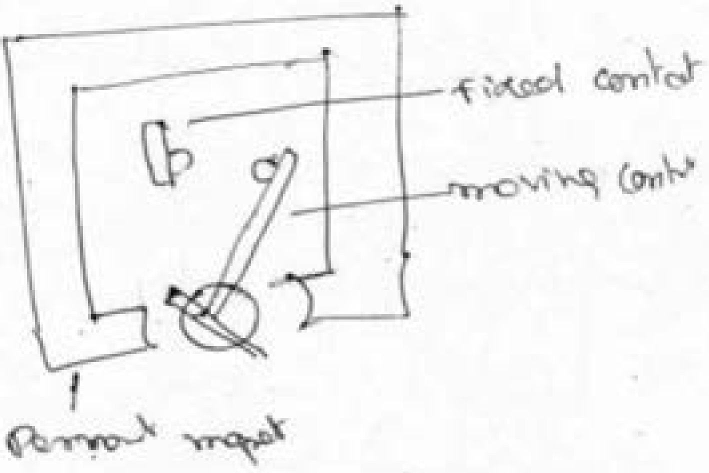
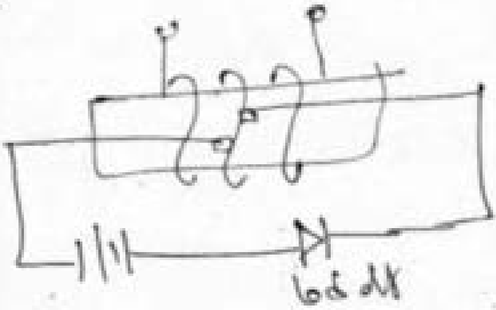
Q.No	Solution	Marks Allocated
	  	3m 3m

PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE-DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	7	PSP	'15/17/18EE72	20-11-2021	40	2021-2022

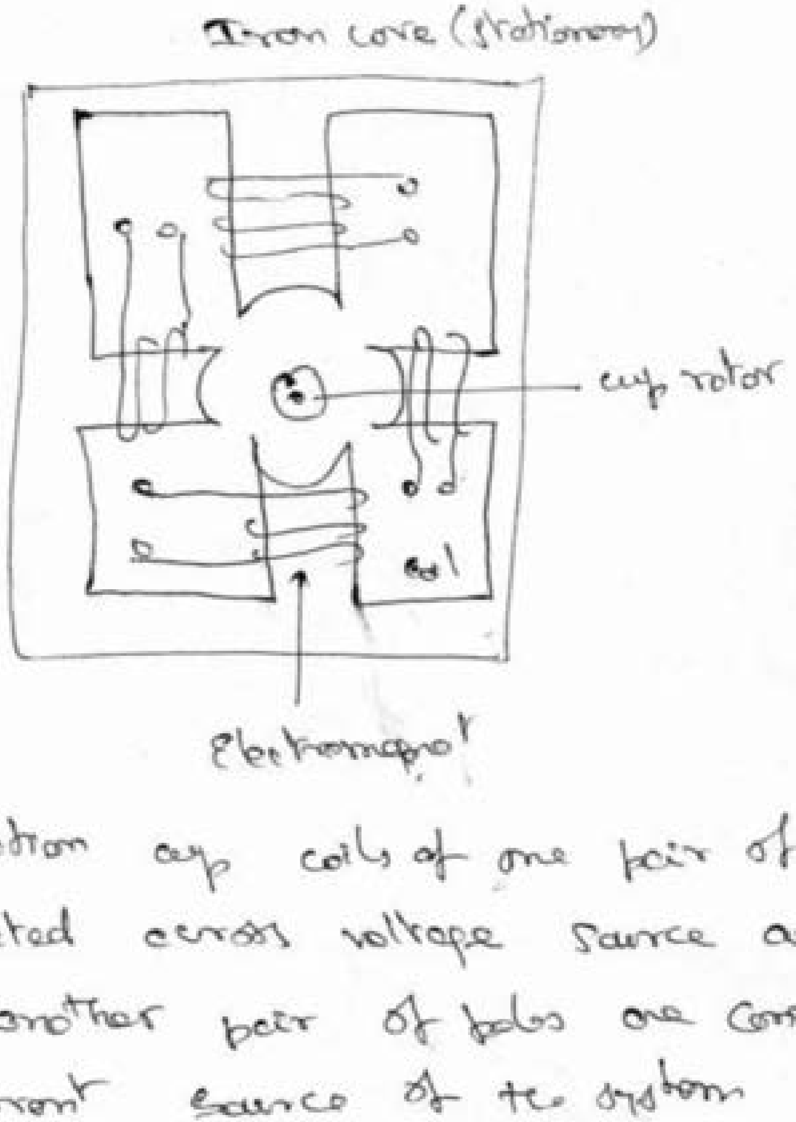
Q.No	Solution	Marks Allocated
4a)		3m
	moving coil is most sensitive electromagnetic	2m
	relay. Because of its high sensitive, this relay	
	is used widely for sensitive & accurate measurement	2m
	Inherently suitable for DC system	2m
	Explanation	3m
4b)	Reed Relay	
		2m

PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE-DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

Reed Relay is used to control one or more reed switches 2m

4/c) Induction cup Relay



3m

In induction cup coils of one pair of poles are connected across voltage source and coils of another pair of poles are connected with current source of the system 3m

—x—

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGNIEERING

ACADEMIC YEAR 2021-2022 (ODD SEM)

SECOND INTERNAL ASSESSMENT

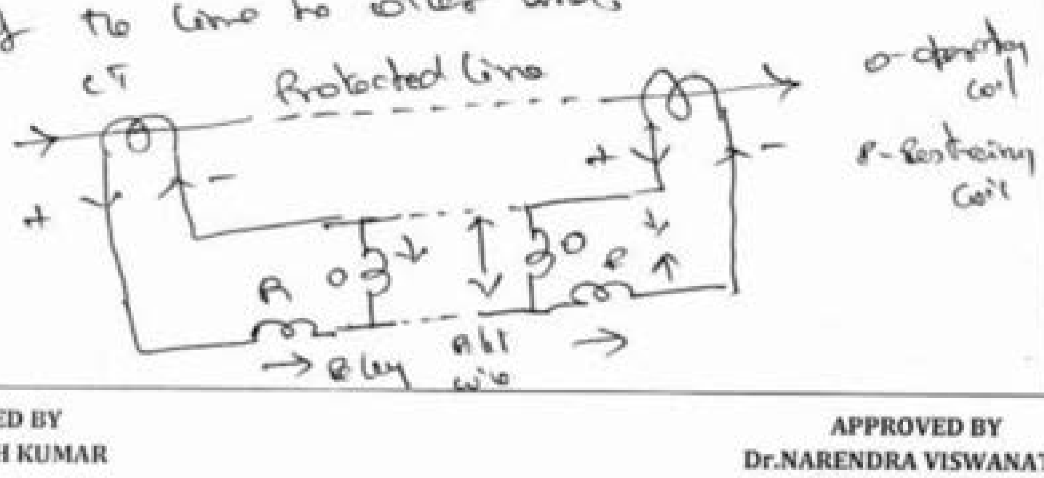
COURSE CODE: 15/17/18EE72 **COURSE NAME : PSP** **SEMESTER : VII**
MAX MARKS : 40 MARKS **TIME / SESSION : 90 MIN / AN** **DATE OF TEST : 27-12-2021**

Q. NO	ANSWER ANY ONE QUESTION FROM PART A AND PART B	CO	MARKS
	PART - A		
1	a) Explain the term pilot with reference to power line protection? what are the different types of wire Pilot	03	08M
	b) Describe the balanced voltage differential scheme and explain the working of differential protection of 3 phase circuits.	01	05M
	c) write short note on i)Buchholz relay ii)Differential scheme for bus protection	02	07M
	OR		
2	a) With neat sketch explain frame leakage protection	02	04M
	b) A generator is protected by restricted earth fault protection. The generator ratings are 13.2 kv,10 MVA. The % of winding protected against phase to ground fault is 85%.The relay setting is such that it trips for 20% out of balanced .Calculate the resistance to be added in the neutral to ground connection.	03	07M
	c) A synchronous generator rated for 20kv protected by circulating current system having neutral grounded through a resistance of 15Ω.The differential protection relay is set to operate when there is an out of balance current of 3 A. The CT's have a ratio of 100/5A.Determine i)Percentage of unprotected winding ii)Value of earth resistance to achieve 75% protection of windings.	03	09M
	PART –B		
3	a) With a neat diagram explain the impedance relay and reactance relay	02	08M
	b) Explain about the MHO relay and protection of parallel feeder	01	06M
	c)Describe about the effect of arc resistance on the performance of distance relay	03	06M
	OR		
4	a) Explain protection of stator against overheating in an alternator	03	10M
	b) The neutral point of a 11KV an alternator is earthed through a resistance of 12Ω,the relay is said to operate when there is out of balance out of a 0.8 A. The C.T's have a ratio of 2000/5.what percentage of the winding is protected against earth faults? what must be the min value of earthing resistance required to give 90% of protection to earth phase?	03	10M

PREPARED BY	**REVIEWED BY**	**APPROVED BY**
Mr. RAJESH KUMAR .V	**Mr. G.H.RAVIKUMAR**	**Dr. NARENDRA VISWANATH**
COURSE INSTRUCTOR	**HoD / EEE**	**PRINCIPAL**

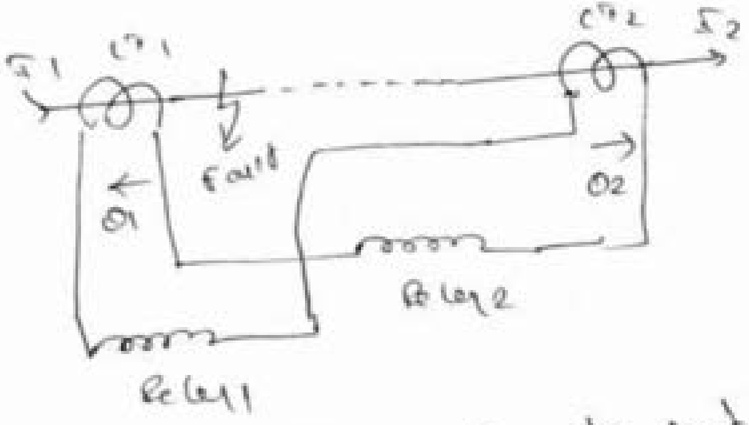
SCHEME & SOLUTION

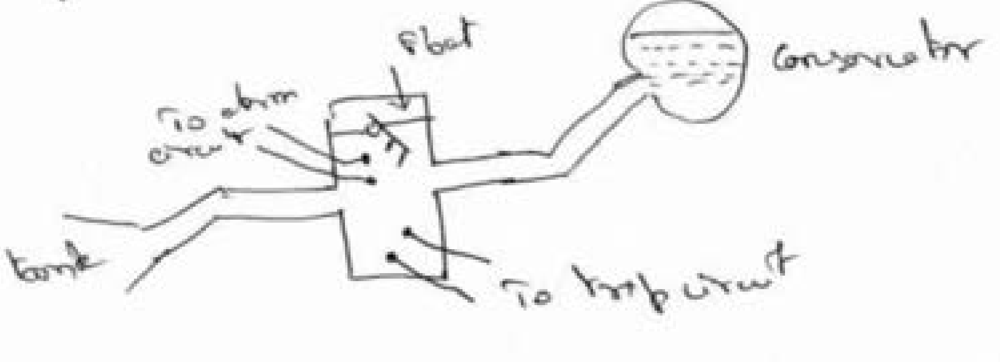
DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	7	PSP	15/17/18EE72	27/12/2021	40	2021-2022

Q.No	Solution	Marks Allocated
(a)	Some Electrical quantities at two ends of transmission line are compared and hence they	2
	require some sort of interconnecting channel over which information can be transmitted	1
	from one end to the other. Three different types of such channels are wire pilot, carrier-current and microwave.	1
	A wire pilot may be buried private cables or alternatively, rented post office or private telephone lines	1
	* A carrier-current pilot is one in which a low voltage, high frequency 50 KHz - 700 KHz is used to transmit information from one end of the line to other end.	1
		2

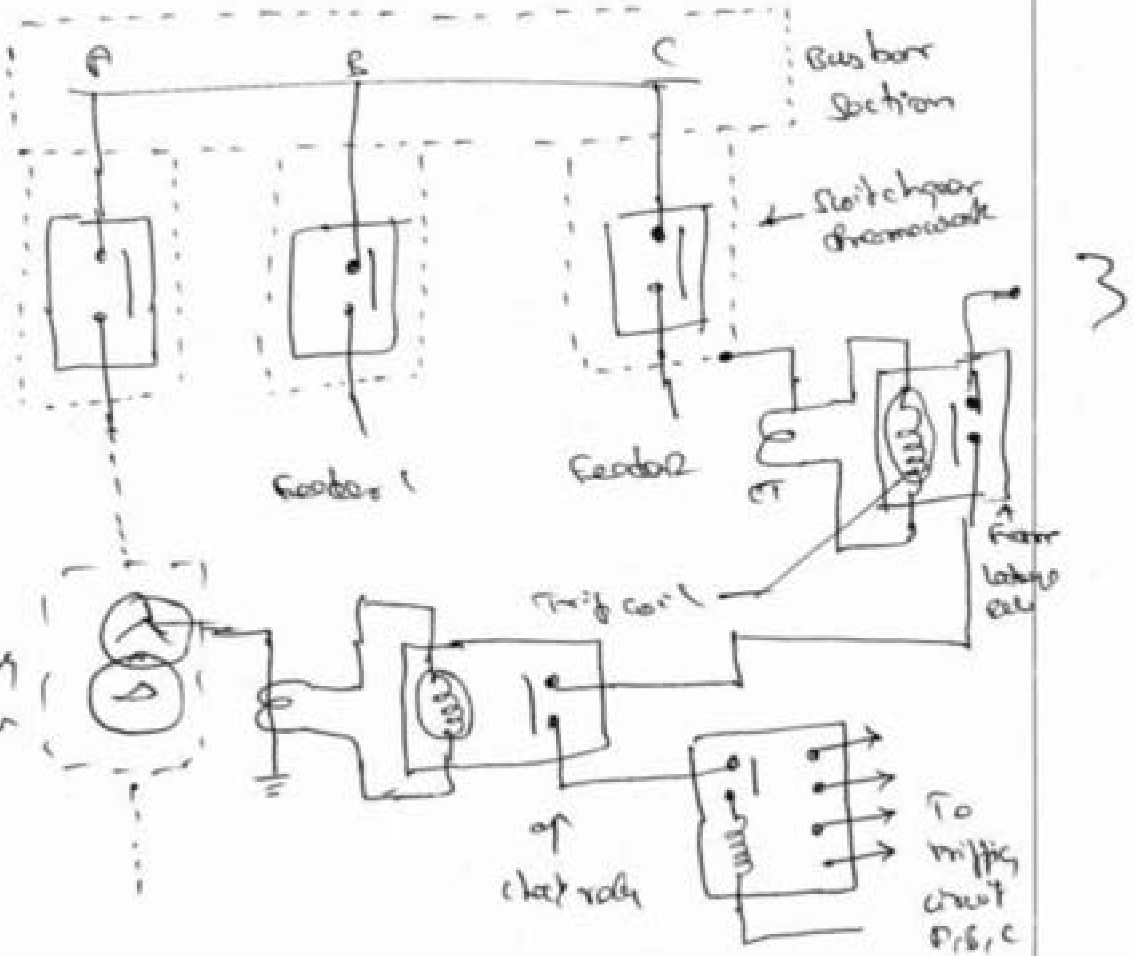
PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE-DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

Q.No	Solution	Marks Allocated
1b)	In this one over current relay is connected through the CT. This is called opposed voltage method. under normal condition, the current I_1 and I_2 is equal to magnitude and phase the voltage balance is equally maintained.  when the fault occurs in the protection zone, the current in the CT's become unbalance because of which the voltage is secondary of the CT's disturb. The current starts flowing through the operating coil. The relay starts operating and gives the command to the circuit breaker to operates. — x —	1 1 1 1 1

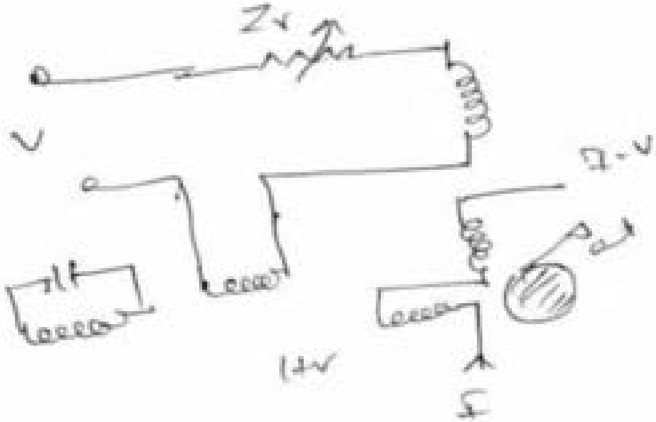
Q.No	Solution	Marks Allocated
1e)	The Buchholz relay protects the transformer from internal faults. It is the gas actuated relay. It is placed between the main tank and the conservator. Such type of relay is used in the transformer having the rating higher than 500KVA.	1
	If the oil evaporates in the form of the gas. The generation of the gas depends on the magnitude of the fault occurs inside the transformer	1
	The internal failure occurs in the transformer either because of the insulation breakdown between the winding or the winding have the weak initial contact.	1
		1

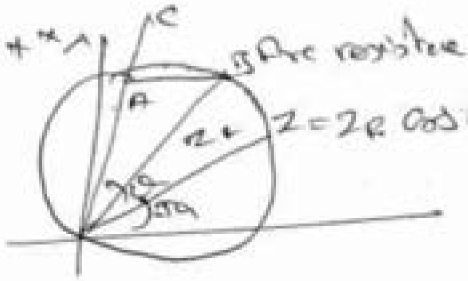
Q.No	Solution	Marks Allocated
1c) ii)	Differential scheme for bus protection	
	The scheme for bus protection, involves KCL, which states that, total current entering an electrical node is exactly equal to total current leaving the node.	1
	The principle of differential busbar protection is very simple. Here secondaries of CTs are connected parallel. That means S1 terminals of all CT's connected together and form a bus wire.	1 1
	Similarly S2 terminals of CT's connected together to form another wire.	
	—x—	
2c)	Frame leakage protection:	
	All busbar protection schemes are mostly designed for earth faults. Each conductor is surrounded by the earthed metal barrier.	1

Q.No	Solution	Marks Allocated
	All the metal frameworks are bonded together and insulated from earth.	
		3
	Frame leakage protection of busbar	
	metal supporting framework known as earthed. fault bus.	

Q.No	Solution	Marks Allocated
2b)	Given $V_l = 13.2$ kV Rating = 10 MVA	1
	To find full load current $I = \frac{\text{Rating in VA}}{\sqrt{3}\, V_L} = \frac{10\times10^6}{\sqrt{3}\times13.2\times10^3} = 437.38A$	1
	Relay setting is 20% out of balance is 20%	1
	of the rated current actuates the relay $I_0 = 437.38 \times \frac{20}{100} = 87.477A$	1
	$V = \frac{V_L}{\sqrt{3}} = \frac{13.2\times10^5}{\sqrt{3}} = 7.62$ kV % of winding unprotected = 15% as	1
	85% is protected $15 = \frac{R I_0}{V} \times 100$	1
	i.e., $15 = \frac{R\times 87.47}{7.62k} \times 100$ $\boxed{R = 13{,}068\,\Omega}$	1

Q.No	Solution	Marks Allocated
2c)	Given $V_L = 20\,kV$, $i_0 = 3A$, $R = 15\Omega$	1
	CT ratio = 1000/5	
	(i) $I_0 = i_0 \times \frac{1000}{5} = 3 \times \frac{1000}{5} = 600A$	2
	$V = \frac{V_L}{\sqrt{3}} = \frac{20 \times 10^3}{\sqrt{3}} = 11547\ V$	1
	% of winding unprotected $= \frac{R I_0}{V} \times 100$	
	$= \frac{15 \times 600}{11547} \times 100$	2
	$= 77.94\%$	
	(ii) we want 75% protection, % of winding unprotected = 100 − 75 = 25%	1
	$25 = \frac{R I_0}{V} \times 100$ i.e., $\Rightarrow 25 = \frac{R \times 600}{11547} \times 100$	2
	$\boxed{R = 4.811\Omega}$	

Q.No	Solution	Marks Allocated
3)	There is one voltage element from potential transformer and a current element fed from current transformer of the system.	1
		2 1
	As the impedance of the transmission line is directly proportional to its length it can easily be concluded that a distance relay can only detects if fault is occured within a predetermined distance or length of line.	
	Reactance Relay:	
	A typical reactance relay using the	

Q.No	Solution	Marks Allocated
3b)	mho Relay * It is a high speed relay and is also known as admittance	1
	* Its operating torque is obtained by the volt-amperes element and the controlling element is developed due to the voltage element  	1
	* The impedance angle of the protected line is normally 60° and 70° which is shown. * The arc resistance R is represented by the length AB, which is horizontal to OC.	1
	* mho Relay is suitable for EHV/UHV loaded transmission lines as its threshold characteristics in Z-plane is a circle passing through the origin	

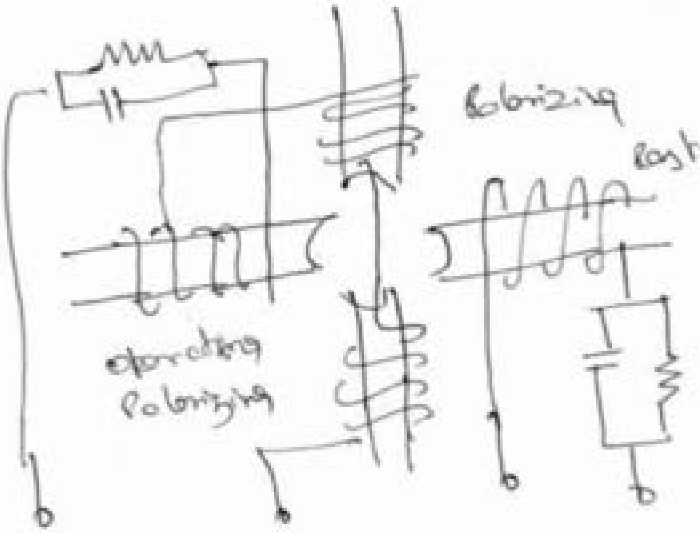
Q.No	Solution	Marks Allocated

Conduction cup structure is shown in fig. It has a four-pole structure carrying operating, polarizing and restraining coils. The operating torque is developed by the interaction of fluxes due to current carrying coil, the interaction of fluxes 2,3 and 4 and the restraining torque is produced by the interaction of fluxes due to poles 1, 2 and 4

1

1

1



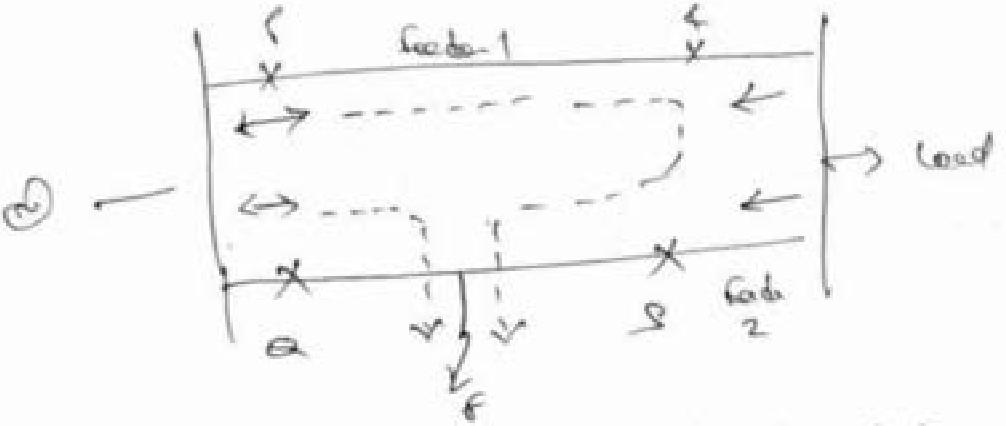
1

$$T = K_1 I^2 - K_2 VI \cos(\theta - 90°) - K_3$$

$$T = K_1 I^2 - K_2 \sin\theta - K_3$$

Q.No	Solution	Marks Allocated

3b To increase the transmission capacity and where continuity of supply is particularly necessary two feeders are connected in parallel. So that in case of a fault on any of the feeders only 1 1

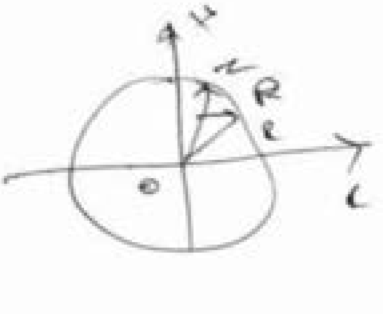
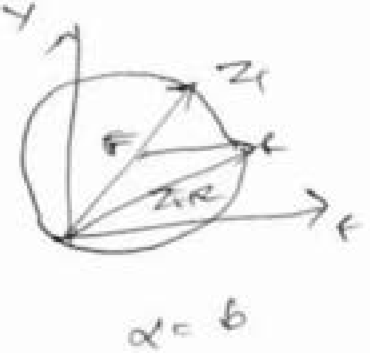


1

that feeder is isolated and continuity of the supply can maintained through another feeder

3c) Effect of arc resistance on the performance of distance relay:

If a flashover from phase to phase or phase to ground occurs an arc resistance is introduced into the fault path. 1

Q.No	Solution	Marks Allocated
	The arc resistance is added to the impedance of line and hence, the resultant impedance which is seen	1
	× In case of ground fault, the resistance of the earth is also introduced	1
	$R_{arc} = \frac{29\times10^3}{I^{1.4}} \cdot l\ \Omega$	1
	I = fault current in ampere l = length of arc in meters	1
	  $\alpha = 6$	1

Q.No	Solution	Marks Allocated
4) c)	All motors need protection against overloading resulting from overload, stalled rotor or unbalanced stator currents. This is because an	2
	open circuit in the supply of the power therefore feeding a motor will come twice as much current to flow in one phase of the motor the inverse time overcurrent relay will tend to	2
	overprotect at low currents and to under protect at high currents The overcurrent relay is very easy to adjust and test and it is self-reset. For	2
	continuous rated motor without service factor or short time overload ratings For motors with 115% service factor, tripping should occur at not more than about	2
	125% of rated motor current. For motors with special short time overload ratings. or with other service factor	2

Q.No	Solution	Marks Allocated
4)	Given $V_L = 11\,kV$, $R = 12\,\Omega$, $CT = 2000/5$	2
	i_0 = Relay current = 0.8A	
	I_0 : min operating line current	1
	$= i_0 \times \frac{2000}{5} = \frac{0.8 \times 2000}{5} = 320A$	
	V = line to neutral voltage $= \frac{V_L}{\sqrt{3}} = \frac{11\,kV}{\sqrt{3}} = 6.35\,kV$	2
	% winding unprotected $= \frac{R I_0}{V} \times 100 = \frac{12 \times 320}{6.35 \times 10^3} \times 100$	
	$= 60.46\%$	2
	% winding protected = 100 − 60.46 = 39.53%	
	Thus with R = 12 Ω only 39.53% winding is protected	2
	It is necessary to give 90% protection	
	∴ % winding unprotected = 100 − 90 = 10%	
	$10\% = \frac{R \times I_0}{V} \times 100$	1
	$10 = \frac{R \times 320}{6.35\,k} \times 100$	

$\boxed{R = 1.9846\,\Omega}$

SHRIDEVI

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGNIEERING

ACADEMIC YEAR 2021-2022 (ODD SEM)

THIRD INTERNAL ASSESSMENT

COURSE CODE: 15/17/18EE72 **COURSE NAME: PSP** **MAX MARKS : 40 MARKS**
DURATION : 90 Min **SEM: VII** **DATE OF TEST : 07-02-2022**

Q. NO	ANSWER ANY TWO FULL QUESTION	CO	MARKS
1	a) Explain how interruption of capacitive current takes place in AC circuit breaker	04	08M
	b) With a neat sketch, explain the recovery rate theory and energy balance theory of arc interruption in a circuit breaker.	05	08M
	c) With a neat sketch explain the working of axial blast circuit breaker	04	04M
2	a)What are the advantages and disadvantages of SF6 circuit breaker	04	06M
	b) With a neat sketch, explain the direct testing of circuit breaker.	05	07M
	c) Explain the construction and operation of the HRC Cartridge fuse. What are its advantages and disadvantages?	04	07M
3	a) With a neat figure explain the working of , i)Rod gap arrestor. ii) Expulsion type arrestor	05	06M
	b) State any four essential requirements of a surge diverter and With a neat sketch, explain the construction and working of Klydonograph instrument used for the measurement of surge voltage.	05	08M
	c) Explain the modules/ components of GIS.	05	06M

PREPARED BY	REVIEWED BY	APPROVED BY
Mr.V.RAJESH KUMAR	Mr.G.H.RAVIKUMAR	Dr.NARENDRA VISWANATH
COURSE INSTRUCTOR	HoD / EEE	PRINCIPAL

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY

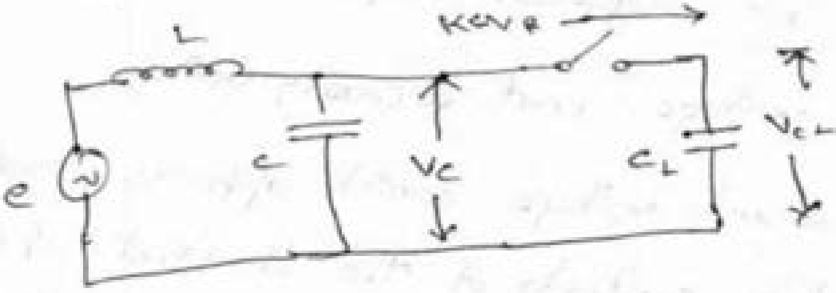
[An Institution Affiliated to VTU Belagavi , Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106.

SCHEME & SOLUTION

DEGREE	DEPT	SEM	SUB NAME	SUB CODE	DATE OF TEST	MAX MARKS	ACADEMIC YEAR
B.E.,	EEE	7	PSP	'15/17/18EE72	07/02/2022	40	2021-2022

Q.No	Solution	Marks Allocated

1(a) The interruption of capacitive current produces high voltage transients across the gap of the circuit breaker. This occurs when an unloaded long transmission line or a capacitor bank is switched off. 2



2

At the instant m

- The capacitive current is 0
- System voltage is maximum

=) If interruption occurs

- Capacitor CL remains charged at the maximum value of system voltage 2

=) At the instant n

- The voltage across the gap is twice the maximum
- value of Vc 2

=) The voltage across the gap becomes partially zero

- voltage falls from 2Vmax to zero

PREPARED BY
Mr.V.RAJESH KUMAR
AP/EEE-DEPT

APPROVED BY
Dr.NARENDRA VISWANATH
PRINCIPAL

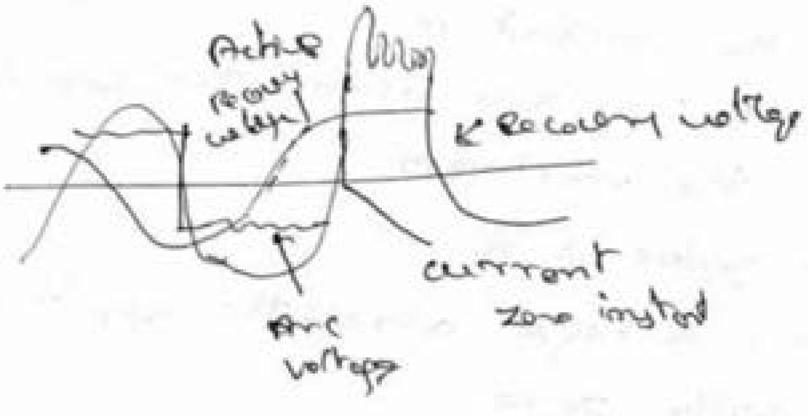
1b) Energy balance theory states that if the rate of heat dissipation between the contacts is greater than the rate at which heat is generated, the arc will be extinguished otherwise it will restrike 2

2

Recovery rate theory states that if the rate at which the ions and electrons combine to form or replaced by neutral molecules

Restriking voltage and Recovery voltage.

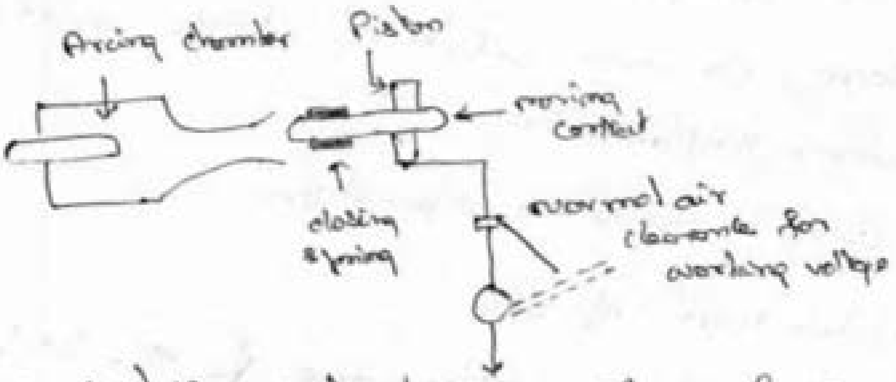
- The transient voltage which appears across the breaker contacts at the instant of arc being extinguished is known as restriking voltage 2
- The power frequency rms voltage which appears across the breaker contacts after the arc is finally extinguished and transient oscillation die out is called recovery voltage



2

1(c) The fixed and moving contacts are held in a closed position with the help of spring pressure. 1

- There is an air reservoir connected to the arcing chamber through an air value



1

* The air value controls the flow of air into the arcing chamber. The value is closed under normal conditions

under faulty condition: when a fault occurs a tripping impulse is produced which causes the opening of the air valve 1

* Since the air value connects the air reservoir and the arcing chamber, a high pressure air enters the arcing chamber.

* The contact separation required for arc extinction is very small generally (1.75 cms) 1

* This small gap may sometimes inadequate clearance for the normal service voltage.

2a) Advantage of SF6 CB

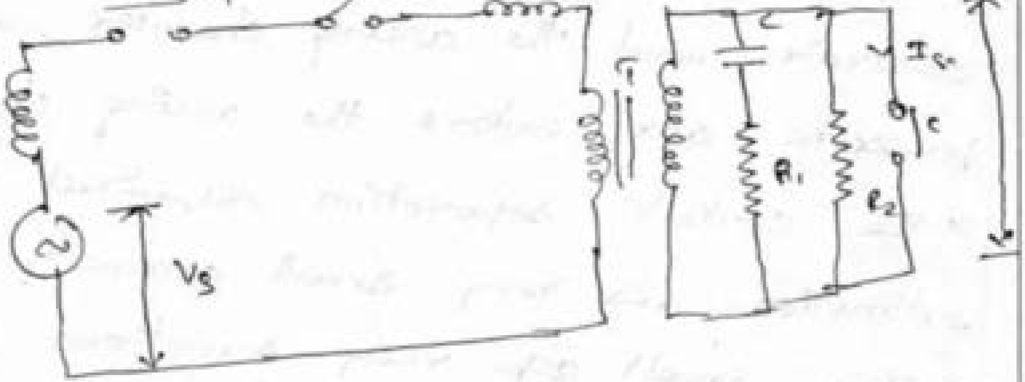
- Enclosed construction
- Stability is high
- It is used in medium and high voltage electrical systems
- Has compact in size
- There is no risk of fire as SF6 is non-inflammable
- Gives noiseless operation

Disadvantages of SF6

- It is costly due to the high cost of SF6
- SF6 gas has to be reconditioned after every operation of the breaker, additional equipment is required for this purpose

—— × ——

2b) Direct testing of circuit breaker



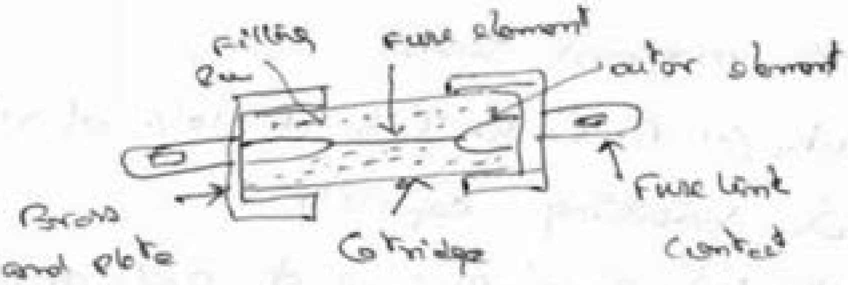
-) The Direct testing of circuit breaker is shown in above figure
- After making the preliminary adjustments of the Constants, etc.

- under normal operating conditions the current flowing through the fuse element does not provide enough energy to melt the element. 1

- If a large current flow the energy produced melts and vaporises the fuse element for the extinguishing the arc 1

- Fuse operates when it elements melt due to heat produced by I^2R_F, where R_F is fuse resistance. 1

- 2



— x —

3a) Rod gap arrestor:

- This arrestor is very simple and is rugged in construction. It is the cheapest among all the other arrestors and requires no maintenance. 2

2

- It consists of two 1inch metal rods that are placed. The flashover voltage depends up to some extent on the length of the lower rod which is connected to the ground. 1

Expulsion type arrestor:

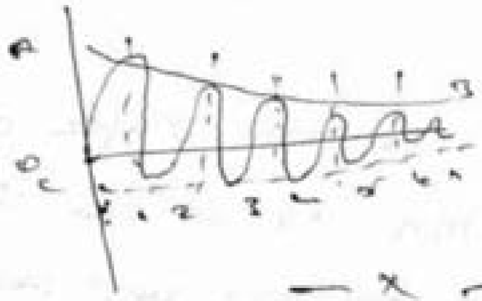
- when a voltage surge occurs that is sufficient to spark over the series gap and the gap in the fiber tube, discharge current flows to the ground 1

The various tests carried out for circuit breakers are making capacity: the master CB and the make switch are closed first, then the breaker under test is closed on a three phase short circuit. 2

- Recovery voltage obtained during the test 1
- Symmetrical breaking current
- Assymmetrical breaking current
- Amplitude factor, natural frequency and RRRV

Short time current tests: 1

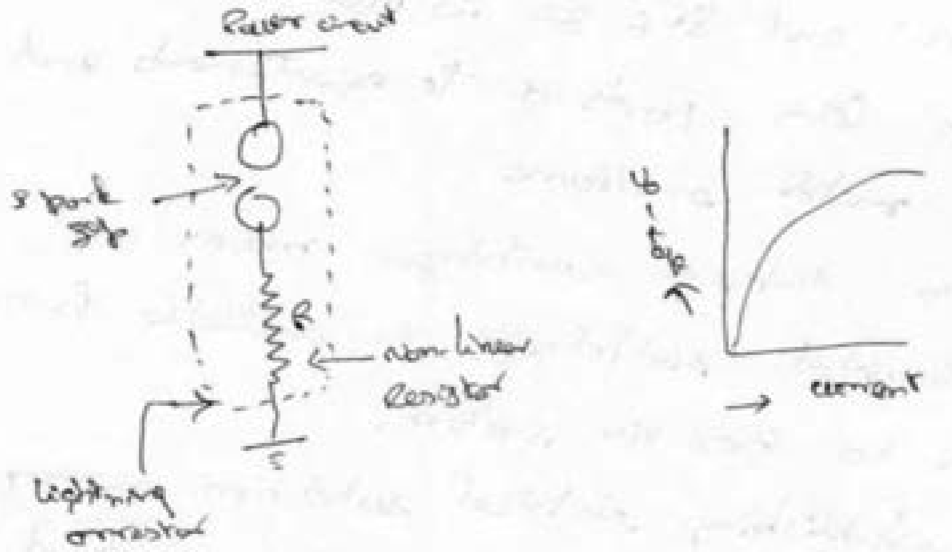
- Test duty (1) B-3'-B-3'-B at 10% of rated symmetrical breaking capacity
- Test duty (2) B-3'-B-3'-B at 30% of rated symmetrical breaking capacity



2c) HRC cartridge fuse.

- High Rupturing capacity. HRC fuse has high rupturing capacity 1
- Consists of heat resisting ceramic body, fusing metal and caps on which silver current carrying element is welded in a special manner 1

Q.No	Solution	Marks Allocated
3b)	A surge arrestor is a protective device which	1
	conducts the high voltage surges on the power system to the ground.	1



Q.No	Solution	Marks Allocated
		1
		1
	The lightning arrestors is off the line i.e, it conducts no current to earth or the gap is non-conducting	1
	On the occurrence of overvoltage, the air insulation across the gap breaks down and an arc is formed.	1
	- It should not pass any current at normal and abnormal power frequency voltage	
	- It should breakdown as quickly as possible after the abnormal high frequency voltage arrives	1
	- It should interrupt power frequency follow current after the surge is discharge to ground.	1

Q.No	Solution	Marks Allocated
3C	GIS is a kind of metal enclosed switchgear. That means, all the equipment of the electrical switchgear are enclosed by gas tight metal enclosure and SF_6 gas is used as insulation between live parts of the equipments and earthed metal enclosure	1 2
	- This type of switchgear means and gas insulated switchgear is available from 12 kV systems to 800 kV system.	1
	For establishing electrical substation in very limited place this type of SF_6 insulated electrical switchgear plays the major role	2
	- The single unit gas insulated substation has gained over appreciation as it is a complete solution for an outdoor substation, in a single unit.	1

— X —

Shridevi Institute of Engineering andTechnology
(An ISO 9001:2008 certified Institution)
Sira Road, Tumkur – 572 106. Karnataka

INTERNAL ASSESMENT TEST NO-1

Sub: Solar and Wind Energy — **Subcode:** 18EE731
Sem: 7th Sem — **Date:** 21/11/2021
Max Marks: 40 — ***Note:* Answer any two full questions** — **Duration:** 90 Minutes

Q-1 (a) Explain classification of energy sources. [8M]
(b)Explain working principle of Solar photovoltaic system & elements. [8M]
(c)Explain briefly Indian energy scenario. [4M]

OR

Q-2 (a)Explain extra terrestrial irradiation. [10M]
. (b) Define altitude angle, zenith angle, hour angle, latitude angle [10M]

Q-3 (a)Explain working principle of solar cell. [8M]
(b)Explain I-V characteristics of solar cell and power output. [8M]
(c)With neat diagram explain Declination angle. [4M]

OR

Q-4(a)With neat diagram Explain propagation of Solar radiation through atmosphere. [7M]
(b)Explain Energy storage and describe different types. [6M]
(c)What do you understand by Energy conservation and various aspects. [7M]

Shridevi Institute of Engineering andTechnology
(An ISO 9001:2008 certified Institution)
Sira Road, Tumkur – 572 106. Karnataka

INTERNAL ASSESMENT TEST NO-1

Sub: Solar and Wind Energy — **Subcode:** 18EE731
Sem: 7th Sem — **Date:** 21/11/2021
Max Marks: 40 — ***Note:* Answer any two full questions** — **Duration:** 90 Minutes

Q-1 (a) Explain classification of energy sources. [8M]
(b)Explain working principle of Solar photovoltaic system & elements. [8M]
(c)Explain briefly Indian energy scenario. [4M]

OR

Q-2 (a)Explain extra terrestrial irradiation. [10M]
. (b) Define altitude angle, zenith angle, hour angle, latitude angle [10M]

Q-3 (a)Explain working principle of solar cell. [8M]
(b)Explain I-V characteristics of solar cell and power output. [8M]
(c)With neat diagram explain Declination angle. [4M]

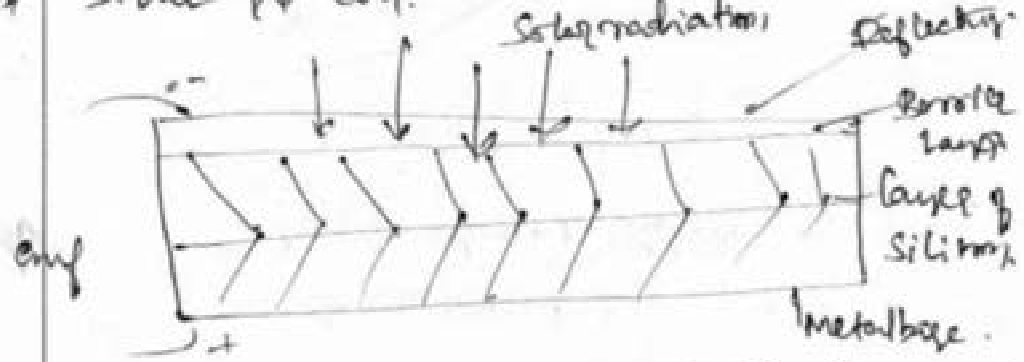
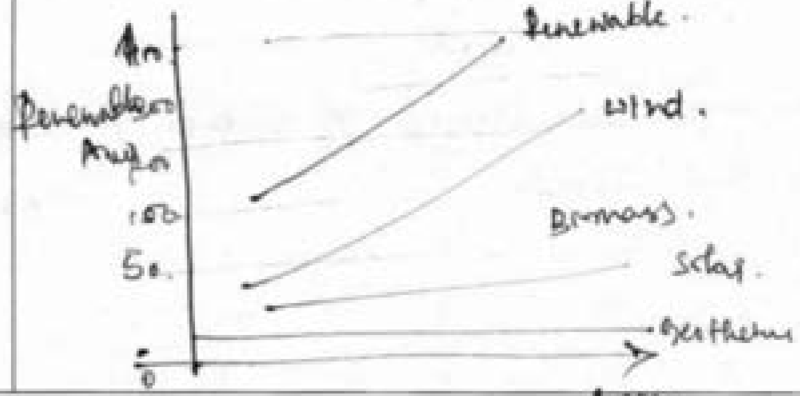
OR

Q-4(a)With neat diagram Explain propagation of Solar radiation through atmosphere. [7M]
(b)Explain Energy storage and describe different types. [6M]
(c)What do you understand by Energy conservation and various aspects. [7M]

G. H. R

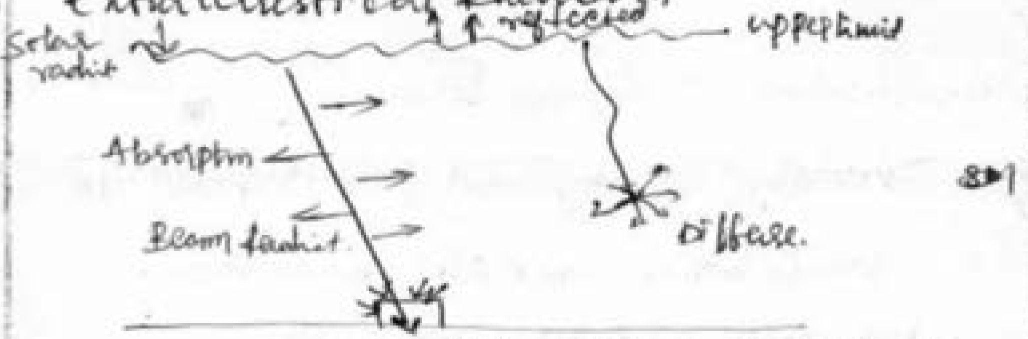
Signature of staff — **Signature of HOD** — **Signature of Principal**

Course Title: Solar & Wind Energy Scheme & Solution **Course Code:** 18EE81.

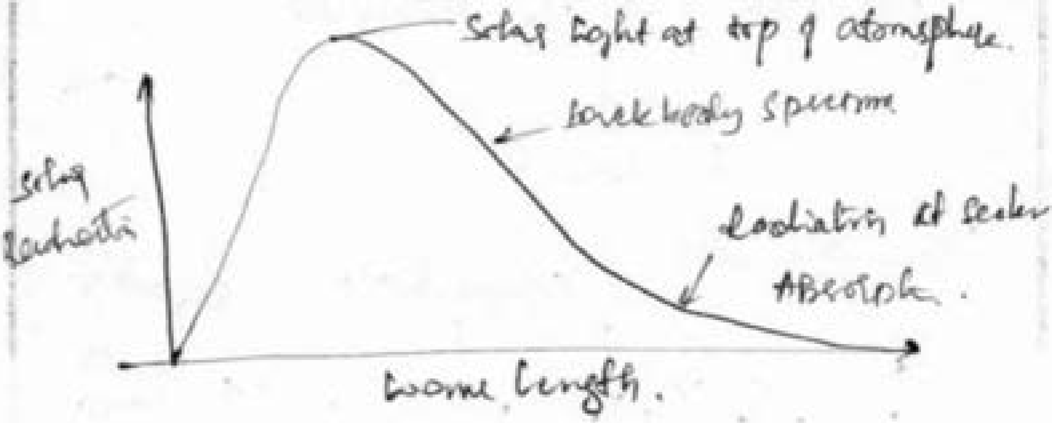
Question Number	Solution	Marks Allocated
1a)	Classification of Energy Resources. Primary energy and secondary energy. Conventional and Non Conventional. Renewable and Non Renewable. Chart Energies.	2 2 8M. 2. 2
1b)	Solar PV cell.  Principle Emf method. PN junction sandwitch Emitter, PN junction	3M. 3M. 8M. 2M
c)	Indian Energy Scenario 	2 4M.

Energy Theory 2

Question Number	Solution	Marks Allotted
2) a)	Extraterrestrial Radiation	



3M 3M



3M. 10M.

UV-C
UV-B
UV-A

Visible range of rays.
Infrared range.

4M.

2. b) Altitude Angle, sunrays of projection. horizontal 2M

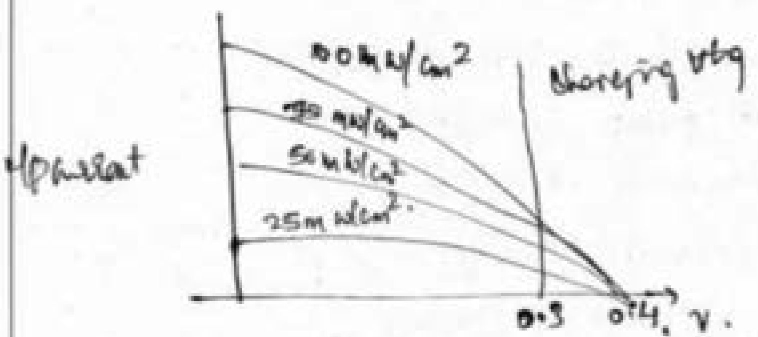
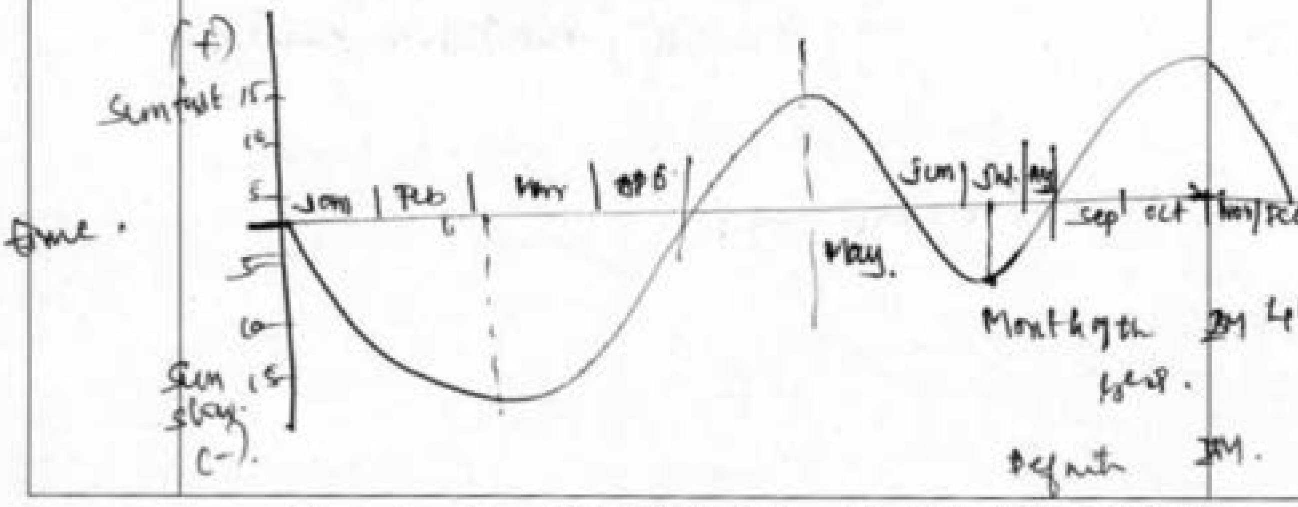
Zenith angle. Complementary angle of Altitude. 2M Vertical.

10M

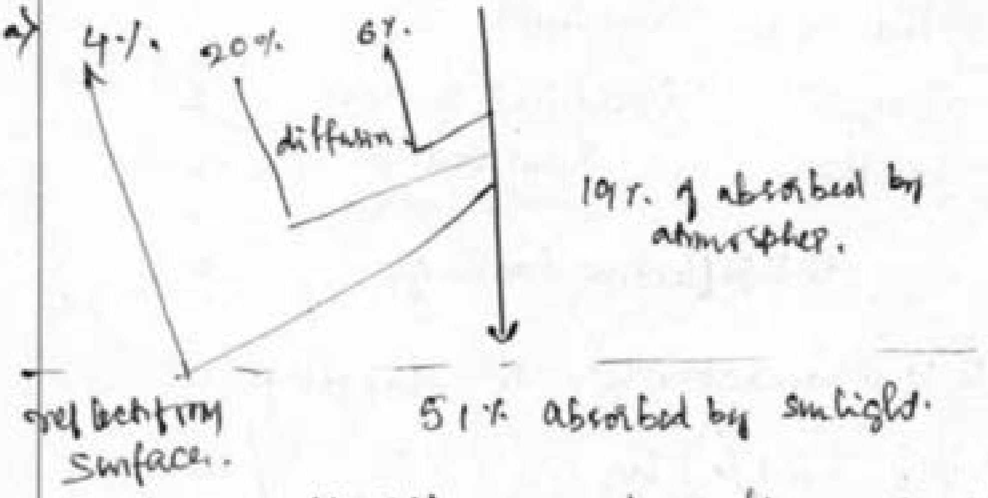
Hour angle. Meridian of the earth direction sunrays.

Latitude angle. measurement of distance of North and South. 2M

2M

Question Number	Solution	Marks Allocated
3) a)	Solar cell elements: Substrate. Electrical contact. 2 Emitter, Front contact 2 Back contact. 2 Antireflective coatings. 2	8M.
b)	I V characterstics of solar cell. $V = (KT/e) \log_e (1 + I_s - I)/I_0$ — 2 +ve, −ve terminals of cell 2  2 $P = (I_s - I_0 \{\exp (eV/kT - 1)] \times V$ 2	8M.
c).	Declination angle.  Month graph 2M Definition 1M.	4M.

The angle b/w the rays of the sun and the plane of the equator

Question Number	Solution	Marks Allocated
4) a)	 Absorption and scattering of solar	3M 7M 4M.
b)	Energy Storage System. Necessity of Storage System. 2 Hydro pump Storage. 1 Compressed Air Storage. 1 Thermal Storage. 1 Hydrogen Storage. 1	6M.
c)	Energy Conservation System. Direct Energy Conversion. Fuel cells, photovoltaic, photoelectric. The process in which heat to mechanical energy transforming.	

Shridevi Institute of Engineering andTechnology
(An ISO 9001:2008 certified Institution)
Sira Road, Tumkur – 572 106. Karnataka

INTERNAL ASSESMENT TEST NO-2

Sub: Solar and Wind Energy **Subcode:** 18EE731
Sem: 7th Sem **Date:** 28/12/2021
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a)With a neat diagram explain Solar Cooker and Solar Pond. [10M]
(b)Define Solar Collector and explain different types of solar collector. [10M]

OR

Q-2 (a)Explain Solar active and passive water heating system. [10M]
. (b) Explain solar dryers and its different types. [10M]

Q-3 (a)Explain Parabolic Dish stirling heat engine system. [8M]
(b)Explain Solar thermal energy application system.. [8M]
(c Explain the important material required for solar collector. [4M]

OR

Q-4(a)Explain the application of solar Photo Voltaic system. [10M]
(b)Explain Heliostat energy conversion system. [10M]

Shridevi Institute of Engineering andTechnology
(An ISO 9001:2008 certified Institution)
Sira Road, Tumkur – 572 106. Karnataka

INTERNAL ASSESMENT TEST NO-2

Sub: Solar and Wind Energy Subcode: 18EE731
Sem: 7th Sem Date: 28/12/2021
Max Marks: 40 Note: Answer any two full questions Duration: 90 Minutes

Q-1 (a)With a neat diagram explain Solar Cooker and Solar Pond. [10M]
(b)Define Solar Collector and explain different types of solar collector. [10M]

OR

Q-2 (a)Explain Solar active and passive water heating system. [10M]
. (b) Explain solar dryers and its different types. [10M]

Q-3 (a)Explain Parabolic Dish stirling heat engine system. [8M]
(b)Explain Solar thermal energy application system.. [8M]
(c Explain the important material required for solar collector. [4M]

OR

Q-4(a)Explain the application of solar Photo Voltaic system. [10M]
(b)Explain Heliostat energy conversionsystem. [10M]

Course Title: **Scheme & Solution** **Course Code:**

Question Number	Solution	Marks Allocated
1) a)	Solar cooker diagram - 3 explaination - 2	5M
	Solar pond diagram - 3 explaintn - 2	5M
b)	Solar collector defgram concentric and parabolic . 5M. explanation working 5M	10M
2) a)	Water heating system active and passive diagram 5M. working of heating system 5M	10M
b)	Solar dryers diagram 5M. different dry and wet solar types 5M	10M
3) a)	parabolic Dish stirling heat Engine system diagram 4M Explaination	
b)	Solar thermal Energy application Block diagram 4M. Explaination and flow chart 4M	8M
c)	material Required solar collector 4 points	4M.
4) a)	Application of Solar photo Voltaic System. PV cells in 5 Application 5X2M	10M.
b)	Helio stat Energy Conversion System	

Shridevi Institute of Engineering andTechnology
(An ISO 9001:2008 certified Institution)
Sira Road, Tumkur – 572 106. Karnataka

INTERNAL ASSESMENT TEST NO-3

Sub: Solar and Wind Energy **Subcode:** 18EE731
Sem: 7th Sem **Date:** 8/03/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a) Explain aerodynamic effects of wind energy conversion. [10M]
(b)Explain basic principle of wind energy conversion. [10M]

OR

Q-2 (a) Write a short note on wind energy storage. [10M]
. (b)Derive a mathematical model of extraction of energy from wind. [10M]

Q-3 (a)Describe the expression for power developed in the wind. [05M]
(b)Explain the wind energy conversion system with horizontal axis. [10M]
(c) Explain the important parameter s for selecting site of wind power plant. [05M]

OR

Q-4(a)state the Ecomonical benefits of wind energy with merits and demerits.. [10M]
(b)Explain the wind energy conversion system with vertical axis. [10M]

Shridevi Institute of Engineering andTechnology
(An ISO 9001:2008 certified Institution)
Sira Road, Tumkur – 572 106. Karnataka

INTERNAL ASSESMENT TEST NO-3

Sub: Solar and Wind Energy **Subcode:** 18EE731
Sem: 7th Sem **Date:** 8/03/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a) Explain aerodynamic effects of wind energy conversion. [10M]
(b)Explain basic principle of wind energy conversion. [10M]

OR

Q-2 (a) Write a short note on wind energy storage. [10M]
. (b)Derive a mathematical model of extraction of energy from wind. [10M]

Q-3 (a)Describe the expression for power developed in the wind. [05M]
(b)Explain the wind energy conversion system with horizontal axis. [10M]
(c) Explain the important parameter s for selecting site of wind power plant. [05M]

OR

Q-4(a)state the Ecomonical benefits of wind energy with merits and demerits.. [10M]
(b)Explain the wind energy conversion system with vertical axis. [10M]

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: **Scheme & Solution** **Course Code:**

Question Number	Solution	Marks Allocated
1) a)	Aerodynamic effect of wind energy conversion Diagram Air foils	5. 2 10M 3.
b)	Basic principle of wind energy. explanation diagram 4M. parts + working 2+4	10M
2) a)	wind energy storage system 5×2M	10M.
b)	Mathematic model of wind energy. $E = W = Fx$ 5M $P = 1/2\, \rho S \underset{2}{V^3} + \underset{3}{\text{graph}}$ M	10M.
3) a)	power developed by wind. $P = 1/2(\rho S V)^3$ 3 graph 2	5M
b)	wind energy conversion horizontal axis. Drag type - diagram + explanation (3+2) Darrieus types diagram + expl. (3+2)	5 10M 5
c)	selecting site of wind power plant 5 points -	5M
4) a)	Economic Benefits – 4M Advantages 4 points - 3M Disadvantages 4 pts 3M	10M
b)	Wind energy with vertical axis Dutch (Construction + working) 3+2 Drag system diagram + work. (2+3)	5M 10M 5M

Shridevi Institute of Engineering andTechnology
Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-3

Sub:Transformer&Generator **Subcode**: 18EE32
Sem: 3rd Sem **Date**: 05/04/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a)Explain Armature reaction of Alternator. [10M]
(b) Explain Commutation process of Alternator. [10M]

Or

Q-2(a) Explain EMF equation of Alternator. [10M]
(b)Explain equivalent circuit of alternator. [10M]

Q-3(a) Explain Slip Test. [10M]
(b) Explain Two Reaction Theory. [10M]

Or

Q-4 (a)Explain Parallel operation of Alternator. [10M]
(b)Explain the Emf ~~equation~~ method of ~~Alternator~~. [10M]

Signature of staff Signature of HOD

Shridevi Institute of Engineering andTechnology
Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-3

Sub:Transformer&Generator **Subcode**: 18EE32
Sem: 3rd Sem **Date**: 05/04/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a)Explain Armature reaction of Alternator. [10M]
(b) Explain Commutation process of Alternator. [10M]

Or

Q-2(a) Explain EMF equation of Alternator. [10M]
(b)Explain equivalent circuit of alternator. [10M]

Q-3(a) Explain Slip Test. [10M]
(b) Explain Two Reaction Theory. [10M]

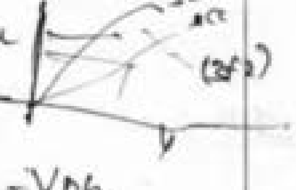
Or

Q-4 (a)Explain Parallel operation of Alternator. [10M]
(b)Explain the Emf ~~equation~~ method of ~~Alternator~~. [10M]

Signature of staff Signature of HOD

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: **Scheme & Solution** **Course Code:**

Question Number	Solution	Marks Allocated
1) a)	Armature Reaction diagram - 4 × 2M Theory - 2M	8M 2M 10M.
b)	Commutation process. diagram - 4M. Theory - 2M Crossand demag 4M	10M.
2) a)	EMF Equation of Alternator expression 5M. Abbreviation derivation 5M	10M
b)	Equivalent circuit of Alternator diagram 5M Explanation 5M	10M
3) a)	Slip test Diagram 3 graph 3 X_d X_q Explanation 2+2	10M
b)	Two Reaction Theory diagram 5M. Aligmn explanation 5M	10M
4) a)	Parallel operation of Alternator diagram 5M $I_{sq} = \frac{\overline{E_1} - \overline{E_2}}{Z_1 + Z_2}$ 5M	10M
b)	EMF Method. diagram 5M Explanation + graph see  $\% R = \frac{E_{ph} - V_{ph}}{V_{ph}}$	10M

SHRIDEVI
EDUCATION

Shridevi Institute of Engineering and Technology

(An ISO 9001:2008 certified Institution)
Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-2

Sub:T&G
Subcode: 18EE33
Sem: IIIsem
Max Marks: 30

Note: **Answer any two full questions**

Date: 21.10.19
Duration: 75 Minutes

Q-1 (a) Explain Sumpner Test. [10M]
(b) Explain polarity test. [05M]

Or

Q-2(a) Explain parallel operation of transformer with unequal voltage ratio. [07M]
(b)Explain necessary condition & parallel operation of transformer with equal voltage. [08M]

Q-3(a) Explain the copper saving of autotransformer. [08M]
(b) Explain equivalent circuit of autotransformer. [07M]

Or

Q-4 (a)Explain on load tap changing of autotransformer. [09M]
(b)Explain equivalent circuit of tertiary winding& stabilisation transformer. [06M]

Signature of staff

Signature of HOD

SHRIDEVI
EDUCATION

Shridevi Institute of Engineering and Technology
(An ISO 9001:2008 certified Institution)
Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-2

Sub:T&G
Subcode: 18EE33
Sem: IIIsem
Max Marks: 30

Note: Answer any two full questions

Date: 21.10.19
Duration: 75 Minutes

Q-1 (a) Explain Sumpner Test. [10M]
(b) Explain polarity test. [05M]

Or

Q-2(a) Explain parallel operation of transformer with unequal voltage ratio. [07M]
(b)Explain necessary condition & parallel operation of transformer with equal voltage. [08M]

Q-3(a) Explain the copper saving of autotransformer. [08M]
(b) Explain equivalent circuit of autotransformer. [07M]

Or

Q-4 (a)Explain on load tap changing of autotransformer. [09M]
(b)Explain equivalent circuit of tertiary winding& stabilisation transformer. [06M]

Signature of staff

Signature of HOD

Course Title: **Scheme & Solution** **Course Code:**

Question Number	Solution	Marks Allocated
1) a)	Sumpner test diagram 4M. working 3M losses 2M	10M
b)	polarity test · diagram 3M. explanation 2M	5M
2) a	parallel operation of Transformer with unequal Vg ratio Diagram 2M. Phase Diagram 3M. explanation 2M	7M.
b)	paralall operation of transformer with equal Vg ratio Diagram + phase diagram + explanation (2+2+2)	8M
3) a)	copper saving of Auto transformer diagram 4M expression 4M	8M
b)	Equivalent circuit of Auto transformer diagram 3M with refer to N_1 and N_2 4M	7M
4) a)	ON Load tap changing of Auto transformer diagram 5M construct working 4M	9M
b)	Tertiary winding diagram w.r.t N_1 & N_2	3M
	Stabilization Transformer ⅄ Δ ⅄	3M

Shridevi Institute of Engineering andTechnology
Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-1

Sub: High voltage Engineering **Subcode:** 18EE56
Sem: 5^{th} Sem **Date:** 22/11/2021
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a) What are the advantages of transmitting electrical power at high voltages. [8M]
(b)Explain cascade transformer. [6M]
(c)Explain generation of high impulse current. [6M]

OR

Q-2(a)Explain triggering of impulse generator. [10M]
(b)Derive the expression for ripple voltage and voltage drop for Walton circuit. [10M]

Q-3 (a) With a neat circuit diagram explain cockroft walton voltage multiplier circuit. [10M]
(b) Explain Single stage Impulse Generator and Marx circuit. [10M]

OR

Q-4(a) Explain Tesla coil [10M]
(b) Explain Series resonant Transformer. [10M]

Shridevi Institute of Engineering andTechnology
Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-1

Sub: High voltage Engineering **Subcode:** 18EE56
Sem: 5^{th} Sem **Date:** 22/11/2021
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a) What are the advantages of transmitting electrical power at high voltages. [8M]
(b)Explain cascade transformer. [6M]
(c)Explain generation of high impulse current. [6M]

OR

Q-2(a)Explain triggering of impulse generator. [10M]
(b)Derive the expression for ripple voltage and voltage drop for Walton circuit. [10M]

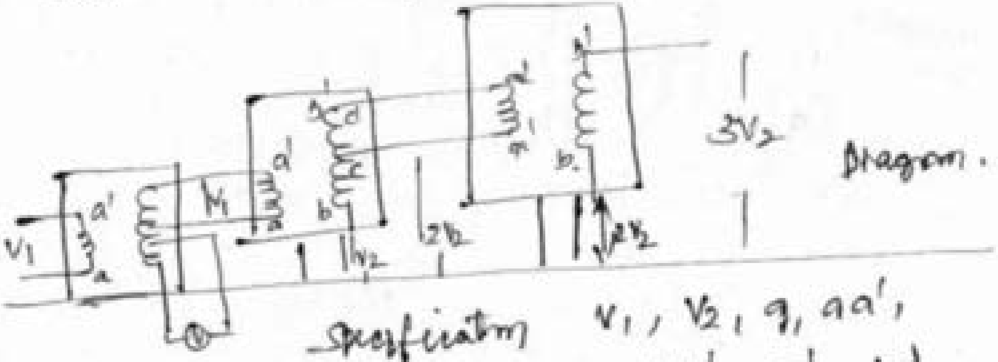
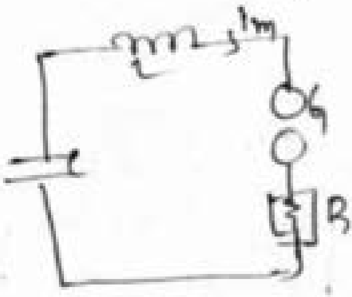
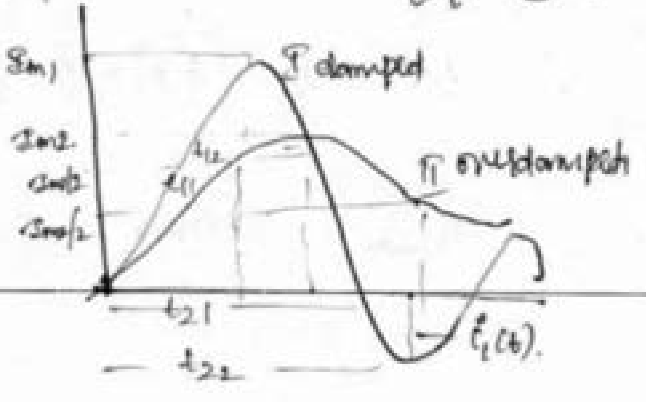
Q-3 (a) With a neat circuit diagram explain cockroft walton voltage multiplier circuit. [10M]
(b) Explain Single stage Impulse Generator and Marx circuit. [10M]

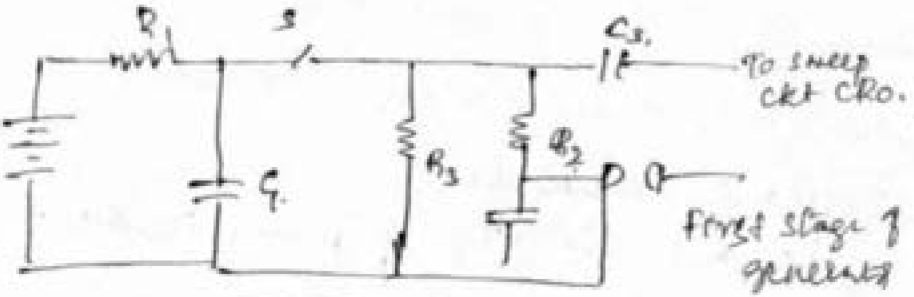
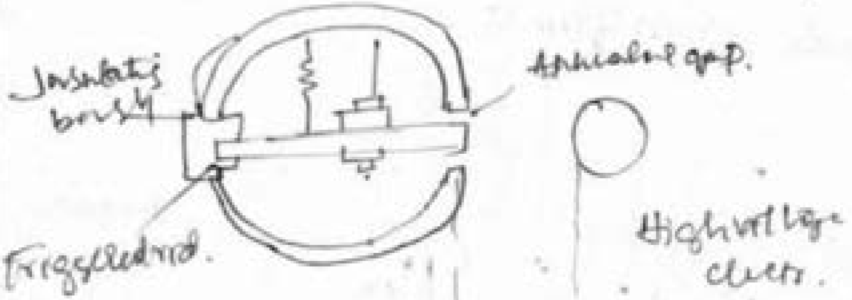
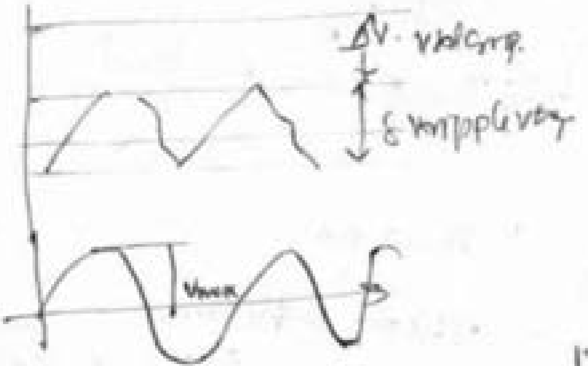
OR

Q-4(a) Explain Tesla coil [10M]
(b) Explain Series resonant Transformer. [10M]

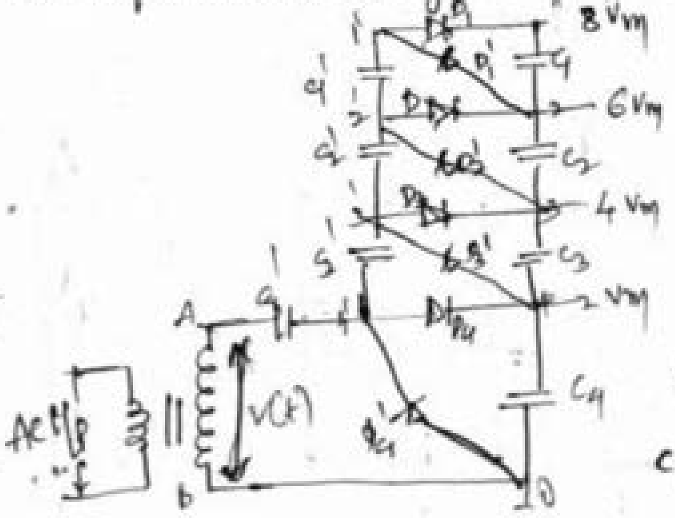
Signature of staff **Signature of HOD** **Signature of Principal**

Course Title: HV Engineering. **Scheme & Solution** **Course Code:** 18EE56.

Question Number	Solution	Marks Allocated
1. a)	Advantages of transmitting electrical power at high voltage.	
	• Reduces size of conductor.	2
	• Increases transmission efficiency.	2 {8M.
	* Decrease % line drop	2
	- Increase stability of power system.	2
b)	Cascade transformer.	
		
	Diagram.	2M.
	Specification V_1, V_2, q, aa', bb', cc', bd	2M $\boxed{6M}$
	Theory.	2M.
c)	Generation of high Impulse current.	
		
	Diagram	2M.
	Theory expression	
	$= R i_m + L\frac{di_m}{dt} + \frac{1}{C}\int^{T} i_m dt$	2M {6M
	Waveform 	2M

Question Number	Solution	Marks Allocated
2) a)	Triggering of Impulse Generator Three electrode gap. Trigatron gap.   theory.	5M 10M 5M 4M
b)	Ripple voltage and voltage drop.  $\delta V_1 = \frac{I}{fC}$ $\delta V_2 = \frac{2I}{fC}$ $\delta V_n = \frac{nI}{fC}$ $\boxed{\delta V = \frac{I}{fC} \frac{n(n+1)}{2}}$ $\Delta V = \frac{I}{fC}\left(\frac{2}{3}n^3 + \frac{n^2}{2} - \frac{n}{6}\right)$ $V_{0(max)} = 2nV_{max} - \frac{I}{fC}\left(\frac{2}{3}n^3\right)$	4M 2M 2M 2M

Question Number	Solution	Marks Allocated
3) a)	Cockroft walton voltage Doubling ckt.	



4

10M.

C_1', C_2', C_3', C_4'

C_1, C_2, C_3, C_4

Half wave rectifier to full wave rectifier 2

1' 2' 3' 4' accelerating.

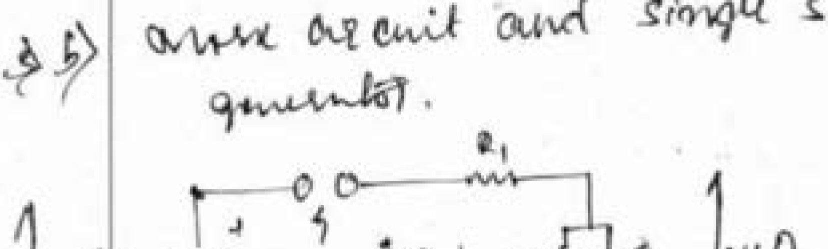
1 2 3 4 Steady state

D_1 D_2 D_3 D_4 +ve conducting 2

D_1' D_2' D_3' D_4' -ve conducting

or no. of Stages. Theory. 2

3 b) [illegible] circuit and single stage impulse generator.



2M

$$Z(S) = R_1 + \frac{\frac{R_2}{C_2 S}}{R_2 + \frac{1}{C_2 S}} + \frac{1}{C_1 S}$$

1M

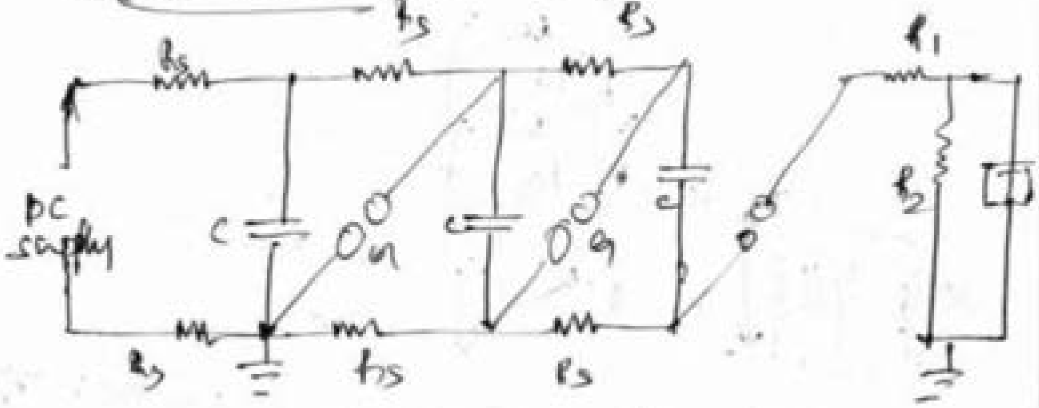
Question Number	Solution	Marks Allocated

$$I(s) = \frac{V_0}{s} \cdot \frac{1}{Z(s)}.$$

$$V(s) = I(s) \frac{R_2}{R_2 C_2 s + 1}.$$

2M. $\left\{ 5M \right.$

Charge circuit



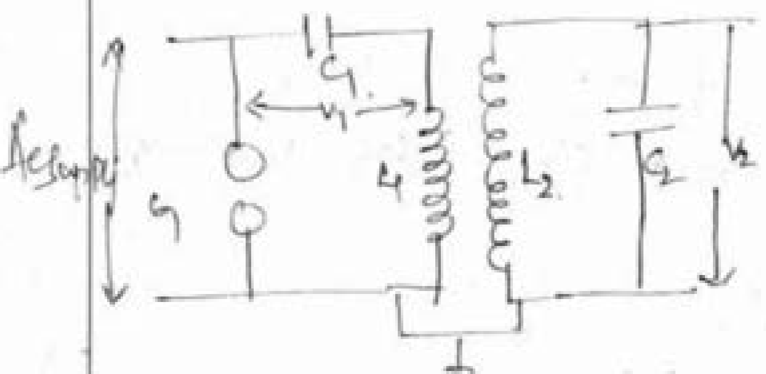
2M

1M. $\left\{ 5M \right.$

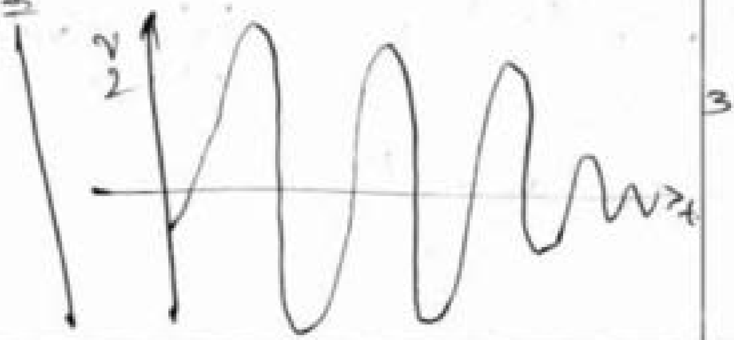
R_s , C_1 G_1, T, R_1 R_2 2

Theory.

4) a) Generation of high frequency AC HV.



3M



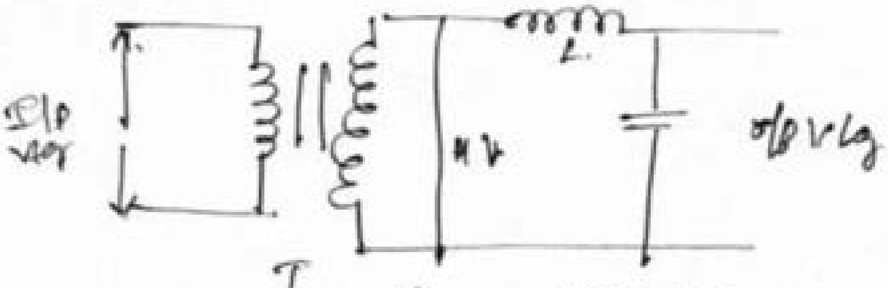
3M.

$f_1 = \frac{1}{2\pi L_1 C_1}$

$L_1 C_1 = L_2 C_2$

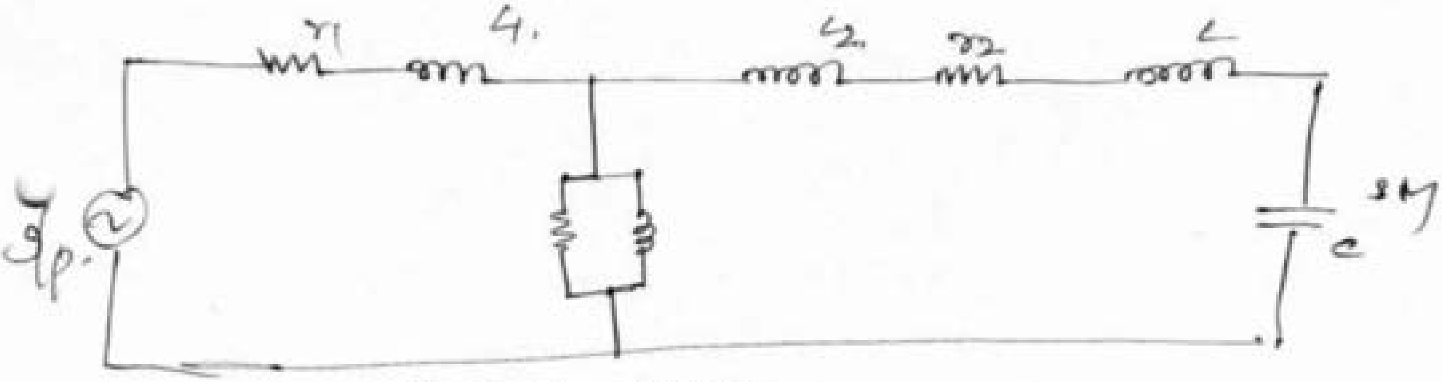
Theory. 4M.

4) 5) Series Resonant Transformer.



3M

Resonant Transformer.



3M

Equivalent Circuit

T_1 L_1 C_1 $r_1 r_2$, $L_1 L_2$, R_0, L_0. — 1M

Theory 2M.

$$\omega(L_2+L)=\frac{1}{\omega C}.$$

Shridevi Institute of Engineering andTechnology
Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-2

Sub: High voltage Engineering **Subcode:** 18EE56
Sem: 5th Sem **Date:** 28/12/2021
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a) Discuss the various factors that affect the spark over voltage of a sphere gap.
(b) Explain Generating Voltmeter. [8M]
(c) Explain Rogawaski coil and magnetic links. [4M]

OR

Q-2(a) Explain balance detection method using Schering bridge. [10M]
(b)Explain straight detector and wheat stone bridge. [10M]

Q-3 (a) With a neat circuit diagram explain peak reading AC voltmeter [10M]
(b) With a neat circuit diagram explain Electrostatic Voltmeter [10M]

OR

Q-4(a) Explain dielectric loss and loss angle measurement using Schering bridge [10M]
(b)Explain partial discharge measurement. [10M]

Shridevi Institute of Engineering andTechnology
Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-1

Sub: High voltage Engineering **Subcode:** 18EE56
Sem: 5th Sem **Date:** 22/11/2021
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a) Discuss the various factors that affect the spark over voltage of a sphere gap.
(b) Explain Generating Voltmeter. [8M]
(c) Explain Rogawaski coil and magnetic links. [4M]

OR

Q-2(a) Explain balance detection method using Schering bridge. [10M]
(b)Explain straight detector and wheat stone bridge. [10M]

Q-3 (a) With a neat circuit diagram explain peak reading AC voltmeter [10M]
(b) With a neat circuit diagram explain Electrostatic Voltmeter [10M]

OR

Q-4(a) Explain dielectric loss and loss angle measurement using Schering bridge [10M]
(b)Explain partial discharge measurement. [10M]

G. H Rame

Signature of staff **Signature of HOD** **Signature of Principal**

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: HVE **Scheme & Solution** **Course Code:** 15EE56

Question Number	Solution	Marks Allocated
1 a)	Factors affect SOV of sphere gap. Near by earth object 2 Influence of dust partile 2 Polarity 2 External irradiation 2	8M
b)	Generating Voltmeter. Diagram 4 Construction and working 4	8M.
c)	Rogowski coil Magnetic links diagram 2 explain 2	4M.
2) a)	Balance Detection using Schering Bridge diagram 4. labelling and working 2+4	10M.
b)	Straight detector diagram 2 explain 3M	5M
	Wheat stone bridge diagram 2 explain 3	5M
3) a	Peak Reading AC voltmeter diagram 4 explaination 3 wave forms 3	10M
b)	Electrostatic Voltmeter diagram 4 explanation construction 3 working 3	10M
4) a)	Dielectric loss Schering bridge. diagram 4 expression of arms 2 tan δ 2	10M
b)	Partial discharge measurement 3 diagram 3 voids identification 3 explaint 2	10M

SHRIDEVI

Shridevi Institute of Engineering andTechnology
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-3

Sub: High voltage Engineering **Subcode**: 18EE56
Sem: 5^{th} Sem **Date**: 09/03/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a) With the help of suitable expression explain Townsends first and second ionization coefficient. [10M]
(b) Explain suspended and bubble theorem in liquid . [10M]

OR

Q-2 (a)Explain natural causes of lightning voltages. [10M]
(b)Explain dielectric test of cable and impulse test of transformer. [10M]

Q-3 (a) Explain break down mechanism in solid dielectric. [10M]
(b) Exolain Paschens Law. [10M]

OR

Q-4(a) With a neat diagram explain Surge Arrester. [10M]
(b)Explain testing of circuit breaker, Insulator. [10M]

SHRIDEVI

Shridevi Institute of Engineering andTechnology
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESMENT TEST NO-3

Sub: High voltage Engineering **Subcode**: 18EE56
Sem: 5^{th} Sem **Date**: 09/03/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a) With the help of suitable expression explain Townsends first and second ionization coefficient. [10M]
(b) Explain suspended and bubble theorem in liquid . [10M]

OR

Q-2 (a)Explain natural causes of lightning voltages. [10M]
(b)Explain dielectric test of cable and impulse test of transformer. [10M]

Q-3 (a) Explain break down mechanism in solid dielectric. [10M]
(b) Exolain Paschens Law. [10M]

OR

Q-4(a) With a neat diagram explain Surge Arrester. [10M]
(b)Explain testing of circuit breaker, Insulator. [10M]

15

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: HVE **Scheme & Solution** **Course Code:** BEE56

Question Number	Solution	Marks Allocated
1) a)	Townsends expression I ionsatin diagram 2M expression $I_1=I_0e^{\alpha d}$ 3M	5M
	II Ionsiation graph 2M.	5M.
b)	suspendend and Bubble. expression 3M	
	suspended theorem statement + expression (3+2)	5M
	Bubbles theorem statement + expression (3+2)	5M
2) a	Natural causes of Lightning Voltages. 5 points of causes of lighting 5×2	10M.
b)	Testing of cable. diagram 2M dielectric test explain 3M	5M
	Impulse test of Transformer 3M explanation 2M	5M
3) a)	Break down Mechanism in solid Dielectric ① intrinsic, thermal, dielect Breack down 3	7M
b)	paschens Law expression 3 graph  3 explanation 4	10M
4) a)	Surge Arrester diagram exp 4 Construction & working (6M)	10M
b)	Testing of circuit Breaker Synthetic testing diagram 3 explanation 2	5M
	Testing of Insulation Dry test and wet test. diagram 3 explanation 2	5M

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering

THIRD INTERNAL ASSESSMENT

Sub: Electrical & Electronics Measurements
Sem: III sem
Max Marks:40

Sub code: 18EE36
Date: 04.04.22
Duration: 90 Minutes

Answer two full questions selecting one full question from each module

MODULE-1

1. a) With a neat figure, explain the operation of True RMS reading voltmeter. **10M**
   b) Explain how Q-meter can be used for the measurement of resistance and inductance of an unknown coil. **10M**

OR

2. a) Explain how Q-meter can be used for the measurement of low impedance of an unknown coil. **10M**
   b) With a neat sketch, explain the working of seven segment LED and LCD diplays. **10M**

MODULE-II

3. a) Explain how Q-meter can be used for the measurement of high impedance of an unknown coil. **10M**
   b) With a neat sketch, explain the operation of ramp type DVM. **10M**

OR

4. b) With a neat sketch, explain the operation of X-Y Recorder **10M**
   c) With a neat sketch, explain the operation of multimeter as a voltmeter. **10M**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering

THIRD INTERNAL ASSESSMENT

Sub: Electrical & Electronics Measurements
Sem: III sem
Max Marks:40

Sub code: 18EE36
Date: 04.04.22
Duration: 90 Minutes

Answer two full questions selecting one full question from each module

MODULE-1

1. a) With a neat figure, explain the operation of True RMS reading voltmeter. 10M
b) Explain how Q-meter can be used for the measurement of resistance and inductance of an unknown coil. 10M

OR

2. a) Explain how Q-meter can be used for the measurement of low impedance of an unknown coil. 10M
b) With a neat sketch, explain the working of seven segment LED and LCD diplays. 10M

MODULE-II

3. a) Explain how Q-meter can be used for the measurement of high impedance of an unknown coil. 10M
b) With a neat sketch, explain the operation of ramp type DVM. 10M

OR

4. b) With a neat sketch, explain the operation of X-Y Recorder 10M
c) With a neat sketch, explain the operation of multimeter as a voltmeter. 10M

Electrical & Electronics Measurements

Third I.A. (18EE36)

04.04.22

1.a) True RMS reading Voltmeter.

Figure ⟶ 3M
construction ⟶ 3M
working principle ⟶ 4M ⟶ $\boxed{10M}$

b) Q - Meter

Figure ⟶ $\boxed{3M}$
Construction ⟶ $\boxed{3M}$
Working : $X_L = X_C$ (Two Measurements are made)

$$\omega L = \frac{1}{\omega C}$$

$$L = \frac{1}{\omega^2 C}. \longrightarrow \boxed{4M}.$$

2.a) Q - Meter :

Figure → $\boxed{3M}$
working → $\boxed{3M}$

Derivation : $L_m = \frac{C_1 - C_2}{\omega^2 C_1 C_2}$ $R_m = \frac{Q_1 - Q_2}{\omega C_1 Q_1 Q_2}$

$$Q_m = \frac{(C_1 - C_2) Q_1 Q_2}{C_1 Q_1 - C_2 Q_2} \quad C_m = \frac{C_1 C_2}{C_1 - C_2}$$

⟶ $\boxed{4M}$

2.b) LED → Figure ⟶ 2M, working ⟶ 3M } 5M

LCD → Figure ⟶ 2M, working ⟶ 3M } ⟶ 5M

3.a) Q-meter → High impedance components

Figure → $\boxed{3M}$

$L_m = \frac{1}{\omega^2 (C_1 - C_2)} \longrightarrow \boxed{2M}$ $Q_m = \frac{R_m}{X_m}$

$R_m = \frac{Q_1 Q_2}{\omega C_1 (Q_1 - Q_2)} \longrightarrow \boxed{3M}$ $= \frac{(C_1 - C_2) Q_1 Q_2}{C_1 (Q_1 - Q_2)}$

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering

FIRST INTERNAL ASSESSMENT

Sub:Utilization of Electric Power. **Sub code:** 18EE742
Sem: VII sem **Date:** 21.11.2021
Max Marks: 40 **Duration:** 90 Minutes

***Note:* Answer two full questions selecting one full question from each module.**

MODULE – 1

1.a) What are requirements of good heating elements. **6M (CO1)**
b) With a neat sketch, explain the construction, principle of operation and applications of Ajax Wyatt furnace. **10M(CO1)**
c) What are the temperature control methods in resistance furnaces. **4M(CO1)**

OR

2.a) Explain with a neat sketch, High frequency eddy current heating. **8M(CO1)**
b) Discuss the major drawback of a direct core type induction furnace. **6M(CO1)**
c) Explain the applications of High frequency eddy current heating. **6M(CO1)**

MODULE – II

3.a) Explain the principle of Dielectric Heating. Derive the mathematical expression for power consumed in such process. State the applications of Dielectric Heating. **10M(CO1)**
b) With a neat sketch, explain the construction and working principle of direct arc furnace. **10M(CO1)**

OR

4.a) With a neat sketch, explain the flash butt welding and spot welding. **10M(CO2)**
b) Clearly explain the various types of electrodes used for welding process. **10M(CO2)**

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering

FIRST INTERNAL ASSESSMENT

Sub:Utilization of Electric Power. **Sub code:** 18EE742
Sem: VII sem **Date:** 21.11.2021
Max Marks: 40 **Duration:** 90 Minutes

***Note:* Answer two full questions selecting one full question from each module.**

MODULE – 1

1.a) What are requirements of good heating elements. **6M (CO1)**
b) With a neat sketch, explain the construction, principle of operation and applications of Ajax Wyatt furnace. **10M(CO1)**
c) What are the temperature control methods in resistance furnaces. **4M(CO1)**

OR

2.a) Explain with a neat sketch, High frequency eddy current heating. **8M(CO1)**
b) Discuss the major drawback of a direct core type induction furnace. **6M(CO1)**
c) Explain the applications of High frequency eddy current heating. **6M(CO1)**

MODULE – II

3.a) Explain the principle of Dielectric Heating. Derive the mathematical expression for power consumed in such process. State the applications of Dielectric Heating. **10M(CO1)**
b) With a neat sketch, explain the construction and working principle of direct arc furnace. **10M(CO1)**

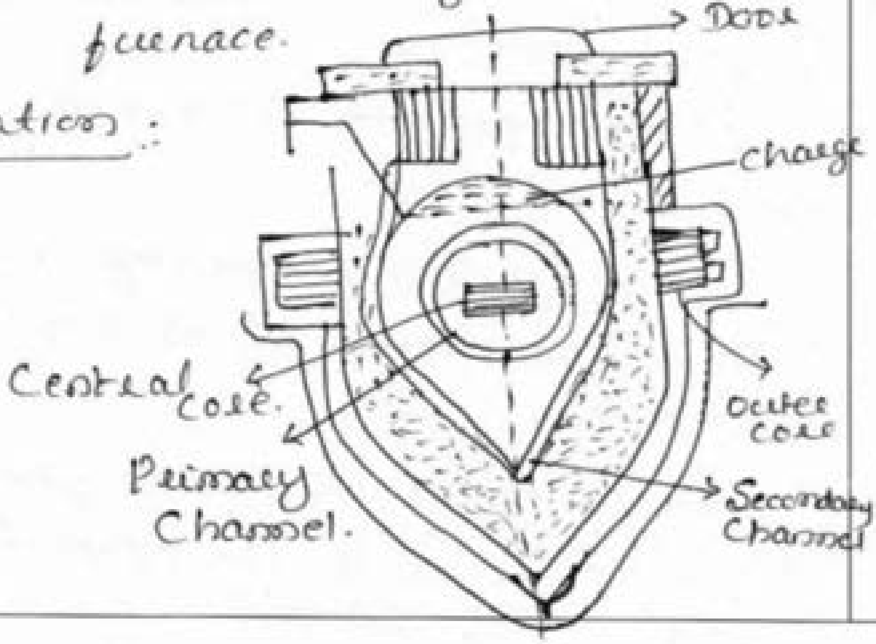
OR

4.a) With a neat sketch, explain the flash butt welding and spot welding. **10M(CO2)**
b) Clearly explain the various types of electrodes used for welding process. **10M(CO2)**

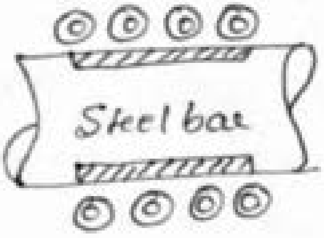
G. H. Rame

MALNAD COLLEGE OF ENGINEERING
(Under the auspices of the M. T. E. S (R), Hassan)
(An Autonomous Institution Affiliated to VTU, Belgaum)
Post Box No.21, Hassan-573202,Karnataka- India
Scheme & Solution

Course Title: Utilization of Electric power **Course Code:** 18EE742

Question Number	Solution	Marks Allocated
	Module - 1	
1.a)	i> High Resistivity ii> High Melting point iii> Low tempr co-efficient of Resistance iv) Free from oxidation. v) Mechanical properties.	6M
b)	Applications :- Melting and Refining of brass and non-ferrous metals.	2M
	Working :- The furnace can be operated from normal frequency supply. The 'V' channel is narrow and even a small quantity of charge is sufficient to keep the secondary circuit closed ...	4M
	Figure. Vertical Core type Induction furnace. Explaination :  	4M

Course Title: **Course Code:**

Question Number	Solution	Marks Allocated
2. b)	i) By varying the applied voltage. ii) Bucking and boosting of secondary voltage. iii) Auto transformer control. iv) Changing the no of heating elements. v) Change of connections vi) Intermittent Switching	4M
2. a)	Explaination of High frequency eddy current heating.  Explaination :- $d = \frac{1}{2\pi}\sqrt{\frac{\rho \times 10^9}{\mu_r f}}$ $d \propto \sqrt{1/f}$. $\longrightarrow$ 4M.	4M
b)	Drawbacks of Direct core type Induction furnace are : i) Leakage reactance of the mag. ckt is high and p f is poor. ii) Due to normal frequency, turbulence of the metal occurs, which requires low frequency. iii) Shape of the crucible is odd & is not convenient to melt the charge.	6M

2. c> Applications of High frequency eddy current heating are :-

Brief explaination of

- i> Surface hardening of steel.
- ii> Annealing of Metals
- iii> Soldering.
- iv) welding, drying, painting etc.

→ 6M

3. a> Dielectric Heating :

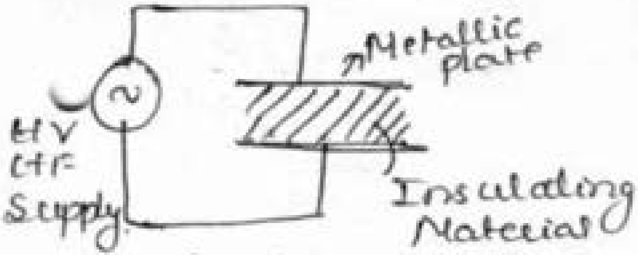


fig (a)

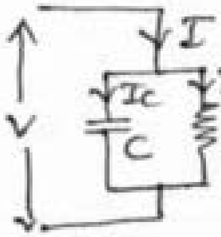
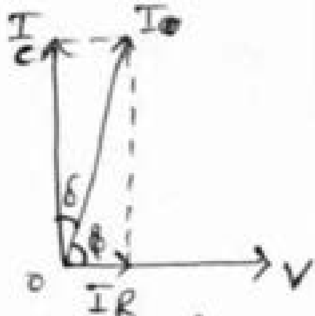


fig (b)
Imperfect capacitor.



Vector diagram
fig(c).

Explaination :- It is also called as high frequency capacitive heating. and specially used for heating insulating Materials like wood, plastic ceramics etc. Uniform heating is possible.

The insulating material to be heated is kept b/w the metallic plates & connected a high voltage as shown in fig (a). This acts as an imperfect capacitor as shown in fig (b).

→ (4M)

$\phi = 90 - \delta$
(fig c)

Derivation :- $C = \frac{\epsilon_0 \epsilon_r a}{t}$

$$I_c = V/X_c = \frac{V}{1/2\pi f C} = 2\pi f C V$$

$$I \simeq I_c = 2\pi f C V$$

$$P = VI\cos\phi = V \times 2\pi f C V \cos\phi$$

$$= 2\pi f C V^2 \cos(90 - \delta) = 2\pi f C V^2 \sin\delta$$

$$\boxed{P = 2\pi f C V^2 \delta}$$

→ ③

Applications :- 1) preheating of plastics
2) Glueing of wood
3) Sterilization
4) Electronic Sewing
5) Diathermy
6) Baking of foundry cores → (3M)

3.b) Direct arc furnace.

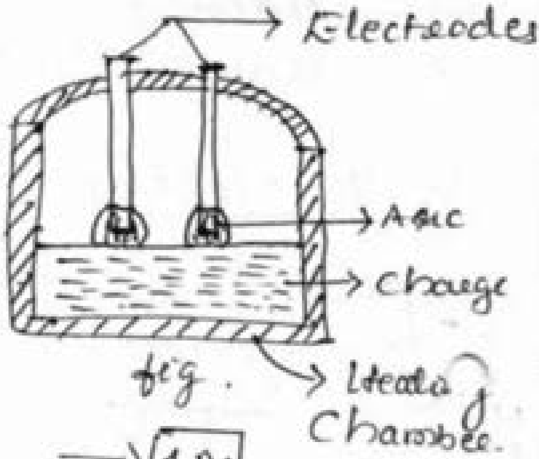


fig.

Explaination :- The fig shows direct arc furnace. The arc is formed b/w the electrodes and charge. The electric current pass thro the charge. Hence a very high temps can be obtained. there is a provision for electrodes to be raised or lowered so that the air gap may be adjusted b/w the electrodes and charge. The carbon or graphite electrodes are used. The current in the charge sets up electromagnetic forces due to that automatic stirring action takes place.

→ 4M

→ 6M

4.a) Spot welding → Figure → 2M
Explaination → 3M

Flash Butt Weding → Figure → 2M
Explaination → 3M

b) Electrodes for Welding:
i) Bare Electrodes → Explaination → 5M
ii) Coated Electrodes → Explaination → (5M)

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering

SECOND INTERNAL ASSESSMENT

Sub: Utilization of Electric Power. **Sub code:** 18EE742
Sem: VII sem **Date:** 28.12.2021
Max Marks: 40 **Duration:** 90 Minutes

Note: **Answer two full questions selecting one full question from each module.**

MODULE – 1

1.a) Discuss the factors which influences the electro deposition process. 8M
b) Clearly explain the extraction of the metal Zinc. 6M
c) Define the following terms and their units. 6M
i) Luminous flux ii) Luminous intensity iii) Illumination iv) MHCP v) MSCP

OR

2.a) State and explain laws of illumination. 6M
b) Briefly explain the factors of lighting schemes for good lighting requirements. 6M
c) With a neat sketch, explain the Rousseau's Construction. 8M

MODULE – 2

3.a) Clearly explain the principles of street lighting and the lamps used for street lighting. 6M
b) With a neat sketch, explain the construction and working of Incandescent lamp. 8M
c) Two lamps of candle powers 500 and 1200 are hung at a height of 10meters from the ground level. The distance between the lamp is 3m. Find the illumination at a point on the ground directly below the 500C.P lamp. 6M

OR

4.a) Clearly explain the factory lighting and the types of factory lighting schemes. 6M
b) Briefly explain the factors for Lighting calculations. 6M
c) A workshop measuring 30x12 m is to be provided with an illumination of 100 lux on the working plane. The coefficient of utilization is 0.4 and the maintenance factor is 0.8 and the luminous efficiency of the lamps is 14 lumens per watt. Calculate the number of lamps required and their deposition. 8M

G. H. Rame

Signature of staff **Signature of HOD** **Signature of Principal**

Utilization of Electric power
Second I.A. (18EE742) 28/12/2021

1. a) Nature of Electrolyte
Current density
Temperature
Conductivity
Electrolytic concentration
Additional Agents
Throwing power
polarisation. → 8M

b) Explaination of Extraction of Zinc → 6M.

c) Definitions & units.
i) Luminous flux
ii) Luminous Intensity
iii) Illumination
iv) MHCP
v) MSCP
→ 6M.

2. a) Laws of illumination.
i) Lambert's cosine Law → 3M
ii) Inverse square Law → 3M

b) Adequate illumination
colour of Light
Uniform illumination
Shadow
Glare
Mounting height
Spacing of Luminaries
any 6 → $\boxed{6M}$

c) Rousseau's construction:
Figure → 4M
Construction → 4M

3. a) Diffusion principle → 3M
Specular reflection principles → 3M

b) Incandescent Lamp
Figure → 3M
construction → 2M
working → 3M → 8M

c) $E_A = \boxed{10.44m} = d$ → 1M

$E_A = 15.546$ lux → 5M.

4. a) Factory Lighting :-
General Lighting → 2M
Local " → 2M
Emergency " → 2M → 6M.

b) i) Utilization Factor (U.F)
(ii) Maintainance factor (M.F)
iii) Waste Light factor (W.L.F)
(iv) Absorption factor
v) Beam factor
vi) Reflection factor
Each 1M → 6M

c) Total flux Ø = 1,12,500 Lumens
200W lamps
Lumen o/p = 200×14 = 2800
No of lamps reqd. = 40 lamps.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering

THIRD INTERNAL ASSESSMENT

Sub: Utilization of Electric Power. **Sub code:** 18EE742
Sem: VII sem **Date:** 08.02.2022
Max Marks: 40 **Duration:** 90 Minutes

Note: **Answer two full questions selecting one full question from each module.**

MODULE – 1

1.a) Derive an expression for the total distance travelled between two stations & the velocity at the breaking. Assume Quadrilateral speed time curve. **10M**

b) A train is required to run between two stops which are 4 km apart with a schedule speed of 45 kmph and the duration of stops being 30seconds. The braking retardation is 3kmphps. Calculate the acceleration, if the ratio of maximum speed to average speed is 1.25. Assume trapezoidal speed time curve. **10M**

OR

2.a) What are simplified speed time curves. For a trapezoidal speed time curve , derive an expression for the maximum speed attained by the train. **10M**

b) Define i) Crest Speed ii) Average Speed iii) Schedule speed. **5M**

c) Discuss the factors which affect the schedule speed. **5M**

MODULE – 11

3.a) Define specific energy consumption. Derive an expression for the same. **10M**

b) A train is moving down a gradient 1% from rest with a uniform acceleration of 1.8 kmphps for 30 seconds. The coasting period is 60 seconds & the braking period is 20 seconds. The tractive resistance is 50 n/tone. Allow 10% for the effect of rotational inertia. The duration of stops is 20 seconds & the efficiency of gear system is 90% & that of motors is 85%. Calculate the schedule speed & the specific energy consumption. **10M**

OR

4.a) Derive the tractive efforts required for propulsion of a train considering gradient and resistance to train movement. **10M**

b) A 200 tonne motor coach has 4 motors, each developing 6000 N-m torque, during acceleration starts from rest. If the gradient is 30 in 1000, gear ratio 4, gear transmission efficiency 90%,, wheel radius 45cm, train resistance 50 N/tone & additional rotational inertia 10%, calculate the time taken to attain the speed of 50kmph. If the line voltage is 3000volts dc & efficiency of motors is 85%,, find the current during notching period. **10M**

Utilization of Electric Power.

Third I.A (18EE742) 08.02.2022.

1. a) Derivation.

$$D = \frac{1}{7200}\left[T(V_1+V_2) - V_1V_2K\right] \longrightarrow \boxed{5M}$$

$$V_2 = V_1 - \beta_c t_2$$

$$t_2 = T-(t_1+t_3)$$

$$= T-\left[\frac{V_1}{\alpha}+\frac{V_2}{\beta}\right]$$

$$V_2 = \frac{\beta}{\beta-\beta_c}\left[V_1\left(1+\frac{\beta_c}{\alpha}\right)-\beta_c T\right] \longrightarrow \boxed{5M}$$

b) $T = 290$ sec. $\longrightarrow$ 2M

$V_a = 49.66$ kmph $\longrightarrow$ 2M

$V_m = 1.25\,V_a = 62.1$ kmph $\longrightarrow$ 2M

$K = \frac{7200D}{V_m^2}\left[\frac{V_m}{V_a}-1\right] = 1.867 \longrightarrow$ 2M

$\alpha = 0.652$ kmphps $\longrightarrow$ 2M $\longrightarrow \boxed{10M}$.

2. a) Definition of speed time curve. $\longrightarrow \boxed{2M}$

Derivation of Maximum speed.

$$V_m = \frac{T}{K} - \sqrt{\left(\frac{T}{K}\right)^2 - \frac{7200D}{K}} \longrightarrow \boxed{6M}$$

$$K = \frac{2T}{V_m} - \frac{7200D}{V_m^2} \quad T = \frac{3600D}{V_a} \longrightarrow \boxed{2M}$$

b) Definitions :- i) Crest speed $\longrightarrow$ 2M
ii) Average " $\longrightarrow$ 2M
iii) Schedule " $\longrightarrow$ 2M
$\Bigg\}\ \boxed{6M}$

Electr 21-22 Even

Shridevi Institute of Engineering andTechnology
Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF Electrical& ENGINEERING

INTERNAL ASSESMENT TEST NO-1

Sub:Renewable Energy Resource **Subcode:** 18EE653
Sem: 6th Sem **Date:** 21/05/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a)With a neat diagram explain Wind Power generation plant. [07M]
(b)Define Renewable Energy.State its advantages and disadvantages. [07M]
(c) Discuss advantages & disadvantages of Tidal plant. [06M]

Or

Q-2(a)Explain harnessing of Hydro energy. [10M]
(b)Explain different methods of conversion of energy by OTEC plant. [10M

Q-3(a) With a neat diagram explain single & two basin Tidal Power generation plant. [07M]
(b) Explain important parameters for selecting site of wind power plant. [07M]
(c) Explain briefly classification of energy sources. [06M]

Or

Q-4 (a) Discuss advantages & disadvantages of wind plant. [07M]
(b)Explain energy availability in Tidal plant. [07M]
(c) Explain classification of tida plant. [06M]

Sira Road, Tumkur – 572 106. Karnataka

DEPARTMENT OF Electrical& ENGINEERING

INTERNAL ASSESMENT TEST NO-1

Sub:Renewable Energy Resource **Subcode:** 18EE653
Sem: 6th Sem **Date:** 21/05/2022
Max Marks: 40 ***Note:* Answer any two full questions** **Duration:** 90 Minutes

Q-1 (a)With a neat diagram explain Wind Power generation plant. [07M]
(b)Define Renewable Energy. State its advantages and disadvantages. [07M]
(c) Discuss advantages & disadvantages of Tidal plant. [06M]

Or

Q-2(a)Explain harnessing of Hydro energy. [10M]
(b)Explain different methods of conversion of energy by OTEC plant. [10M

Q-3(a) With a neat diagram explain single & two basin Tidal Power generation plant. [07M]
(b) Explain important parameters for selecting site of wind power plant. [07M]
(c) Explain briefly classification of energy sources. [06M]

Or

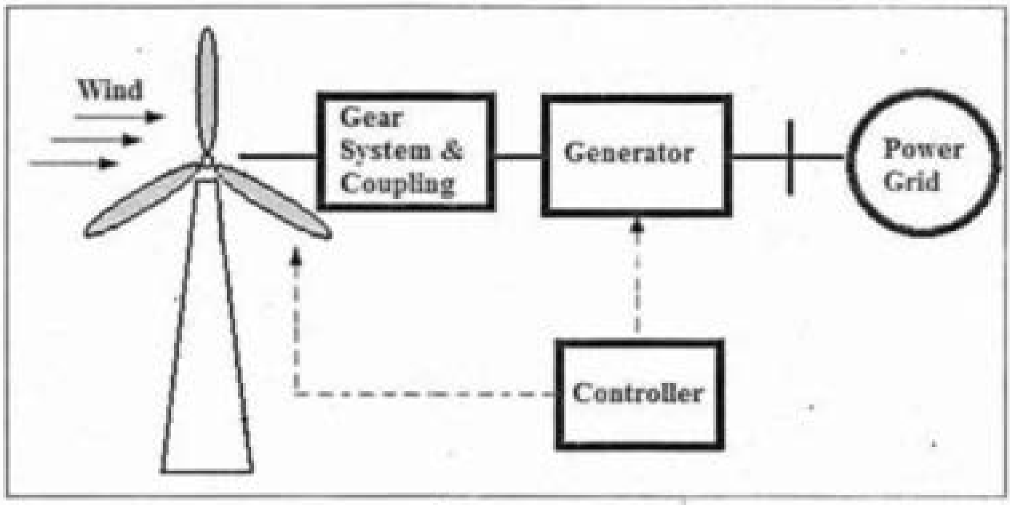
Q-4 (a) Discuss advantages & disadvantages of wind plant. [07M]
(b)Explain energy availability in Tidal plant. [07M]
(c) Explain classification of tida plant. [06M]

Signature of staff **Signature of HOD**

Renewable Energy Resources Test 1. 18EE653

Scheme and Solution

1a)



Block diagram 4

7M.

Wind power plants produce electricity by having an array of wind turbines in the same location. The placement of a wind power plant is impacted by factors such as wind conditions, the surrounding terrain, access to electric transmission, and other siting considerations. In a utility-scale wind plant, each turbine generates electricity which runs to a substation where it then transfers to the grid where it powers our communities. 3

Defn 2M.

1b) Renewable energy is **energy derived from natural sources that are replenished at a higher rate than they are consumed**. Sunlight and wind, for example, are such sources that are constantly being replenished. Renewable energy sources are plentiful and all around us.

Benefits of Renewable Energy Use

Less global warming.
Improved public health.
Inexhaustible energy.
Jobs and other economic benefits.
Stable energy prices.
Reliability and resilience.

4M

7M.

Disadvantages of Renewable Energy

- Renewable Energy Is Not Available Round the Clock. ...
- The Efficiency of Renewable Technologies Is Low. ...
- The Initial Cost of Renewable Energy Is High. ...
- Renewable Energy Sites Require A Lot of Space. ...
- Renewable Energy Devices Need Recycling.

1 c). **Advantages of tidal energy**

- Environment-friendly.
- A highly predictable energy source.
- High energy density.
- Operational and maintenance costs are low.
- An inexhaustible source of energy.

3M

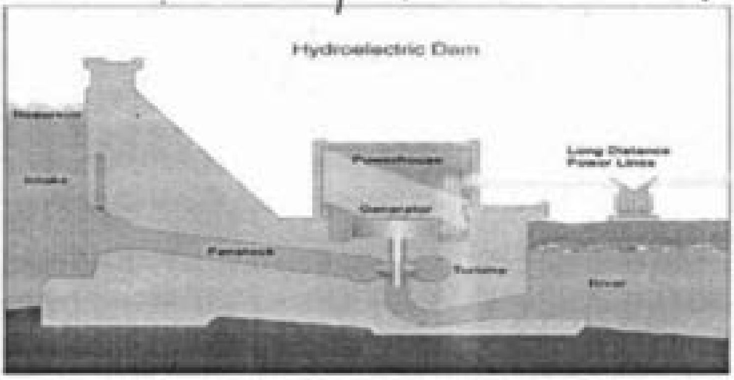
6M.

Disadvantages of tidal energy

- The cost: building tidal power plants is currently pretty expensive. ...
- Effects on the environment: tidal power plants aren't always good for the environment around them, even though the energy they produce is environmentally-friendly. ...
- Gaps between the tides: tidal power is not constant.

3M

2) a) Harnessing of Hydro Energy.



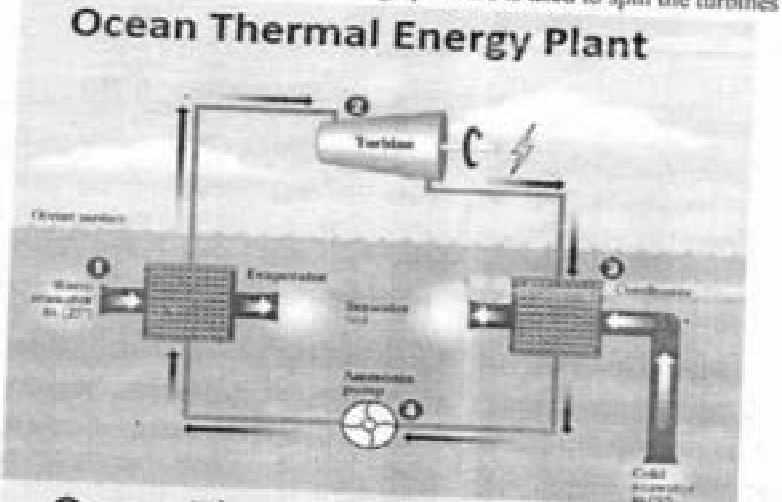
5M.

Hydroelectric power is the energy derived from flowing water. This can be from rivers or man-made installations, where water flows from a high-level reservoir down through a tunnel and away from a dam. **Turbines placed within the flow of water extract its kinetic energy and convert it to mechanical energy.**

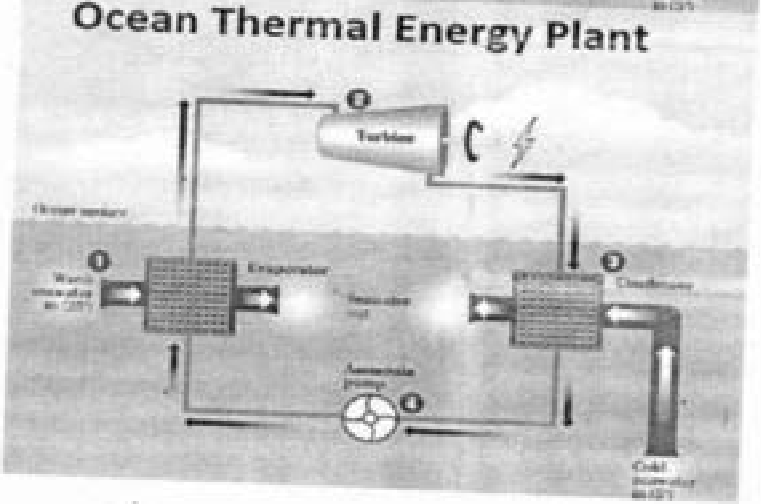
5M

2) 5)

OTEC plant, the energy of warm surface water is used to convert low boiling point liquid ammonia into gaseous state. The vapour of ammonia at high pressure is used to spin the turbines of generators converting the Ocean thermal energy



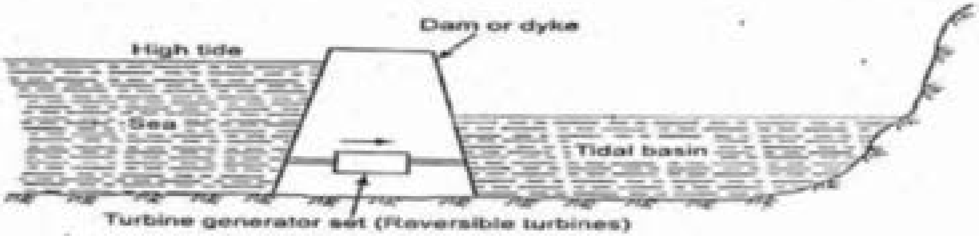
6M.



Theory 4M.

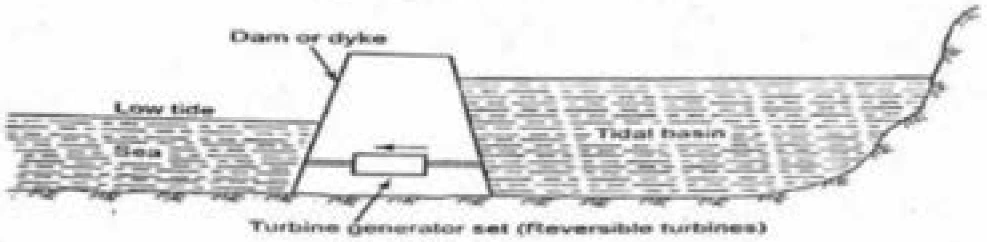
Tidal power plant.

3) a)

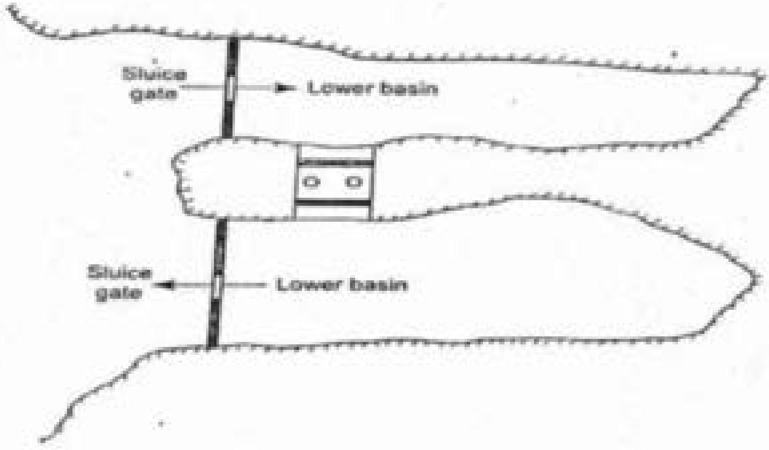


(a) High Tide

02M



(b) Low Tide



01M

7M

Fig shows a general arrangement of double basin tidal power plant. In this type, the two basins are located apart and their waters are never exchanged.

4M

The turbine is set up between the two basins. One basin is intermittently filled by the flood tide and other is intermittently drained by the ebb tide.

Water flow from high basin to low basin is through turbines. This flow is controlled such that continuous power is obtained from the plant without waiting for tidal sequence.

The single basin schemes have only one basin. Power generation is intermittent and mostly during off-peak load periods on daily load curves.

The tidal basin and the sea are separated by a dam or dyke. The rise and fall of tidal water levels provide the potential head.

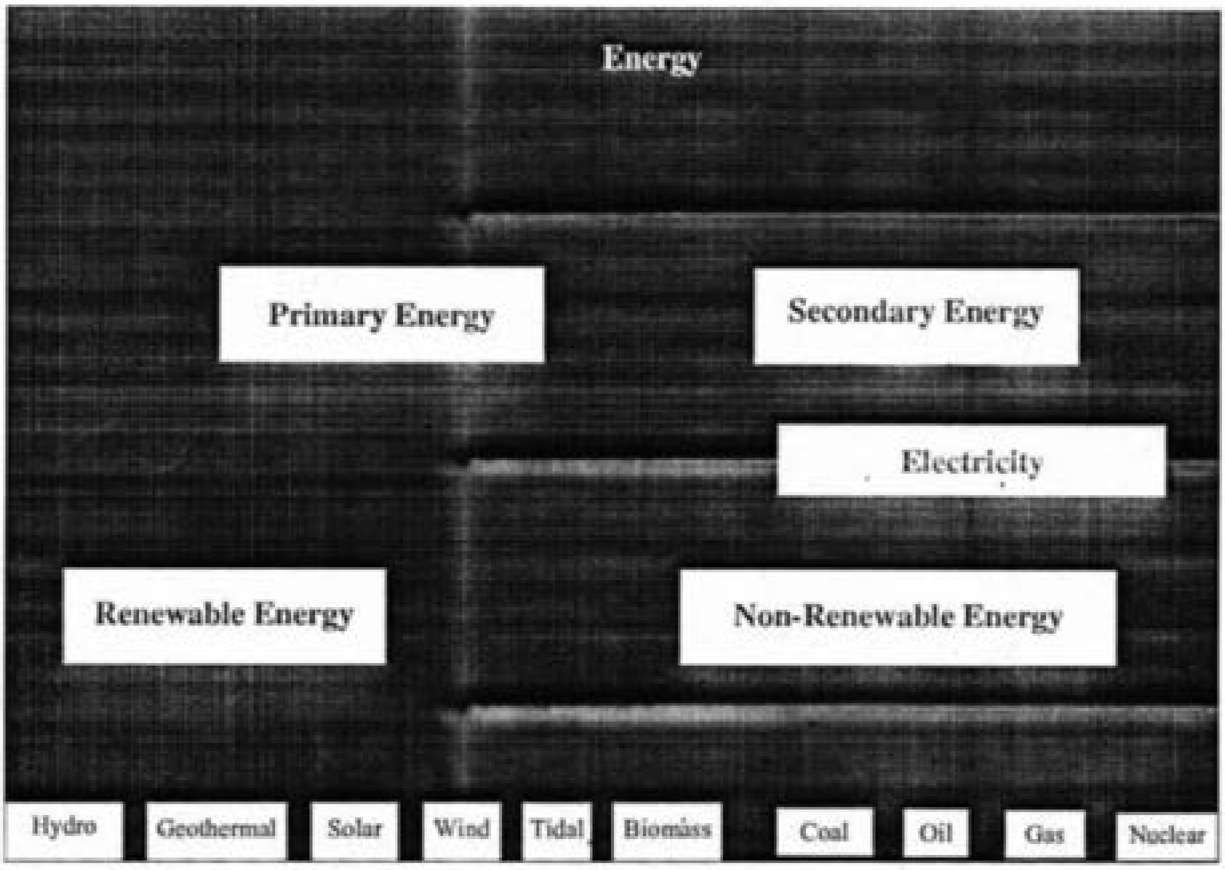
Working

Fig shows a general arrangement of single basin tidal power plant (double cycle system) such plants generally use reversible water turbines so that power is generated on low tide as well high tide.

3) b). The selection of a suitable site for wind energy development is a complex decision- making problem that involves many technical, economic, social, environmental, and regu- latory factors such as wind speed, road access, population density, electrical grid infrastruc- ture, industrial support for construction, tourism ... 4M

3) c) SITE SELECTION CONSIDERATION FOR WECS. ...
High annual average wind speed:
Availability of anemometry data: ... 7M
Availability of wind V(t) Curve at the proposed site: ...
Wind structure at the proposed site: ... 3M
Altitude of the proposed site: ...
Terrain and its aerodynamic: ...
Local Ecology.

3) c)



3M

6M

4) a.
- Free Fuel. ...
- One of the Cleanest Forms of Energy. ...
- Advances in Technology. ... 3M 7M.
- Doesn't Disrupt Farmland Operations. ...
- Reduces Our Dependence of Fossil Fuels. ...
- Dangerous to Some Wildlife. ...
- Noisy. ... 3M
- Expensive Upfront Cost.

b) Energy Availability in Tidal plant.

$E = \rho g A \int z\,dz.$ 2

$E = 1.4h^2$ 2 7M

$KE = 0.5mv^2.$ 2

$\boxed{KE}$: 1

c) Classification of Tidal Power.

Single · Basin 3M 6M

Double Basin

Flow of water from high tide to low tide 3M

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - I, MAY 2022

Semester : VI **DIGITAL SIGNAL PROCESSING** **Sub Code: 18EE63**
Max Marks: 40 Date: 21-05-2022 **Duration:** 1½ Hours

NOTE: Answer two full questions

1 a) State and prove i) Circular time shift property ii) Circular frequency shift property iii) Parseval's theorem 10 Marks

b) Determine 4-point circular convolution using tabular arrays method for $x_1(n) = x_2(n) = \{1, 2, 2, 1\}$. Verify your answer by Stackham's method. 10 Marks

2 a) Determine 4-point DFT of the sequence x(n)={0, 1, 2, 3} hence verify the result by taking IDFT using linear transformation 10 Marks

b) Compute the circular convolution using DFT+IDFT for the following sequences $x_1(n) = \{2, 3, 1, 1\}$ x2(n) = {1, 3, 5, 3} 10 Marks

3 a) Find the DFT of a sequence x(n) = {1, 1, 0, 0} and find the IDFT of Y(k) = {2, 1+j, 0, 1-j} 10 Marks

b) Given $x(n) = (\frac{1}{2})^n [\, u(n) - u(n-4)]$ Determine the following without computing 4-point DFT X(k)

i) If $G(k) = W_4^{2k} X(k)$ find g(n) ii) $\sum_{k=0}^{3} X(k)X^*(k)$ iii) X(0) + X(2) 10 Marks

4 a) Calculate the 8-point DFT of the following signal x(n)={1, 1, 1, 1} also calculate magnitude and phase angle of X(k). 10 Marks

b) G(k) and H(k) are 6-point DFTs of sequences g(n) and h(n) respectively.
If G(k) = {1+j, -2.1+j3.2, -1.2-j2.4, 0, 0.9+j3.1, -0.3+j1.1} and $h(n) = g((n-4))_6$. Determine the H(k) without computing the DFT. 10 Marks

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - I, MAY 2022

Semester : VI **DIGITAL SIGNAL PROCESSING** **Sub Code: 18EE63**
Max Marks: 40 Date: 21-05-2022 **Duration:** 1½ Hours

NOTE: Answer two full questions

1 a) State and prove i) Circular time shift property ii) Circular frequency shift property iii) Parseval's theorem 10 Marks

b) Determine 4-point circular convolution using tabular arrays method for $x_1(n) = x_2(n) = \{1, 2, 2, 1\}$. Verify your answer by Stackham's method. 10 Marks

2 a) Determine 4-point DFT of the sequence x(n)={0, 1, 2, 3} hence verify the result by taking IDFT using linear transformation 10 Marks

b) Compute the circular convolution using DFT+IDFT for the following sequences $x_1(n) = \{2, 3, 1, 1\}$ x2(n) = {1, 3, 5, 3} 10 Marks

3 a) Find the DFT of a sequence x(n) = {1, 1, 0, 0} and find the IDFT of Y(k) = {2, 1+j, 0, 1-j} 10 Marks

b) Given $x(n) = (\frac{1}{2})^n [\, u(n) - u(n-4)]$ Determine the following without computing 4-point DFT X(k)

i) If $G(k) = W_4^{2k} X(k)$ find g(n) ii) $\sum_{k=0}^{3} X(k)X^*(k)$ iii) X(0) + X(2) 10 Marks

4 a) Calculate the 8-point DFT of the following signal x(n)={1, 1, 1, 1} also calculate magnitude and phase angle of X(k). 10 Marks

b) G(k) and H(k) are 6-point DFTs of sequences g(n) and h(n) respectively.
If G(k) = {1+j, -2.1+j3.2, -1.2-j2.4, 0, 0.9+j3.1, -0.3+j1.1} and $h(n) = g((n-4))_6$. Determine the H(k) without computing the DFT. 10 Marks

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: DSP **Scheme & Solution** **Course Code: 18EE63**

Question Number	Solution	Marks Allocated
1 a)	$x((n-m))_N \longleftrightarrow W_N^{mk}X(k)$	3
	$e^{j\frac{2\pi}{N}lk}x(n) \longleftrightarrow X((k-l))_N$	3
	$\sum_{n=0}^{N-1} x(n)\, x_2^*(n) = \frac{1}{N}\sum_{k=0}^{N-1} X_1(k)\, X_2^*(k)$	4
b)	$x_1(n)$ ④ $x_2(n) = \{9, 8, 9, 10\}$	3
	verification by Stockham's method $X_1(k) = X_2(k) = \{6, -1-j, 0, -1+j\}$	3
	$X_3(k) = X_1(k)\, X_2(k) = \{36, 2j, 0, -2j\}$	④
	$x_2(n) = \{9, 8, 9, 10\}$	
2 a)	$X(k) = \sum_{n=0}^{4-1=3} x(n)\, e^{-j\frac{2\pi}{4}nk} = \{6, -2+2j, -2, -2-2j\}$	⑤
	$x(n) = \frac{1}{4}\sum_{k=0}^{3} X(k)\, e^{+j\frac{2\pi}{4}kn} = \{0, 1, 2, 3\}$	⑤
b)	$X_1(k) = \{7, 1-j2, -1, 1+j2\}$ $X_2(k) = \{12, -4, 0, -4\}$	⑥
	$Y(k) = \{84, -4+j8, 0\ -4-j8\}$	④
	$y(n) = x_1(n)$ ④ $x_2(n) = \{19, 17, 23; 25\}$	
3 a)	$X(k) = \{2, 1-j, 0, 1+j\}$	⑤
	$y(n) = \{1, 1, 0, 0\}$	⑤
5)	i) $g(n) = x((n-2))_4 = \{\frac{1}{4}, \frac{1}{8}, 1, \frac{1}{2}\}$	③
	ii) $\sum_{k=0}^{3} X(k)\, X^*(k) = N\sum_{n=0}^{3} \lvert x(n)\rvert^2 = 4[1+\frac{1}{4}+\frac{1}{16}+\frac{1}{64}] = \frac{85}{16}$	③
	iii) $X(0) = x(0)+x(1)+x(2)+x(3) = \frac{15}{8}$	
	$X(2) = 1+\frac{1}{2}e^{-j\pi}+\frac{1}{4}e^{-j2\pi}+\frac{1}{8}e^{-j3\pi} = \frac{5}{8}$	④
	$X(0)+X(2) = \frac{15}{5}+\frac{5}{8} = \frac{20}{8}$	

Question Number	Solution	Marks Allocated
4 a)	$x(n) = \{1, 1, 1, 1, 0, 0, 0, 0\}$	
	$X(k) = \{4, 1-j2.414, 0, 1-j0.414, 0, 1+j0.414$ $0, 1+j2.414\}$	⑥
	$\lvert X(k)\rvert = \{4, 2.6129, 0, 1.0823, 0, 1.0823, 0, 2.6129\}$	②
	$\underline{\lvert X(k)} = \{0, -67.498, 0, -22.489, 0, 22.489, 0, 67.498\}$	②
b)	$h(n) = [g(n-4)_6]$.	
	$H(k) = W_6^{4k} G(k) = e^{-j\frac{2\pi}{6}4k} G(k) = e^{-j\frac{4\pi}{3}k} G(k)$	②
	$H(k) = \{1+j, 1-j1.732, 2.27-j2.1466,$	
	$H(k) = \{1+j,$ −[illegible].7212 $- j3.4186, -1.4794 + j2.2392, 0$ $-3.1346 - j0.7706, 1.1020 - j0.2902\}$	⑧

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - II, JUNE 2022

Semester : VI **DIGITAL SIGNAL PROCESSING** **Sub Code: 18EE63**
Max Marks: 40 Date: 28-06-2022 **Duration:** 1½ Hours

NOTE: Answer two full questions

1 a) Using overlap save method, determine the y(n) of a filter whose impulse response h(n) = {1, 1, 1} to an input x(n) = { 3, -1, 0, 1, 3, 2, 0,1, 2, 1}. Use 6-point circular convolution. 10 Marks

b) Tabulate the comparison of complex multiplication and additions for direct computation of DFT verses the FFT algorithm for N=16, 32 and 128 10 Marks

2 a) Develop an 8-point the DIT FFT algorithm and draw the complete signal flow graph 10 Marks

b) Given $x(n) = 2^n$ and N=8, find X(k) using DIT-FFT algorithm. 10 Marks

3 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 10 Marks

b) Given the sequences $x_1(n)$ and $x_2(n)$ given below. Compute the circular convolution $x_1(n)$ (*)$x_2(n)$ for N=4. Use DIT-FFT algorithm. $x_1(n)$ ={2, 1, 1, 2}and $x_2(n)$ ={1, -1, -1, 1} 10 Marks

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - II, JUNE 2022

Semester : VI **DIGITAL SIGNAL PROCESSING** **Sub Code: 18EE63**
Max Marks: 40 Date: 28-06-2022 **Duration:** 1½ Hours

NOTE: Answer two full questions

1 a) Using overlap save method, determine the y(n) of a filter whose impulse response h(n) = {1, 1, 1} to an input x(n) = { 3, -1, 0, 1, 3, 2, 0,1, 2, 1}. Use 6-point circular convolution. 10 Marks

b) Tabulate the comparison of complex multiplication and additions for direct computation of DFT verses the FFT algorithm for N=16, 32 and 128 10 Marks

2 a) Develop an 8-point the DIT FFT algorithm and draw the complete signal flow graph 10 Marks

b) Given $x(n) = 2^n$ and N=8, find X(k) using DIT-FFT algorithm. 10 Marks

3 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 10 Marks

b) Given the sequences $x_1(n)$ and $x_2(n)$ given below. Compute the circular convolution $x_1(n)$ (*)$x_2(n)$ for N=4. Use DIT-FFT algorithm. $x_1(n)$ ={2, 1, 1, 2}and $x_2(n)$ ={1, -1, -1, 1} 10 Marks

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

INTERNAL ASSESSMENT - II, JUNE 2022

Semester : VI **DIGITAL SIGNAL PROCESSING** **Sub Code: 18EE63**
Max Marks: 40 Date: 28-06-2022 **Duration:** 1½ Hours

NOTE: Answer two full questions

1 a) Using overlap save method, determine the y(n) of a filter whose impulse response h(n) = {1, 1, 1} to an input x(n) = { 3, -1, 0, 1, 3, 2, 0,1, 2, 1}. Use 6-point circular convolution. 10 Marks

b) Tabulate the comparison of complex multiplication and additions for direct computation of DFT verses the FFT algorithm for N=16, 32 and 128 10 Marks

2 a) Develop an 8-point the DIT FFT algorithm and draw the complete signal flow graph 10 Marks

b) Given $x(n) = 2^n$ and N=8, find X(k) using DIT-FFT algorithm. 10 Marks

3 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 10 Marks

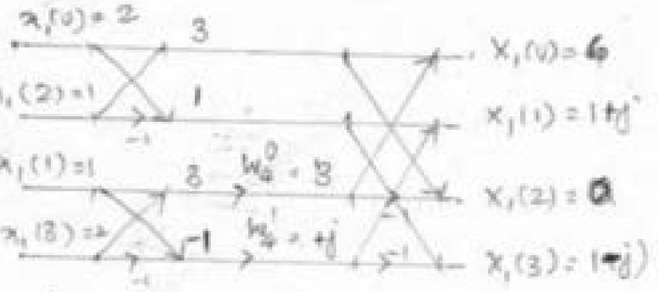
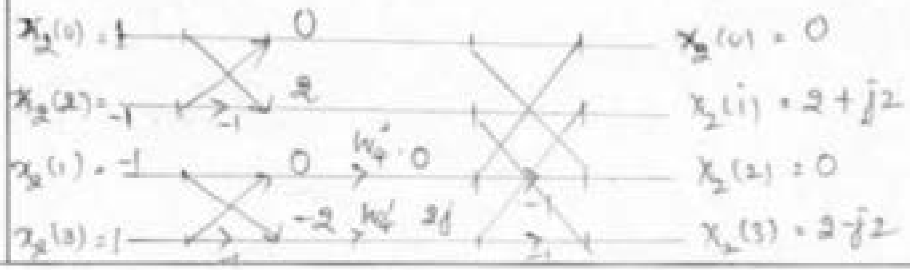
b) Given the sequences $x_1(n)$ and $x_2(n)$ given below. Compute the circular convolution $x_1(n)$ (*)$x_2(n)$ for N=4. Use DIT-FFT algorithm. $x_1(n)$ ={2, 1, 1, 2}and $x_2(n)$ ={1, -1, -1, 1} 10 Marks

****

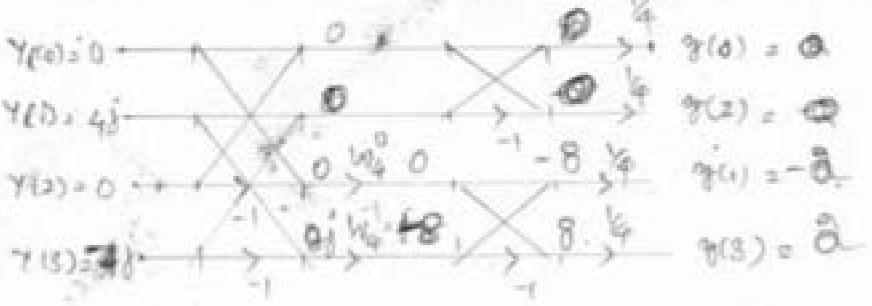
BCFE

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: DSP **Scheme & Solution** **Course Code:** 15EE63

Question Number	Solution	Marks Allocated
1 a)	$N = M+L-1$ $N=6 \quad M=3 \quad L = N-M+1 = 6-3+1 = 4$	②
	$x_1(n) = \{0, 0, 3, -1, 0, 1\}$ $x_2(n) = \{0, 1, 3, 2, 0, 1\}$ $x_3(n) = \{0, 1, 2, 1, 0, 0\}$ $h(n) = \{1, 1, 1, 0, 0, 0\}$	④
	$y_1[n] = [1\ 1\ 3\ 2\ 2\ 0]$ $y_2[n] = [1\ 2\ 4\ 6\ 5\ 3]$ $y_3[n] = [0\ 1\ 3\ 4\ 3\ 1]$	④
	$y(n) = \{3, 2, 2, 0, 4, 6, 5, 3, 3, 4\ 3\}$	②
b)	⊗ (N^2) DFT FFT $\frac{N}{2}\log_2 N$ ⊕ $N(N-1)$ $N \log_2 N$	
	$\boxed{16}$ 256 32 240 64	③
	$\boxed{32}$ 1024 80 992 160	③
	$\boxed{128}$ 16,384 449 16256 896	④
2 a)	Standard DIT FFT algorithm — ⑥ Flow graph ④)	10
b)	$x(n) = 2^n$ $x(n) = \{1, 2, 4, 8, 16, 32, 64, 128\}$	②
	$X(k) = \{255, 48.63+j166.05, -51+j102, -78.63+j46.05, -85, -78.63-j46.05, -51-j102, 48.63-j166.05\}$ Flow graph ②	⑥
3 a)	$X(5) = 2+j2$, $X(6) = j4$ $X(7) = 2-j2$	②
	DIF-FFT IDFT flow graph	⑤
	$x(n) = \{1, 1, -1, -1, -1, 1, -1, -1\}$	①
b)		③
		③

$Y(k) = X_1(k)\,X_2(k) = \{0\ 4j, 0, -4j\}$

Question Number	Solution	Marks Allocated
		②
	$y(n) = x_1(n)$ ④ $x_2(n) = \{0, -2, 0, 2\}$	①

①

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY,TUMKUR-06
Department of Electrical & Electronics Engineering
INTERNAL ASSESSMENT - III, JULY-2022

Semester: **VI** Subject: **DIGITAL SIGNAL PROCESSING** Sub Code: **18EE-63**
Max Marks: **40** Date: **15-07-2022** Duration: **90** Minutes

NOTE: Answer any two full questions

1. Obtain the direct form –I & II, cascade and parallel realizations for the system function given by
$H(z)=\frac{8Z^3-4Z^2+11Z-2}{(Z-\frac{1}{4})(Z^2-Z+\frac{1}{2})}$ 20 Marks

2 a) Explain the impulse invariant transformation method of transforming an analog filter to digital filter 08 Marks

b) Using impulse invariance with T=1sec, determine H(z) if $H(s) = \frac{1}{S^2+\sqrt{2}S+1}$ 12 Marks

3 a) Explain the bilinear transform method. Derive an expression showing mapping from S-plane to Z-plane 12 Marks

b) Realize the direct form & 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

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY,TUMKUR-06
Department of Electrical & Electronics Engineering
INTERNAL ASSESSMENT - III, JULY-2022

Semester: **VI** Subject: **DIGITAL SIGNAL PROCESSING** Sub Code: **18EE-63**
Max Marks: **40** Date: **15-07-2022** Duration: **90** Minutes

NOTE: Answer any two full questions

1. Obtain the direct form –I & II, cascade and parallel realizations for the system function given by
$H(z)=\frac{8Z^3-4Z^2+11Z-2}{(Z-\frac{1}{4})(Z^2-Z+\frac{1}{2})}$ 20 Marks

2 a) Explain the impulse invariant transformation method of transforming an analog filter to digital filter 08 Marks

b) Using impulse invariance with T=1sec, determine H(z) if $H(s) = \frac{1}{S^2+\sqrt{2}S+1}$ 12 Marks

3 a) Explain the bilinear transform method. Derive an expression showing mapping from S-plane to Z-plane 12 Marks

b) Realize the direct form & 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

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY,TUMKUR-06
Department of Electrical & Electronics Engineering
INTERNAL ASSESSMENT - III, JULY-2022

Semester: **VI** Subject: **DIGITAL SIGNAL PROCESSING** Sub Code: **18EE-63**
Max Marks: **40** Date: **15-07-2022** Duration: **90** Minutes

NOTE: Answer any two full questions

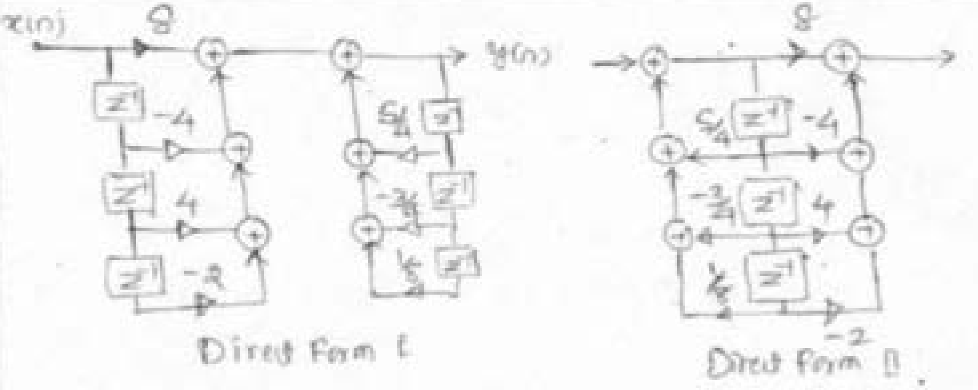
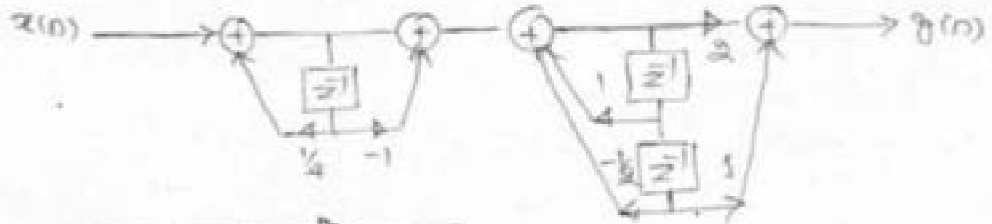
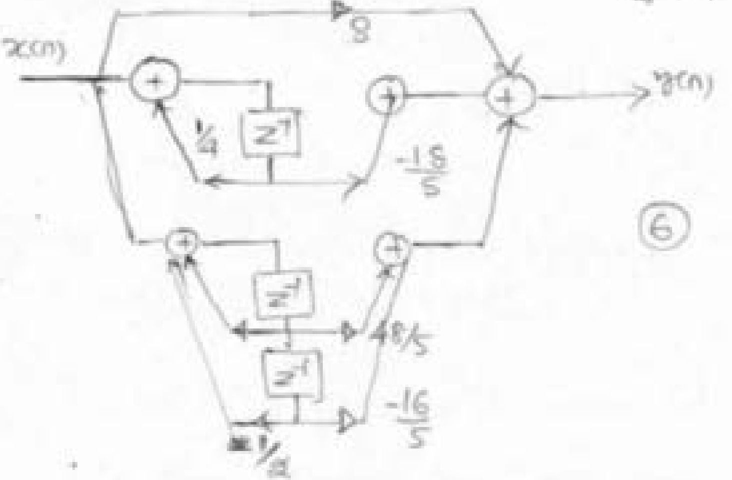
1. Obtain the direct form –I & II, cascade and parallel realizations for the system function given by
$H(z)=\frac{8Z^3-4Z^2+11Z-2}{(Z-\frac{1}{4})(Z^2-Z+\frac{1}{2})}$ 20 Marks

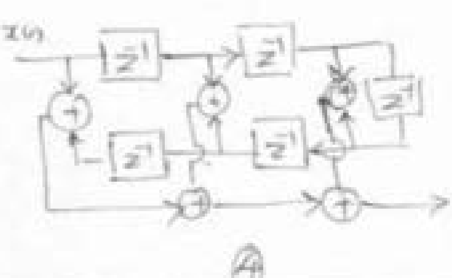
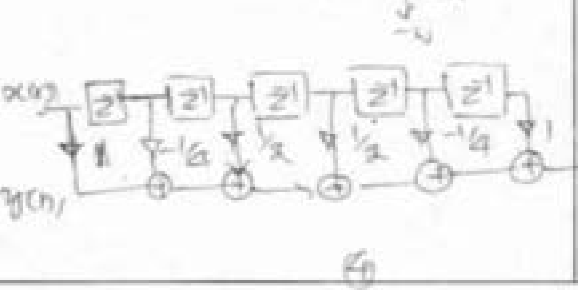
2 a) Explain the impulse invariant transformation method of transforming an analog filter to digital filter 08 Marks

b) Using impulse invariance with T=1sec, determine H(z) if $H(s) = \frac{1}{S^2+\sqrt{2}S+1}$ 12 Marks

3 a) Explain the bilinear transform method. Derive an expression showing mapping from S-plane to Z-plane 12 Marks

b) Realize the direct form & 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

Question Number	Solution	Marks Allocated
1		③+③
		⑥
	 ⑥ $A = -\frac{18}{5}$ $B = \frac{48}{5}$ $C = -\frac{16}{5}$ ②	⑧
2a)	Standard Derivation for impulse invariant transformation. $H(s) = \sum_{K=1}^{N} \frac{A_K}{S-P_K}$ $h(t) = \mathcal{L}^{-1} H(s) = \mathcal{L}^{-1} \sum_{K=1}^{N} \frac{A_K}{S-P_K} = \sum_{K=1}^{N} A_K e^{P_K t}$ $h[n] = h(t)\|_{t=nT}$ $h[n] = \sum_{K=1}^{N} A_K e^{P_K nT}$ $H(z) = Z\{h[n]\} = \sum_{n=-\infty}^{\infty} \sum_{K=1}^{N} A_K e^{P_K nT} z^{-n}$ $H(z) = \sum_{K=1}^{N} A_K \frac{1}{1-e^{P_K T} z^{-1}}$	② ④ ②

Question Number	Solution	Marks Allocated
2 b)	$H(s) = \frac{1}{s^2+\sqrt{2}s+1}$ $A = \frac{1}{j\sqrt{2}}$ $B = -\frac{1}{j\sqrt{2}}$	②
	$P_1 = -\frac{1}{\sqrt{2}} + j\frac{1}{\sqrt{2}}$ $P_2 = -\frac{1}{\sqrt{2}} - j\frac{1}{\sqrt{2}}$	②
	$H(s) = \frac{j\frac{1}{\sqrt{2}}}{(s+\frac{1}{\sqrt{2}} - j\frac{1}{\sqrt{2}})} + \frac{-j\frac{1}{\sqrt{2}}}{(s+\frac{1}{\sqrt{2}}+j\frac{1}{\sqrt{2}})}$	②
	$\frac{1}{s-P_k} \rightarrow \frac{1}{1-e^{P_kT}z^{-1}}$ $H(z) = \frac{0.641z^{-1}}{1-6.7497z^{-1}+0.243z^{-2}}$	⑥
3a)	Bilinear Transformation $\frac{dy(t)}{dt} = x(t)$ — ① $\int_{(n-1)T}^{nT}\frac{dy(t)}{dt}dt = \int_{(n-1)T}^{nT} x(t)dt \Rightarrow [y(t)]_{(n-1)T}^{nT} = \int_{(n-1)T}^{nT} x(t)dt$ $y(nT) - y[(n-1)T] = \int_{(n-1)T}^{nT} x(t)dt$ According to Trapezoidal rule $\int_a^b f(x)dx = \frac{b-a}{2}[f(a)-f(b)$ $y(nT) - y(n-1)T = \frac{nT-nT+T}{2}[x(nT)+x(n-1)T]$ $y(n) = y(t)\|_{t=nT}$ $y(n) - y(n-1) = \frac{T}{2}[x(n) - x(n-1)]$ $Y(z) - z^{-1}Y(z) = \frac{T}{2}[X(z) - z^{-1}X(z)]$ $\frac{2}{T}\frac{1-z^{-1}}{1+z^{-1}}Y(z) = X(z)$ ① $\frac{dy(t)}{dt} = x(t)$ $sY(s) = X(s)$ — ② Comparing ① + ② $s = \frac{2}{T}\frac{1-z^{-1}}{1+z^{-1}}$ 	
b)	 ④  ④	④+④

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
ELECTRICAL MACHINE DESIGN - 18EE55

Max Marks: 40 **Internal Assessment Test-II** **Date:** 29-12-2021
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. **(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. **(10Marks)**

OR

2. a) Show that the output of the generator with single turn coil is given by $P= \frac{0.03E'Vaq A}{PN}$ in KW **(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. **(10Marks)**

PART-B

3. a) Discuss the design of shunt field winding of a DC machine. **(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 **(10Marks)**

OR

4. a) Derive output equation of a 3 ϕ core type transformer and hence deduce an expression for output emf / turn. **(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. **(10Marks)**

Signature of staff **Signature of HOD** **Signature of Principal**

Electrical m/c Design.

scheme and solution

1 a> explanation of factors to be considered for selecting No of poles } 5M

Three advantages of higher value of No of poles of DC machines } 5M

b> (i) Main dimension

$D^2L = \frac{1}{Co}\frac{Pa}{n}$

$n = \frac{N}{60} = \frac{300}{60} = 5 rPS$ — ½

$Pa = \frac{P}{\eta} = \frac{1000}{0.92} = 1086.95 KW$ — ½

$Co = \pi^2 \, Bav \, q \times 10^{-3}$

$= \pi^2 \times 0.7 \times 401000 \times 10^{-3}$

$Co = 276.35$ — ½

$D^2L = 0.7866 m^2$ — ½

(ii) No of poles

$f = \frac{pn}{2} = \frac{10 \times 5}{2} = 25$ — ½

current/brush neglecting the field current

$Ia = \frac{P}{E \times 10^{-3}} = \frac{1000}{500 \times 10^{-3}} = 2000$ Amps — ½

current/brush arm $I_b = \frac{2Ia}{P} = \frac{2 \times 2000}{10} = 400$ Amps. — ½

for 10 pole current/brush = 400 Amps
choose No of poles = 10 } — ½

$$D^2L = 0.7866$$

$$\frac{L}{\tau} = 0.7$$

$$L = 0.7\frac{\pi D}{P}$$

$$L = 0.21990$$

$$\boxed{D = 1.529\,m \quad L = 0.3363\,m}$$ — (1/2)

Check

(i) peripheral speed $= V_a = \frac{\pi D N}{60} = \frac{\pi \times 1.5 \times 300}{60}$

$V_a = 23.56\ m/s$ — (1/2)

(ii) pole pitch $\tau = \frac{\pi D}{P} = \frac{\pi \times 1.5}{10} = 0.47m$ — (1/2)

(iii) Length of air gap:-

$$AT_g = 800{,}000\ B_g\, l_g\, K_g$$

$$l_g = \frac{AT_g}{800{,}000\ B_g\, k_g}$$

$B_g = \frac{B_{av}}{\gamma} = \frac{0.7}{0.7}$ — (1/2)

$= 1\ wb/m^2$

$$AT_g = 0.5\ AT_a$$

$AT_a = \frac{q \times \text{pole pitch}}{2} = \frac{40{,}000 \times 0.47}{2} = 9400A$ — (1/2)

$$AT_q = 0.5 \times 9400$$

$AT_q = 4700$ Amps — (1/2)

$$l_q = \frac{4700}{800{,}000 \times 1 \times 1.15}$$ — ①

$$\boxed{l_q = 5.1\ mm}$$

Q a) Let

E' = Avg voltage b/w adjacent comm segment

V_a = peripheral velocity m/s. } (1M)

P = No of poles.

N = speed in rpm.

$E = E' \times$ No of coils b/w adjacent brush arms

with single turn coils the total No of coils in the armature $= Z/2$ — (1M)

No of coils b/w adjacent brush arm $= Z/2P$

$E = E' Z/2P$ — (1M)

power o/p $= P = VI_a \times 10^{-3}$

$E \simeq V$

$P = E I_a \times 10^{-3}$ — ② — (1M)

substituting for E

$$P = E' \frac{Z}{2P} I_a \times 10^{-3}$$

$$q = \frac{(I_a/A)Z}{\pi D}$$ — (1M)

$I_a Z = A q \pi D$

substituting for $I_a Z$

$$P = \frac{E'}{2P} A q \pi D \times 10^{-3}$$ — (1M)

but $V_a = \frac{\pi D N}{60}$

$$\pi D = \frac{60 V_a}{N}$$ — (1M)

$$P = \frac{E'}{2P} A q . \frac{60 V_a}{N} \times 10^{-3}$$

$$\boxed{P = 0.03 \frac{E' A q V_a}{P N}}$$ — (1M) ③

b) Voltage across shunt field w/d $= 0.85\,V$

$= 0.85 \times 460$

$= 391$ volts. — 1/2

Voltage across each field coil $E_f = \dfrac{\text{voltage across shunt field w/d}}{P}$

$= \dfrac{391}{6}$

$= 65.17$ volts — 1/2

Area of field w/d conductor $a_f = \dfrac{I_f T_f \rho L_m}{E_f}$

Length of mean turn $= L_m = 2(L_p + b_p + 2d_f)$

$= 2(L_p + b_p) + 4d_f$

$= L_i + 4d_f$

$= 0.74 + 4d_f$ — ⓵⁄₂

Cooling surface area available $S = 2 L_m h_f$

$= 2(0.74 + 4d_f)\,0.13$

$= 0.1924 + 1.04\,d_f$ — 1/2

permissible power loss / coil

$Q_f = S q_f$

$= (0.1924 + 1.04\,d_f)\,1200$

$Q_f = 230.88 + 1248\,d_f$ — ① — 1/2

Actual copper loss in field coil $Q_f = I_f^2 R_f$

$= \dfrac{AT_f\, E_f}{T_f}$

④

$$Q_f = \frac{4000 \times 65.17}{T_f}$$

$$Q_f = \frac{260680}{T_f} \quad \text{——} ② \quad -1/2$$

Equating eqn: ① & ② the permissible loss to actual loss weget

$$T_f = \frac{260680}{230.88 + 1248\, d_f} \quad \text{——} ⓐ \quad - \text{(1M)}$$

Area of conductor $= h_f\, d_f\, S_f$

$= 0.13 \times 0.52\, d_f$

$= 0.0676\, d_f$ —— ③ — (1/2 M)

Also

conductor Area $= T_f\, a_f$

$$= T_f \frac{AT_f\, \rho\, L_m}{E_f}$$

$= T_f \left(9.08 \times 10^{-7} + 4.91 \times 10^{-6} d_f\right)$ —④ (1/2M)

Equating eqn: ③ & ④

$$T_f = \frac{0.0676\, d_f}{9.08 \times 10^{-7} + 4.91 \times 10^{-6} d_f} \quad \text{——} ⓑ \quad - \text{(1M)}$$

Equating eqn: ⓐ & ⓑ

$84.36\, d_f^2 + 14.33\, d_f - 0.237 = 0$

$d_f = 0.01518$ —— 1/2

From (a)

$T_f = 1043$ turns

$L_m = L_i + 4 d_f$ —— 1/2

$L_m = 0.8\,m$

⑤

$$a_f = \frac{AT_f \rho L_m}{E_f}$$

$$a_f = \frac{4000 \times 2 \times 10^{-8} \times 0.8}{65.17}$$

$$a_f = 0.982 \times 10^{-6} m^2$$

$\boxed{a_f = 0.982 \, mm^2}$ — (1M)

3a) Design steps of shunt field w/d

10 steps (10M)

b) (i) core area

Net core area $A_i = S_f A_{gi}$

for three stepped core

Ratio $\frac{\text{Gross core area}}{\text{Area of circumscribing circle}} = 0.84$ — (1/2M)

Gross core area $A_{gi} = 0.84 \times$ Area of circumscribing circle — (1/2M)

Area of circumscribing circle $= \frac{\pi d^2}{4}$

$= \frac{\pi (0.25)^2}{4}$

$= 0.049 \, m^2$

$A_{gi} = 0.84 \times 0.049$

$\boxed{A_{gi} = 0.041 \, m^2}$ — (1M)

Net core area $A_i = 0.9 \times 0.041$

$\boxed{A_i = 0.037 \, m^2}$ — (1/2M)

(ii) window area

$$A_w = H_w W_w$$

$$K_w = \frac{\text{Area of copper in window}}{\text{Area of window}} = \frac{A_c}{A_w}$$

$$A_w = \frac{A_c}{K_w}$$ — ½M

$$A_c = 2(a_p T_p + a_s T_s)$$

$$T_p = \frac{V_p}{V_s/\sqrt{3}} T_s \qquad T_s = \frac{V_s}{E_t} = \frac{V_s/\sqrt{3}}{E_t} = \frac{440/\sqrt{3}}{8.5}$$

$$= \frac{6600}{440/\sqrt{3}} \times 30 \qquad T_s = 29.88$$

$T_s \simeq 30$ turns — ~~½M~~ 1M

$$T_p = 779.5$$

$T_p \simeq 780$ turns — 1M ~~½M~~

$$a_p = \frac{I_p}{\delta} \qquad a_s = \frac{I_s}{\delta}$$

$$I_p = \frac{KVA \times 1000}{3V_p} \qquad I_s = \frac{KVA \times 1000}{3V_s}$$

$$I_p = \frac{300 \times 1000}{3 \times 6600} \qquad = \frac{300 \times 1000}{3 \times 440/\sqrt{3}}$$

$I_p = 15.15$ Amps $\qquad I_s = 393.65$ Amps

$$a_p = \frac{15.15}{2.5} \qquad a_s = \frac{393.65}{2.5}$$

$\boxed{a_p = 6.06\ mm^2}$ — 1M $\qquad \boxed{a_s = 157.46\ mm^2}$ — 1M

$$A_c = 2(6.06 \times 780 + 157.46 \times 30)$$

$A_c = 18901.2\ mm^2$ — ½M

$$A_w = \frac{A_c}{K_w} = \frac{18901.2}{0.28}$$

$$\boxed{A_w = 67504.28\,mm^2}$$ — (1/2 M)

~~Wind~~ width of window = leg spacing

$$W_w = 0.4\,m$$

$$H_w = \frac{A_w}{W_w} = \frac{67504.28 \times 10^{-6}}{0.4}$$

$$\boxed{H_w = 0.17\,m}$$ — (2M)

4 a)

$E = 4.44 f \phi_m T$ volts — ① — (1/2 M)

$E_t = 4.44 f \phi_m$ — ② — (1/2 M)

$A_c = 2(T_p a_p + T_s a_s)$ — ③ — (1/2 M)

$A_c = 2\left[T_p \frac{I_p}{\delta} + T_s \frac{I_s}{\delta}\right]$ — ④ — (1/2 M)

$A_c = \frac{4\,AT}{\delta}$ — ⑤ — (1/2 M)

$A_c = K_w A_w$ — ⑥ — (1/2 M)

$A_T = \frac{K_w A_w \delta}{4}$ — ⑦ — (1/2 M)

$$\boxed{Q = 3.33 f B_m K_w A_w A_i \delta \times 10^{-3}\ KVA}$$ — ⑧

— (1/2 M)

o/p Eqn/: in terms of volts / turn

$$Q = V_p I_p \times 10^{-3}$$

$$Q = 4.44 f \phi_m AT \times 10^{-3}$$ —— ① —— 1/2 M

$$\frac{\phi_m}{r} = AT$$ —— ② —— 1/2 M

$$\phi_m = \sqrt{\frac{r \times 10^{+3}}{4.44 f} Q}$$ —— ③ 1/2 M

$$\left.\begin{aligned} \text{Volts/turn} &= \frac{E}{T} \\ &= 4.44 f \phi_m \\ E_t &= K\sqrt{Q} \\ E_t &= K\sqrt{KVA} \end{aligned}\right\}$$ —— 2 M

b) mmf of shunt field w/d = 7500 —— 1/2 M

mmf of series field w/d $AT_s = 9000 - 7500$

$= 1500$ Amps —— 1/2 M

No of series turns/pole $T_S = \frac{AT_S}{I_S}$

For short shunt

$$I_S = I_L = \frac{KW \times 10^3}{V}$$

$$= \frac{200 \times 10^3}{220}$$

$= 909$ Amps. —— 1/2 M

$$T_S = \frac{1500}{909}$$

$T_S = 1.65$ turns — $\frac{1}{2}$M

No of turns should be an integer

Divide the series field in three parallel paths.

$$\text{current / parallel path} = \frac{909}{3}$$

$= 303$ — $\frac{1}{2}$M

Series field turns/pole $T_S = \frac{AT_S}{303}$

$\simeq 5$ — $\frac{1}{2}$M

Thus there are 5 turns connected in 3 parallel path

Shunt field:

Dia of bar conductor $d_{fc} = \sqrt{\frac{4a_f}{\pi}}$ — $\frac{1}{2}$M

$$a_f = \frac{AT_f \, \rho L_m}{E_f}$$ — $\frac{1}{2}$M

$L_m = 2(L_p + b_p) + 4d_f$

$= 2(0.23 + 0.23) + 4 \times 0.05$

$L_m = 1.12\,m$ — $\frac{1}{2}$M

$$E_f = \frac{\text{voltage across shunt field coil}}{\text{No of poles}}$$

$$= \frac{0.9 \times 220}{6}$$

$E_f = 33$ volts — $\frac{1}{2}$M

$$a_f = \frac{7500 \times 2 \times 10^{-8} \times 1.12}{33}$$

$$= 5.09\ mm^2$$

$$d_{fc} = \sqrt{\frac{5.09 \times 4}{\pi}}$$

$$\boxed{d_{fc} = 2.54\ mm}$$ — ½ M

$$d_{fci} = d_{fc} + \text{insulation}$$

$$= 2.54 + 0.1$$

$$= 2.64\ mm.$$ — ½ M

$$S_f = 0.75\left(\frac{d_{fc}}{d_{fci}}\right)^2$$

$$= 0.75\left(\frac{2.54}{2.64}\right)^2$$

$$S_f = 0.694$$ — ½ M

$$I_f = \frac{AT_f}{T_f}$$

$$T_f = \frac{h_f\, d_f\, S_f}{a_f}$$

$$= \frac{0.15 \times 50 \times 10^{-3} \times 0.694}{5.09 \times 10^{-6}}$$ — 2 M

$$T_f = 1022 \text{ turns}$$

$$I_f = \frac{7500}{1022}$$

$$I_f = 7.33 \text{ Amps}$$ — 2 M

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
ELECTRICAL MACHINE DESIGN - 18EE55

SHRIDEVI

Max Marks: 40 **Internal Assessment Test-III** **Date:** 09-02-2022
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 . **(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. **(10Marks)**

OR

2. a) Explain the step by step procedure of squirrel cage induction Motor. **(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. **(10Marks)**

PART-B

3. a) What are the factors to be considered for estimating the length of air gap for Induction motor. Explain them. **(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. **(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. **(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. **(10Marks)**

1. A) Derive output equation of 3-ϕ Induction motor.

⇒ The o/p eqⁿ relates the o/p of the IM with the main dimensions of the stator & is the basic tool to initiate the design.

The o/p of 3-ϕ IM is given by,

o/p in KW = input to the motor in KW * Efficiency.

i/p to the motor in KW = $3 V_{ph} I_{ph}$

but $V_{ph} \simeq E_{ph}$.

$E_{ph} = 4.44 f \phi T_{ph} K_{wp}$. —— (1M)

where, $T_{ph} \rightarrow$ turns/ph

$K_{wp} \rightarrow$ Wdg factor

$$i/p\ KVA = Q = \frac{3 V_{ph} I_{ph}}{1000} = \frac{3 E_{ph} I_{ph}}{1000} = 3 E_{ph} I_{ph} \times 10^{-3}$$

$$Q = 3(4.44 f \phi T_{ph} K_{wp}) I_{ph} \times 10^{-3}$$

where, $Q = \frac{HP \times 735.5}{\eta \times pf \times 1000}$ —— (1M)

$$KVA\ i/p = \frac{KW}{\eta \cos\phi}$$

$Q = 3 \times 4.44 f \phi (T_{ph} I_{ph}) K_{wp} \times 10^{-3}$ KVA —— ① (1M)

ϕ = flux density × area under pole pitch

The specific magnetic loading $= \frac{\phi}{\frac{\pi D}{P} * L}$ —— (1M)

$$\left. \begin{array}{l} B_{avg} = \dfrac{\phi}{\frac{\pi D}{P} \cdot L} \\ \phi = B_{avg} \dfrac{\pi D}{P} \cdot L. \end{array} \right\} \text{—— (1M)}$$

specific electric loading

$$q = \frac{3 \times 2 T_{ph} I_{ph}}{\pi D}$$

$$T_{ph} I_{ph} = \frac{q \pi D}{6}$$ — (1M)

Note:- $1\phi : q = \frac{I_{ph} Z_{ph}}{\pi D}$

$$3\phi : q = \frac{3 I_{ph} Z_{ph}}{\pi D}$$

$$T_{ph} = \frac{Z_{ph}}{2}$$

$$Z_{ph} = 2 T_{ph}.$$ — (1M)

Eq^n ① becomes:

$$Q = 3 \times 4.44 f \left(B_{avg} \frac{\pi D}{P} \cdot L \right) \left(\frac{q \pi D}{6} \right) K_{wx} \times 10^{-3}$$

$$f = \frac{N_s P}{120} = \frac{N_s P}{60 \times 2} = \frac{n_s P}{2} \text{ rps.}$$ — (1M)

$$Q = 3 \times 4.44 \left(\frac{n_s P}{2} \right) \left(B_{avg} \frac{\pi D}{P} \cdot L \right) \left(\frac{q \pi D}{6} \right) K_{wx} \times 10^{-3}$$

$$Q = (1.11 \pi^2 B_{avg} q K_{wx} \times 10^{-3})(D^2 L n_s)$$

$$Q = C_0 D^2 L n_s$$

$$D^2 L = \frac{Q}{C_0 \cdot n_s}$$ — (1M)

where $C_0 = (1.11 \pi^2 B_{avg} q K_{wx} \times 10^{-3})$

The above eq^n gives the o/p eq^n of IM. Designing is done by suitable values of efficiency & pf.

$\eta \rightarrow 0.7$ to 0.9

pf → 0.7 to 0.9

$K_{wx} \rightarrow K_p \times K_d$ (1M)

where, K_p → pitch factor

K_d → distribution factor

1B.) Determine

Given:-

100 kVA

2000/400 V

50 Hz

1-ϕ shell type

vtg/turn = 10V

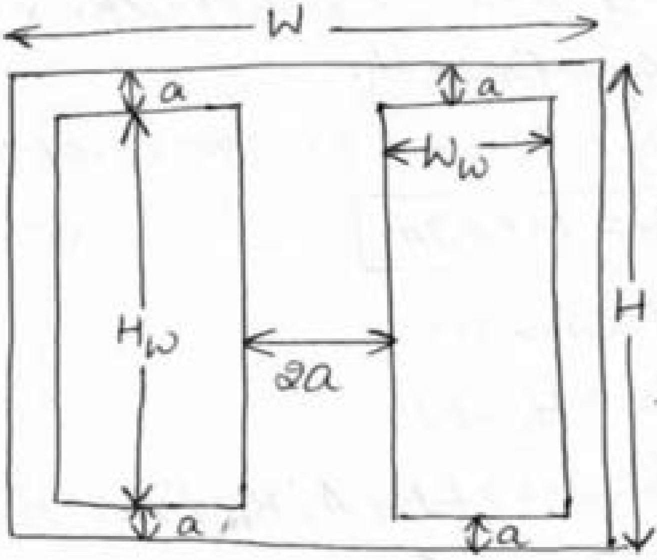
$B = 1.1\ Wb/m^2$

$\delta = 2A/mm^2$

$K_w = 0.33$

$S_f = 0.9$

$\frac{H_w}{W_w} = 2.5$, $\frac{b}{2a} = 2.5$



1M

Net iron core area $A_i = \frac{E_t}{4.44 f B_m}$

$$A_i = \frac{10}{4.44 \times 50 \times 1.1} = \frac{10}{244.2} = 0.041 m^2$$

$\boxed{A_i = 0.041 m^2}$ — 1M

Gross (or) iron core.

$$Ag_i = \frac{A_i}{S_f} = \frac{0.041}{0.9}$$

$\boxed{Ag_i = 0.04555}$ — 1M

$Ag_i = 2a \times b$

$0.04555 = 2a \times 5a$

$0.04555 = 10a^2$

$a^2 = \frac{0.04555}{10}$

$a^2 = 4.555 \times 10^{-3}$

$\boxed{a = 0.0675}$ — 1M

$\frac{b}{2a} = 2.5$

$b = 2.5 \times 2a$

$\boxed{b = 5a}$

$\therefore b = 5(0.0675)$

$\boxed{b = 0.3375m}$ — 1M

The area of yoke = depth of yoke x height of yoke.

$A_y = D_y \times H_y$

$A_y = b \times a = 0.3375 \times 0.0675$

$\boxed{A_y = 0.022m}$ —— ①M

Area of window

$A_w = H_w \cdot W_w$

$Q = 2.22 f B_m A_i K_w \delta A_w \times 10^{-3}$

$$A_w = \frac{Q}{2.22 f B_m A_i K_w \delta \times 10^{-3}}$$

$$= \frac{100}{2.22 \times 50 \times (1.1 \times 0.04) \times 0.33 \times 2 \times 10^{6} \times 10^{-3}} = \frac{100}{3304.026}$$

$A_w = 33.040 \Rightarrow 0.033 m^2$.

$\frac{H_w}{W_w} = 2.5$

$H_w = 2.5 W_w$

$0.033 = 2.5 W_w \times W_w$

$W_w^2 = \frac{0.033}{2.5}$

$\boxed{W_w = 0.11m}$ —— ①M

$H_w = 2.5 \times 0.1$

$\boxed{H_w = 0.25m}$ —— ①M

$H = H_w + 2a$

$= 0.25 + 2(0.0675)$

$\boxed{H = 0.385m}$

$W = 4a + 2W_w$

$W = 4(0.0675) + 2(0.1)$

$\boxed{W = 0.47m}$ } ①M

W/d details :-

$T_p = \frac{V_p}{E_t} = \frac{2000}{10} = 200$ turns

$T_s = \frac{V_s}{E_t} = \frac{400}{10} = 40$ turns } ①M

$a_p = \frac{I_p}{\delta} =$

$$I_p = \frac{KVA \times 10^3}{V_p} = \frac{100 \times 1000}{2000} = 50A$$

$$a_p = \frac{50}{2} = 25mm^2.$$

$$a_s = \frac{I_s}{\delta} \qquad I_s = \frac{KVA \times 1000}{V_s} = \frac{100 \times 1000}{2000} = 250A$$

(1M)

$$a_s = \frac{250}{2} = 125mm^2$$

2A) The no. of slots in the rotor is selected such that crawling, cogging, vibration & noise are avoided.

Guidelines for selection of rotor slots:

1. The no. of rotor slots never be equal to stator slots but it must be either larger (or) smaller.
   S_r = 15 to 30% smaller (or) larger than stator slots. (S_s)
2. To avoid synchronous cusps
   $S_s \sim S_r \neq P, 2P$ (or) $5P$.
3. To avoid magnetic locking in 3-ϕ m/c.
   $S_s \sim S_r \neq 3P$.
4. To avoid noise & vibration the difference of
   $S_s \sim S_r \neq 1, 2, P \pm 1$ (or) $P \pm 2$.
5. The $S_s \sim S_r \neq 0 \pm P, \pm 2P, \pm 3P, \pm 5P, \pm 1, \pm 2, \pm (P+1) \pm (P+2)$

(6M)

The dia of rotor $D_r = D - 2lg$

where $D \rightarrow$ dia of stator bore

$lg \rightarrow$ length of air gap.

Design of rotor bars & slots·

1·) Rotor bar current

Let $I_b \rightarrow$ bar current

rotor mmf = $\frac{I_b S_r}{2}$.

stator mmf = $3 I_{ph} T_{phs} K_{ws}$

Rotor mmf = (Pf) stator mmf

$$\frac{I_b S_r}{2} = \cos\phi \times 3 I_{ph} T_{ph} K_{ws}.$$

$$I_b = \frac{2 \times 3 \times I_{ph} \times T_{ph} K_{ws} \cos\phi}{S_r}.$$

$$I_b = \frac{6 I_{ph} T_{ph} K_{ws} \cos\phi}{S_r}$$

$$I_b \approx 0.85 \times 6 \frac{I_{ph} T_{phs}}{S_r}$$

2M

2· Area of rotor bar:-

Area of bar = $\frac{I_b}{\delta_b}$ mm^2

where, $\delta_b \rightarrow$ current density in rotor bar varies from 4-7A/mm^2.

3· Length of bar, $L_b = L + 2$ to 3cm

4· Copper loss in bar = $(I_b^2 r_b) S_r$

$$r_b = \frac{\rho L_b}{a_b}$$

2M

2B·) Given:-

$P = 250$Hp

3ϕ

$f = 50$Hz

$V = 400$

$N = 1410$rpm

$B_{avg} = 0.5$ Wb/m^2

$q = 30{,}000$ A/m

$\eta = 0.9$

$pf = 0.9$

$K_{ws} = 0.955$

$D^2L = \frac{Q}{C_0 n_S}$ $\quad N_S = \frac{120 f}{P} = 1500$ rpm. —— (1M)

[Note:- speed of the motor is 1410 rpm & the nearest synchronous speed corresponding to 50Hz is 1500 rpm]

$P = 4$

$Q = \frac{HP \times 746}{\eta \times pf \times 1000} = \frac{250 \times 746}{0.9 \times 0.9 \times 1000}$

$\boxed{Q = 230.2}$ —— (1M)

$C_0 = 11 B_{avg}\, q \times K_{ws} \times 10^{-3}$

$= 11 (0.5)(30,000)(0.955) \times 10^{-3}$

$\boxed{C_0 = 157.57}$ —— (1M)

$D^2L = \frac{230.2}{157.6 \times 25} = 0.0584 m^3$

since there is a commercial m/c we have to design a m/c of minimum cost.

$\frac{L}{\tau} = 1.2 \Rightarrow L = 1.2\tau = 1.2 \frac{\pi D}{P}$

$L = \frac{1.2 \pi D}{4}$ $\quad \boxed{L = 0.942 D}$ —— (1M)

$D^2 L = 0.0584$

$D^2 (0.942 D) = 0.0584$

$D^3 = 0.0619$

$\boxed{D = 0.395 m}$ —— (1M)

$L = 0.942 \times 0.395$

$\boxed{L = 0.3728 m}$

ii) No. of turns/ph:-

$E_{ph} = 4.44 f \phi_m K_{ws}$

$T_{ph} = \frac{E_{ph}}{4.44 f \phi_m K_{ws}}$

$\phi_m = B_{avg} \frac{\pi D}{P} L = 0.5 \times \frac{\pi \times 0.395}{4} \times 0.3728.$

$\boxed{\phi_m = 0.0578 Wb}$ —— (1M)

$$T_{ph} = \frac{400}{4.44 \times 50 \times 0.0578 \times 0.955}$$

$T_{ph} = 32.64 \simeq 33$ turns

T_{ph} actual $= \frac{Z_S S_S}{6}$

Z_S conductor/slot $= \frac{6T_{ph}}{S_S}$ —— (1M)

iii) $S_S \rightarrow$ no. of slots $= 3mP - 3 \times 3 \times 4 = 36$ slots

slot pitch $= \frac{\pi D}{S_S} = \frac{\pi(0.395)}{36} = 0.034$

$= 34.4$ mm

slot pitch $= \frac{\pi D}{S_S}$

15 to 25 mm

$S_S = \frac{\pi D}{\text{pole pitch}}$

$= \frac{\pi(0.395)}{15 \times 10^{-3}}$

$S_S = 83$

$S_S = \frac{\pi D}{\text{pole pitch}}$

$S_S = \frac{\pi(0.395)}{25 \times 10^{-3}}$

$S_S = 50.$

if $m = 3$

$S = 36$

Choose $m = 5$

$S = 3mP$

$S = 3 \times 5 \times 4$

$\boxed{S = 60}$ —— (1M)

Total no. of conductors = Conductors/slot * no. of slots

Cond/slot $= \frac{6T_{ph}}{S_S} = \frac{6 \times 33}{60} = 3.3$

Choose cond/slot $= 3$

Total no. of conductors $= 3 \times 60 = 180$

Turns/ph $= \frac{180}{3 \times 2} = 30.$ —— (1M)

The value of turns/ph calculated earlier is 32.6. Thus there is a decrease of about 7% in the turns provided & ∴ the value of flux density would be increased.

Cond/slot is an odd integer for the single layer concentric w/d with semiclosed slot is used. Double layer is not possible.

$a_p = \frac{I_{ph}}{\delta_s}$

$I_{ph} = \frac{Q \times 10^3}{3V_{ph}} = \frac{230.2 \times 10^3}{3 \times 400} = 191.83A$

$I_{ph} = 192A$.

Area of stator cond = $a_s = \frac{I_s}{\delta_s} = \frac{192}{3.5} = 55mm^2$

Area of slot = $\frac{Z_{ss} a_{ss}}{\text{slot space factor}}$

= 412.5

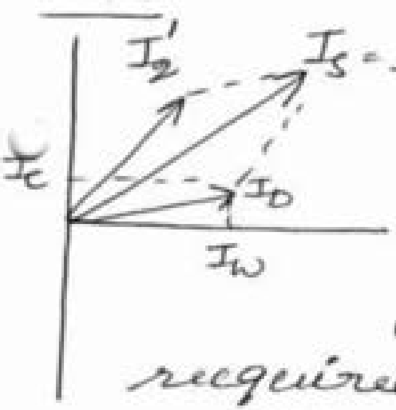
(1M)

3A. Length of airgap

Dia of rotor = $D_r = D - 2l_g$.

The length of air gap is selected taking the following points into consideration.

Pf:-



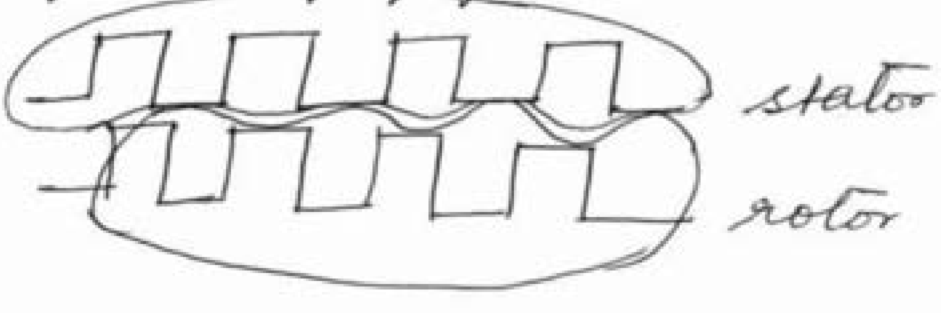
Magnetising mmf which is reponsible for production of flux in the magnetic ckt

$= AT_{\text{stator core}} + AT_{\text{stator teeth}} + AT_{\text{air gap}}$

Usually 70% of the total mmf is required to set up the flux in the air gap

$AT_g = 8 \times 10^5 B_g l_g K_g$.

(2M)



- mmf recquired to send the flux through the air gap is proportional to the product of flux density & the length of air gap.
- The air gap generally consumes the max amount of mmf to pass the flux through the air gap.
- Greater the air gap greater will be the AT required to pass the flux through the air gap, magnetising mmf will be large & pf will be poorer.

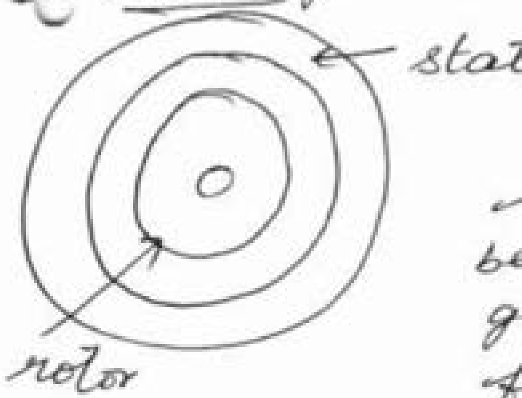
2. Overload capacity:-

- Fig shows the zig zag leakage flux in IM. The flux jumps from stator teeth to rotor teeth alternatively without linking with both the conductor.

(2M)

- The length of air gap affect the value of zigzag leakage reactance which forms a large part of total leakage reactance.
- If the length of air gap is larger than the zig zag leakage flux will be less & the leakage reactance will be less.

3. Cooling:-



Length of air gap is large, the cylindrical surfaces of rotor & stator are separated by a large distance. This would afford better facilities for cooling at the gap surfaces especially when a fan is fitted for circulation of air

— (2M)

4.} Unbalanced magnetic pull:-

If the length of the air gap is small, the even a small deflection of the shaft would produce a large irregularly in the air gap. It is responsible for production of large unbalanced magnetic pull which has the tende-cy to further increase deflection in the shaft to reduce unbalanced magnetic pull length of the air gap should be large. —(1M)

5.} Noise:-

* The principle cause for noise in IM is the variation in the reluctance as the rotor rotate with relatively large air gap the variation in the reluctance will be min & noise is less.

* The principle cause of noise in IM is the variation of reluctance of the path of zig-zag leakage flux. —(1M)

6.} Pulsation loss:-

* With larger length of air gap the variation of reluctance due to slotting is small. The ~~variati~~-on tooth pulsation loss which is produced due to variation in reluctance of the air gap, is reduced accordingly.

∴ The pulsation loss is less with large gaps

—(1M)

38) Given :- P = 15 KW

3 - φ

P = 6pole

f = 50Hz .

cage - IM .

D = 0.32m

L = 0.125m

$S_s = 54$

Cond / slot = 24

Current in each cond = 17.5A

FL ~~for~~ pf lagging .

(N) FL speed = 950 rpm

$\rho_{cu} = 0.02\ \Omega/m/mm^2$

No. of rotor slots $= S_s + \frac{P}{2}$

$$S_r = 54 + \frac{6}{2}$$

$$\boxed{S_r = 57}$$ — (1M)

Rotor mmf = Pf · stator mmf

$$\frac{I_b S_r}{2} = 0.85 (3 I_{ph} T_{ph} K_{ws})$$

$$T_{phs} = \frac{\text{Cond / slot} \times \text{slots}}{3 \times 2}$$

$$= \frac{24 \times 54}{6}$$

$$\boxed{T_{phs} = 216}$$ — (1M)

$$I_b = \frac{2(0.85)(3)(17.5)(216)(0.955)}{57}$$

$$\boxed{I_b = 322.65A}$$ — (1M)

Area of each bar $= \frac{I_b}{\delta_b}$

$\delta_b = 7A/mm^2$

Area of each bar $= \frac{322.65}{7} = 46.09 \simeq 46.1 mm^2$

Length of each bar = L + (3 to 5) cm

$= 0.125 + 4.5 \times 10^{-2}$

$= 0.17$

Cu loss in each bar $= I_b^2 r_b S_r$

$$r_b = \frac{\rho L_b}{a_b} = \frac{0.02 \times 0.17}{46.1}$$

$r_b = 7.375 \times 10^{-5}$

∴ Cu loss in each bar $= (322.65)^2 (7.375 \times 10^{-5})(57)$

$= 437.62 W$ — (1M)

End ring in current $= \frac{S_r I_b}{\pi p} = \frac{57 \times 322.65}{\pi \times 6}$

$= 975.67A$//

Area of end ring $= \frac{I_e}{\delta_e} = \frac{975.67}{7}$

$a_e = 139.38\, mm^2$

$a_e = 140 mm^2$ —— 1M

$a_e = d_e \times t_e$

$a_e = 14 \times 10 mm$

Cu loss in end ring $= 2 I_e^2 r_e$

$r_e = \frac{\rho L_e}{a_e} = \frac{0.02 \times \pi D_e}{a_e}$

$L_e = \pi D_e$

$L_e = \pi(0.306)$

$L_e = 0.961$

$D_e = D_r - d_e$

$= 0.32 - 14 \times 10^{-3}$

$D_e = 0.306$ —— 1M

$\therefore r_e = \frac{0.02 \times \pi \times (0.306)}{140 \times 10^{-3}} = 1.37 \times 10^{-4}$

$\therefore$ Cu loss in end rings $= 2(975.67)^2(1.37 \times 10^{-4})$

$= 260.82W$ —— 1M

Total rotor loss = loss in bar + loss in endrings

$= 437.64 + 260.82$

$= 698.46W$ —— 1M

The ratio $\frac{\text{Cu loss}}{\text{rotor o/p}} = \frac{s}{1-s}$

$\frac{\text{Rotor Cu loss}}{\text{rated o/p}} = \frac{s}{1-s}$

$\frac{698.46}{15 \times 10^3} = \frac{s}{1-s}$

$0.04656 = \frac{s}{1-s}$

$$0.04656 = \frac{S}{1-S}$$

$S = 0.045$

$N = (1-S)N_S$

$N = 955 \, rpm$ —— (1M)

Effective resistance

$$r_r' = 4 m_s^2 T_{phs}^2 K_{wr}^2 \rho \left[\frac{L_b}{S_r a_b} + \frac{2 D_e}{\pi p^2 a_e} \right]$$

$$r_r' = 4(3)^2 (216)^2 (0.954)^2 (0.02) \left[\frac{0.17}{57 \times 46.1} + \frac{2 \times 0.306}{\pi (6)^2 (140)} \right]$$

$\boxed{r_r' = 3.31 \Omega}$ —— (1M)

4.A) Let the dissipating surface of the tank $= S_t$

The dissipating surface of the tube $= x S_t$

Loss dissipated by tubes by convection =

$$6.5 \times \frac{135}{100} \times x S_t$$

$= 8.8 x S_t$ —— (1M)

Total loss dissipated by walls & tubes

$= 12.55 S_t + 8.8 x S_t$

$= S_t (12.5 + 8.8x)$ —— ① —— (1M)

Actual total area of tank walls & tubes

$= S_t + x S_t$

$= S_t (1+x)$ —— (1M)

Loss dissipated per m^2 of dissipating surface

$$= \frac{\text{Total loss dissipated}}{\text{Total area}}$$

$$= \frac{S_t (12.5 + 8.8x)}{S_t (1+x)} = \frac{12.5 + 8.8x}{1+x}$$ —— ② —— (1M)

Tempt rise in transformer with cooling tubes

$$\theta = \frac{\text{total loss}}{\text{Total dissipated}} \text{ ——— } ③$$

$$\text{total loss} = P_{loss} = P_i + P_c$$

where $P_i \rightarrow$ Iron loss

$P_c \rightarrow$ Copper loss

From eqn ① & ③

$$\theta = \frac{P_i + P_c}{S_t(12\cdot5 + 8\cdot8x)}$$

$$12\cdot5 + 8\cdot8x = \frac{P_i + P_c}{\theta \cdot S_t}$$

$$8\cdot8x = \frac{P_i + P_c}{\theta \cdot S_t} - 12\cdot5$$

$$x = \frac{1}{8\cdot8}\left[\frac{P_i + P_c}{\theta \cdot S_t} - 12\cdot5\right] \text{ ——— } ④ \text{ ——— } ⓘ\text{M}$$

Total area of cooling tubes = xS_t.
substituting for x from eqn ④ we get,

$$= \frac{1}{8\cdot8}\left[\frac{P_i + P_c}{\theta S_t} - 12\cdot5\right]S_t$$

$$= \frac{1}{8\cdot8}\left[\frac{P_i + P_c}{\theta} - 12\cdot5\,S_t\right] \text{ ——— } ⑤ \text{ ——— } (1M)$$

Let,
$l_t \rightarrow$ length of the tube
$d_t \rightarrow$ dia of the tube.

∴ surface area of each tube = $\pi d_t L_t$.

Total no. of tubes $n_t = \frac{\text{Total area of tubes}}{\text{Area of each tube}}$.

$$n_t = \frac{\frac{1}{8\cdot8}\left[\frac{P_i + P_c}{\theta} - 12\cdot5S_t\right]}{\pi d_t L_t}$$

$$n_t = \frac{1}{8.8\pi d_t L_t}\left[\frac{P_i+P_c}{\theta} - 12.5 S_t\right] \text{ — ⑥ — (1M)}$$

* The std. dia of cooling tube is 50mm & the length of the tube depends on height of the tank.

* The tubes are arranged with a centre to centre spacing of 75mm.

* The dimension of the tank are decided by the dimension of the transformer frame & clearance recquired on all the side. The dimension of the the tank is shown in fig.

Figure:

(1M)

H_t → height of the tank
L_t → length of the tank
W_t → width of the tank
D → Centre ~~of~~ to centre distance b/w the core.
C_1 → Clearance b/w w/d & tank along the width
C_2 → Clearance b/w w/d & tank along the length.
C_3 → Clearance b/w the transformer frame & the tank at the bottom.
C_4 → Clearance b/w the transformer frame & the tank at the top.
DOC → Outer dia of circle.

With reference to the fig. width of tank

$= 2D + DOC + 2C_1$ (3ϕ)

$= D + DOC + 2C_1$ (1ϕ)

Length of the tank $L_t = DOC + 2C_2$

Height of the tank $H_t = H + C_3 + C_4$

* The clearance on the sides depends on vtg & power rating of the w/d.
* The clearance at the top depends on the oil height above the assemble transformer & the space for mounting the terminals & tap changing gear. (1M)
* The clearance at the bottom depends on the space required for the mounting the frame inside the tank.

Standard Table:-

(1M)

4B) Given:-

15KW

$V = 400V$

3ϕ 50Hz.

$D = 0.3m$

$L = 0.12m$

$S = 72$

Cond/slot = 20

Δ-connected

$I_m = ?$

$l_g = 0.55m$

$k_g = 1.2$

$$\text{Distribution factor} = \frac{\sin m\beta/2}{m \sin\beta/2}$$

m = no. of slot/pole/ph

$$m = \frac{72}{6\times3}$$

$m = 4$ (1M)

$$\text{slot angle } \beta = \frac{180}{S/P}$$

$$\frac{S}{P} = \frac{72}{6} = 12$$

$$\beta = \frac{180}{12} = 15$$ (1M)

$$\text{Distribution factor} = \frac{\sin 4\left(\frac{15}{2}\right)}{4\sin\left(\frac{15}{2}\right)} = 0.958$$ (1M)

slot/pole = 12, Coil span = 11

if coil span = slots/pole (full pitch)

∴ The w/d is carded by 1 slot

· Chorded angle (or) angle of chording

$$\alpha = \frac{\text{Chorded slot}}{s/p} * 180^\circ$$

$$= \frac{1}{12} * 180^\circ$$

$\alpha = 15^\circ$ —— (1M)

Pitch factor $k_p = \frac{\cos\alpha}{2} = \frac{\cos 15}{2} = 0{\cdot}9914$

stator w/d factor $k_{ws} = k_p \times k_d$

$$= 0{\cdot}9914 \times 0{\cdot}958$$

$$= 0{\cdot}9497 \simeq 0.95$$ —— (1M)

mmf required for air gap

$AT_g = 800{,}000\, B_g K_g l_g$.

$B_{g60} = 1{\cdot}36 B_g$

$$B_{av} = \frac{\phi_m}{\text{area/pole}}$$

$E_{ph} = 4{\cdot}44 f \phi_m T_{ph} K_{ws}$

$$\phi_m = \frac{E_{ph}}{4{\cdot}44 f T_{ph} K_{ws}}$$

$$T_{ph} = \frac{Z_{ss}}{3 \times 6}$$

Z_{ss} = slots * cond/slot

$= 72 * 20$

$= 1440$ —— (1M)

$$T_{ph} = \frac{1440}{6} = 240$$

$$\phi_m = \frac{400}{4{\cdot}44 \times 50 \times 0{\cdot}95 \times 240} = \frac{400}{50616}$$

$\phi_m = 7{\cdot}9 \times 10^{-3}$ Wb —— (1M)

$$\text{Area/pole} = \frac{\pi DL}{P}$$

$$= \frac{\pi(0.31)(0.12)}{6}$$

$$= 0.0188 \text{ —— } 1M$$

$$B_{av} = \frac{7.9\times10^{-3}}{0.0188} = 0.4202\ wb/m^2$$

$$B_{g60} = 1.36 \times 0.4202$$

$$B_{g60} = 0.57 \text{ —— } 1M$$

mmf required for air gap

$AT_g = 300.96\ A$

mmf required for iron part $= 0.35 \times 301$

$= 105A$

Total mmf $AT_{60} = AT_g +$ mmf for ironpart

$= 301 + 405$

$= 406A$

Magnetising current /ph.

$$I_m = \frac{0.427\, AT_{60}\, P}{T_{ph}\, K_{ws}} = \frac{0.427\times406\times6}{840\times0.95}$$

$$\boxed{I_m = 4.56A} \text{ —— } 1M$$

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
[An Institution Affiliated to VTU Belagavi, Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
DEGREE :UG	***AY:2021-2022***	***SEM VII***	***TITLE: Internal Assessment Test-I***	***DATE:20-11-21***
SUB NAME /CODE: POWER SYSTEM ANALYSIS-2/15EE71,17EE71,18EE71				

Answer two full questions choosing one question from each part

PART-A

Max Marks : 40

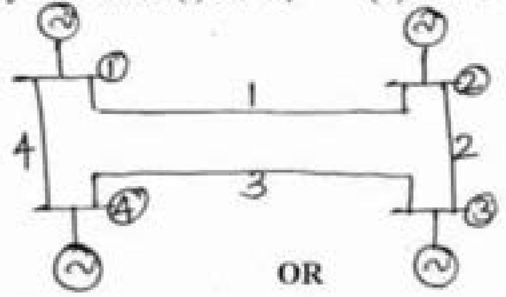
1. a. Define the following terms with examples
(i) Branch path incidence matrix (ii) Bus incidence matrix (iii) Basic loop incidence matrix (iv) Augmented loop incidence matrix

[CO1](8Marks)

b. The bus incidence matrix is given below. Draw the oriented graph. Obtain element-node incidence matrix incidence matrix . **[CO1](4 Marks)**

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

c. For the power system shown in fig select ground as reference and a tree for which the link elements are 1-2, 1-4,2-3 & 3-4 write basic cut set and basic loop incidence matrix. Verify the relation (i) $Cb=B_l^t$ (ii) $B^tC=0$ **[CO1](8 Marks)**



OR

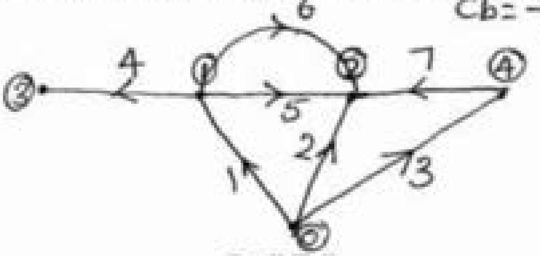
2 .a) The bus incidence matrix of a 8-element, 5-node system is given below obtain the element-node incidence matrix. The oriented graph and hence single line diagram of the network involved. The column represents elements. **[CO1](4 Marks)**

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

b. Define the following terms with examples

(i) Basic loop (ii) element node incidence matrix (iii) Basic cutset incidence matrix (iv) Augmented cut set incidence matrix **[CO1](8 Marks)**

c. The oriented connected graph of a system is shown in fig
obtain (i) Basic cut set incidence matrix B (ii) Basic loop incidence matrix C
select 5,6 and 7 as links. Hence verify the relation ~~Cb=Bl~~ $C_b = -[B_L]^t$ **[CO1](8 Marks)**

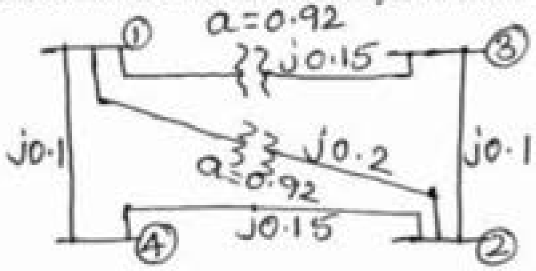


PART-B

3. a) Define primitive n/w. Give primitive element representation in impedance and admittance form, define all variables. Also give nature of primitive n/w

[CO1](6 Marks)

b) Find the bus admittance matrix for the system shown in fig. **[CO1](6 Marks)**



c) Determine Ybus by singular transformation for the system with data as follows

[CO1](8 Marks)

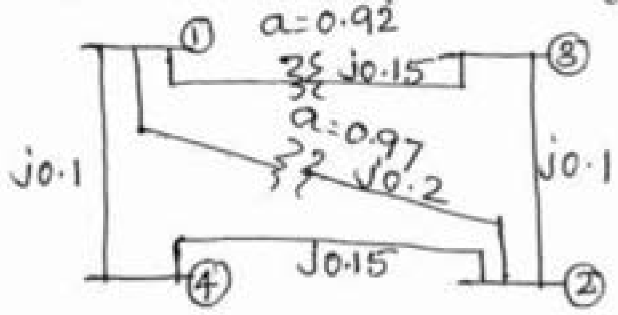
Element No.	1	2	3	4	5
Bus Code p-q	0-1	1-2	2-3	3-0	2-0
Self Admittance	1.4	1.6	2.4	2.0	1.8

OR

4. a) Derive the equation for finding Ybus by singular transformation method

[CO1](6 Marks)

b) Find the bus admittance matrix for the system shown in fig. **[CO1](6 Marks)**



c) Determine Ybus by singular transformation for the system with data as follows

[CO1](8 Marks)

Element No.	1	2	3	4	5
Bus Code p-q	0-1	1-2	2-3	3-0	2-0
Self Impedance	0.8	0.5	0.4	0.5	0.25

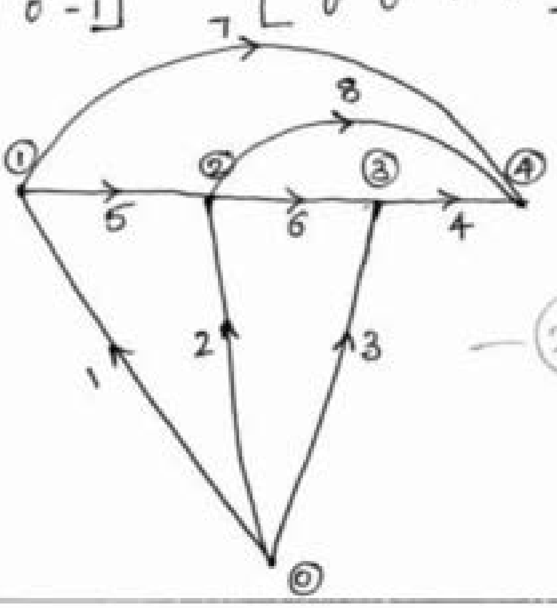
Tanuja K.S	**Prof. G.H Ravikumar**	**Dr.Narendra Vishwanath**
(Asst Professor)	**(H.O.D)**	**(Principal)**

SHRIDEVI INSTITUTE OF ENGINEERING AND TECHNOLOGY
[An Institution Affiliated to VTU Belagavi · Approved by AICTE -New Delhi, Recognized by Govt. of Karnataka & Certified by an ISO 9001:2015]
SIRA ROAD, TUMKUR – 572106

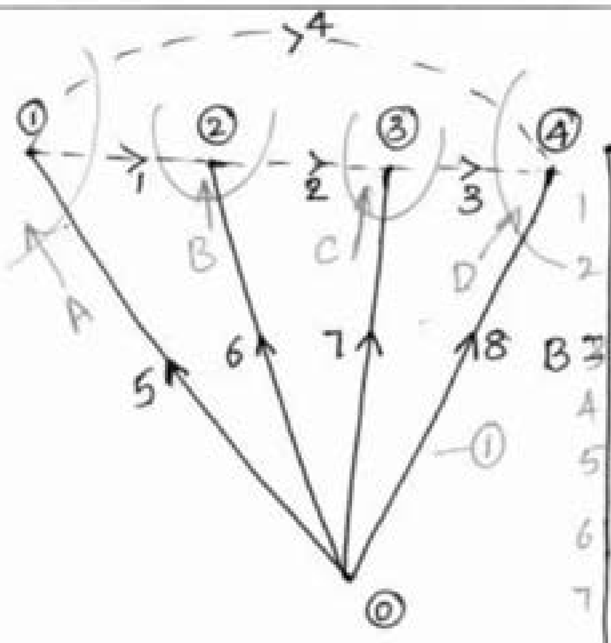
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME & SOLUTION

Course Title: PS-2 **Course Code:** 15,17,18EE71

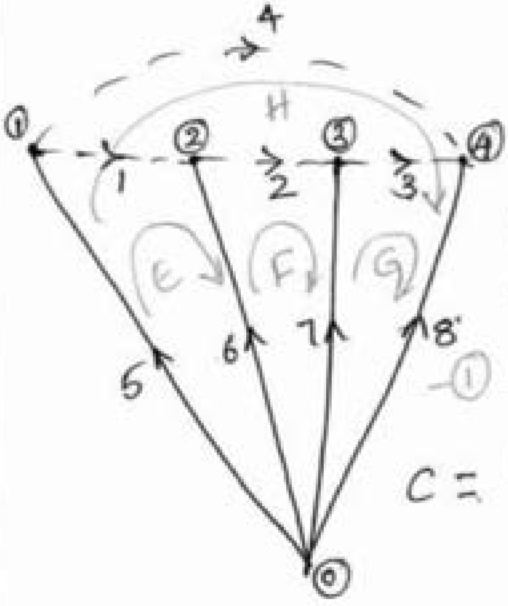
Question Number	Solution	Marks Allocated
	part - A	
1 a)	(i) Defination — 1 X 4 M Example — 1 X 4 M	8 M
b)	$A = \begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 1 & -1 \\ 1 & -1 & 0 & 0 \\ 0 & 1 & -1 & 0 \\ 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & -1 \end{bmatrix}$ — $\frac{1}{2}$ $\hat{A} = \begin{bmatrix} 1 & -1 & 0 & 0 & 0 \\ 1 & 0 & -1 & 0 & 0 \\ 1 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 & -1 \\ 0 & 1 & -1 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 \\ 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 & -1 \end{bmatrix}$ — $1\frac{1}{2}$  — (2M)	4 M

c)



$$B = \begin{array}{c|cccc} & A & B & C & D \\ 1 & -1 & 1 & 0 & 0 \\ 2 & 0 & -1 & 1 & 0 \\ 3 & 0 & 0 & -1 & 1 \\ 4 & -1 & 0 & 0 & 1 \\ \hline 5 & 1 & 0 & 0 & 0 \\ 6 & 0 & 1 & 0 & 0 \\ 7 & 0 & 0 & 1 & 0 \\ 8 & 0 & 0 & 0 & 1 \end{array} \quad \begin{array}{l} B_l \\ \\ U_b \end{array}$$

—①



$$C = \begin{array}{c|cccc} & E & F & G & H \\ 1 & 1 & 0 & 0 & 0 \\ 2 & 0 & 1 & 0 & 0 \\ 3 & 0 & 0 & 1 & 0 \\ 4 & 0 & 0 & 0 & 1 \\ \hline 5 & 1 & 0 & 0 & 1 \\ 6 & -1 & 1 & 0 & 0 \\ 7 & 0 & -1 & 1 & 0 \\ 8 & 0 & 0 & -1 & -1 \end{array} \quad \begin{array}{l} U_l \\ \\ C_b \end{array}$$

—①

$$C_b = -B_l^t$$

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

$C_b = -B_l^t$

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ -1 & 1 & 0 & 0 \\ 0 & -1 & 1 & 0 \\ 0 & 0 & -1 & -1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 1 \\ -1 & 1 & 0 & 0 \\ 0 & -1 & 1 & 0 \\ 0 & 0 & -1 & -1 \end{bmatrix} \quad \text{— ②}$$

Hence proved LHS = RHS

(ii) $B^t C = 0$

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

8M

$$= \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \quad \text{— ②}$$

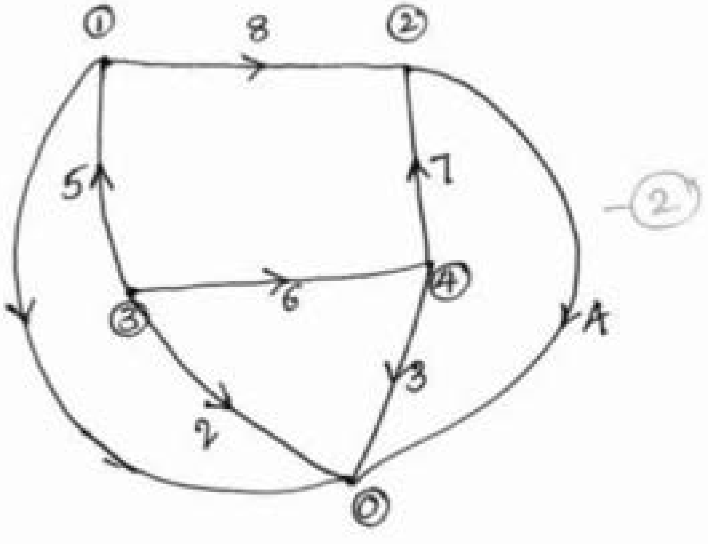
Hence proved $B^t C = 0$

2. a)

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ -1 & 0 & 1 & 0 \\ 0 & 0 & 1 & -1 \\ 0 & -1 & 0 & 1 \\ 1 & -1 & 0 & 0 \end{bmatrix} \text{— } (1/2)$$

$$\hat{A} = \begin{array}{c|ccccc} & 0 & 1 & 2 & 3 & 4 \\ \hline 1 & -1 & 1 & 0 & 0 & 0 \\ 2 & -1 & 0 & 0 & 1 & 0 \\ 3 & -1 & 0 & 0 & 0 & 1 \\ 4 & -1 & 0 & 1 & 0 & 0 \\ 5 & 0 & -1 & 0 & 1 & 0 \\ 6 & 0 & 0 & 0 & 1 & -1 \\ 7 & 0 & 0 & -1 & 0 & 1 \\ 8 & 0 & 1 & -1 & 0 & 0 \end{array} \text{— } (1\tfrac{1}{2})$$

4M.



—(2)

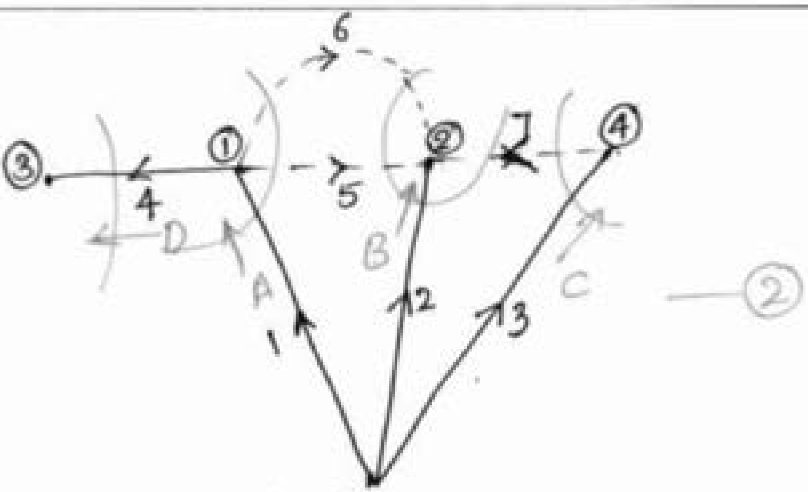
b)

Defination —— 1 X 4

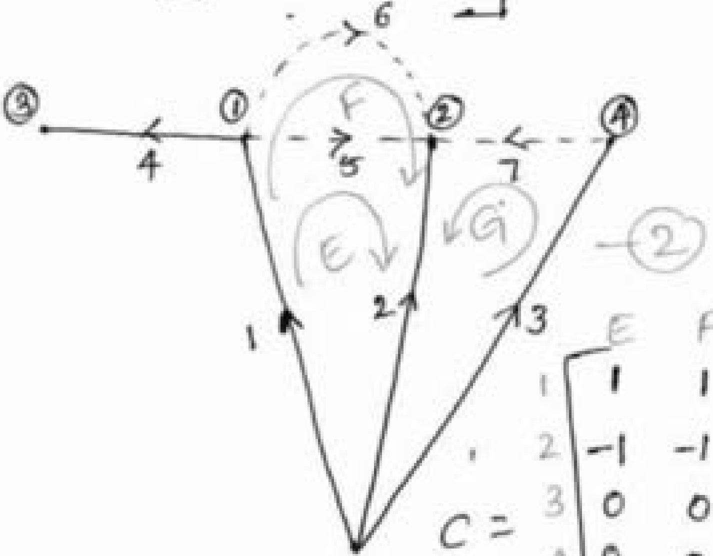
Explanation with Eg. —— 1 X 4

8M

c>



$$B = \begin{array}{c|cccc|l} & A & B & C & D & \\ \hline 1 & 1 & 0 & 0 & 0 & \\ 2 & 0 & 1 & 0 & 0 & U_b \\ 3 & 0 & 0 & 1 & 0 & \\ 4 & 0 & 0 & 0 & 1 & \text{— ①} \\ 5 & -1 & 1 & 0 & 0 & \\ 6 & -1 & 1 & 0 & 0 & B_l \\ 7 & 0 & 1 & -1 & 0 & \end{array}$$



$$C = \begin{array}{c|ccc|l} & E & F & G & \\ \hline 1 & 1 & 1 & 0 & \\ 2 & -1 & -1 & -1 & C_b \\ 3 & 0 & 0 & 1 & \\ 4 & 0 & 0 & 0 & \text{— ①} \\ 5 & 1 & 0 & 0 & \\ 6 & 0 & 1 & 0 & U_l \\ 7 & 0 & 0 & 1 & \end{array}$$

$$C_b = B_l^t.$$

$$C_b = \begin{bmatrix} 1 & 1 & 0 \\ -1 & -1 & -1 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix} \; ; \; -B_l^t = -\begin{bmatrix} -1 & 1 & 0 & 0 \\ -1 & 1 & 0 & 0 \\ 0 & 1 & -1 & 0 \end{bmatrix}^t$$

$$-B_l^t = -\begin{bmatrix} -1 & -1 & 0 \\ 1 & 1 & 1 \\ 0 & 0 & -1 \\ 0 & 0 & 0 \end{bmatrix}$$ — ②

$$-B_l^t = \begin{bmatrix} 1 & 1 & 0 \\ -1 & -1 & -1 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$$

Hence proved LHS = RHS

8M

3 a) Defination — ①

prin/w Representation
in impedance form — ①
admittance form — ①
defining all variables — ②
nature of prin/w matrix — ①

6M

b>

$$Y_1 = \frac{Y_t}{a} = \frac{j0.15}{0.92} = j0.163$$

$$Y_2 = \left(\frac{1-a}{a^2}\right) Y_t = \left[\frac{1-0.92}{(0.92)^2}\right] j0.15 = j0.014$$ ②

$$Y_3 = \left(\frac{a-1}{a}\right) Y_t = \left(\frac{0.92-1}{0.92}\right) j0.15 = -j0.013$$

$$Y_4 = \frac{Y_t}{a} = \frac{j0.2}{0.92} = j0.217$$

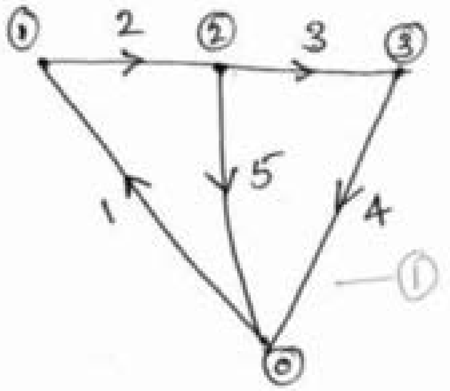
$$Y_5 = \left(\frac{1-a}{a^2}\right) Y_t = \left[\frac{1-0.92}{(0.92)^2}\right] j0.2 = j0.0189$$ ②

$$Y_6 = \left(\frac{a-1}{a}\right) Y_t = \left(\frac{0.92-1}{0.92}\right) j0.2 = -j0.0174$$

6M.

$$Y_{bus} = \begin{bmatrix} j0.5129 & -j0.217 & -j0.163 & -j0.1 \\ -j0.217 & j0.4497 & -j0.1 & -j0.15 \\ -j0.163 & -j0.1 & j0.25 & 0 \\ -j0.1 & -j0.15 & 0 & j0.25 \end{bmatrix}$$ ②

C



— ①

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

$$A^t = \begin{bmatrix} -1 & 1 & 0 & 0 & 0 \\ 0 & -1 & 1 & 0 & 1 \\ 0 & 0 & -1 & 1 & 0 \end{bmatrix}$$ — ①

$$Y_{pri} = \begin{bmatrix} j1.4 & 0 & 0 & 0 & 0 \\ 0 & j1.6 & 0 & 0 & 0 \\ 0 & 0 & j2.4 & 0 & 0 \\ 0 & 0 & 0 & j2.0 & 0 \\ 0 & 0 & 0 & 0 & j1.8 \end{bmatrix}$$ — ①

8M.

$$\left.Y_{bus} = A^t \left[Y_{pri}\right] A \right\}$$ — ②

$$= \begin{bmatrix} j3.0 & -j1.6 & 0 \\ -j1.6 & j5.8 & -j2.4 \\ 0 & -j2.4 & j4.4 \end{bmatrix}$$ — ②

4 a) Derivation of Ybus by singular transformation method.

$I_{bus} = Y_{bus} E_{bus}$ — ① } — ①

$i + j = [y] v$ — ②

$A^t i + A^t j = A^t [y] v$ — ③ } — ①

$A^t i = 0$

$A^t j = I_{bus}$ — ④ } — ①

$I_{bus} = A^t [y] v$ — ⑤

$\text{power} = (I_{bus}^*)^t E_{bus}$ — ①

$= (j^*)^t v$

$(I_{bus}^*)^t E_{bus} = (j^*)^t v$ } 1 M.

$\boxed{v = A E_{bus}}$

$I_{bus} = A^t [y] A E_{bus}$ — ⑥

comparing ① & ⑥ — ①

$Y_{bus} = A^t [y] A$

$Z_{bus} = Y_{bus}^{-1}$ } [illegible]

6M.

b>

$$y_1 = \frac{y_t}{a} = \frac{j0.15}{0.92} = j0.163$$

$$y_2 = \left(\frac{1-a}{a^2}\right)y_t = \left(\frac{1-0.92}{(0.92)^2}\right)j0.15$$

$$y_2 = j0.014$$

$$y_3 = \left(\frac{a-1}{a}\right)y_t = \left(\frac{0.92-1}{0.92}\right)j0.15$$

$$y_3 = -j0.013$$

2M

$$y_4 = \frac{y_t}{a} = \frac{j0.2}{0.97} = j0.206$$

$$y_5 = \left(\frac{1-a}{a^2}\right)y_t = \left(\frac{1-0.97}{0.97}\right)j0.2$$

$$y_5 = j0.00637$$

$$y_6 = \left(\frac{a-1}{a}\right)y_t = \left(\frac{0.97-1}{0.97}\right)j0.2$$

$$y_6 = -j0.00619$$

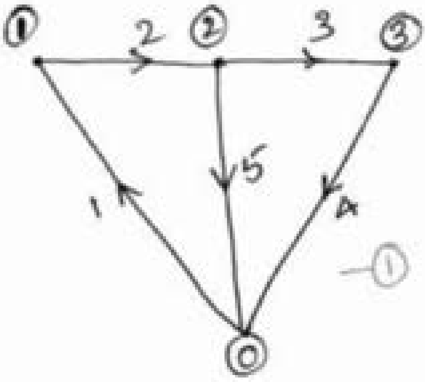
2M.

$$Y_{bus} = \begin{bmatrix} j0.889 & -j0.206 & -j0.163 & -j0.5 \\ -j0.206 & j0.4498 & -j0.1 & -j0.15 \\ -j0.163 & -j0.1 & j0.25 & 0 \\ -j0.5 & -j0.15 & 0 & j0.65 \end{bmatrix}$$

2M

6 M.

c>



—①

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

$$A^t = \begin{bmatrix} -1 & 0 & 0 & 0 & 0 \\ 0 & -1 & 1 & 0 & 1 \\ 0 & 0 & -1 & 1 & 0 \end{bmatrix}$$ —①

$$Z_{pri} = \begin{bmatrix} j0.8 & 0 & 0 & 0 & 0 \\ 0 & j0.5 & 0 & 0 & 0 \\ 0 & 0 & j0.4 & 0 & 0 \\ 0 & 0 & 0 & j0.5 & 0 \\ 0 & 0 & 0 & 0 & j0.25 \end{bmatrix}$$ —①

$$Y_{pri} = \begin{bmatrix} -j1.25 & 0 & 0 & 0 & 0 \\ 0 & -j2.0 & 0 & 0 & 0 \\ 0 & 0 & -j2.5 & 0 & 0 \\ 0 & 0 & 0 & -j2.0 & 0 \\ 0 & 0 & 0 & 0 & -j4.0 \end{bmatrix}$$ —①

$Y_{bus} = A^t [y_{per}] A$ } — ②

$$Y_{bus} = \begin{bmatrix} -j3.25 & j2.0 & 0 \\ j2.0 & -j8.5 & j2.5 \\ 0 & j2.5 & -j4.5 \end{bmatrix}$$ — ①

8M.

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
(An ISO 9001:2008 Certified Institution)
Department of Electrical & Electronics Engineering
Power Systems 2 -15/17/18EE-71

Max Marks: 40 **Internal Assessment Test-II** **Date:** 27-12-2021
Semester: VII **Duration:** 90 Minutes

NOTE: Answer any *two* full questions

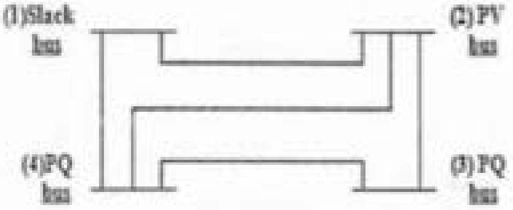
PART-A

1. a) Explain the different types of buses and explain the significance of slack bus. What are the datas are required for load flow analysis. **(10 Marks)**

b) Obtain the load flow solution at the end of 1st iteration, using G.S method of the power system shown in fig. The line and bus data are given in table.Given $0.2 \le Q2 \le 1$ PU , also find the slack bus power **(10Marks)**

From	To	Impedance in pu
1	2	0.05+j0.15
1	4	0.10+j0.3
2	3	0.15+j0.45
2	4	0.10+j0.3
3	4	0.05+j0.15

	Vi	Pi(p.u)	Qi(p.u)
1	1.04+j0.0	-	-
2	1.04+j0.0	0.5	-
3	-	-1.0	0.5
4	-	-0.3	-0.1



OR

2. a) Explain with a flow chart & equation how the load flow analysis is carried out using N-R method. **(10Marks)**

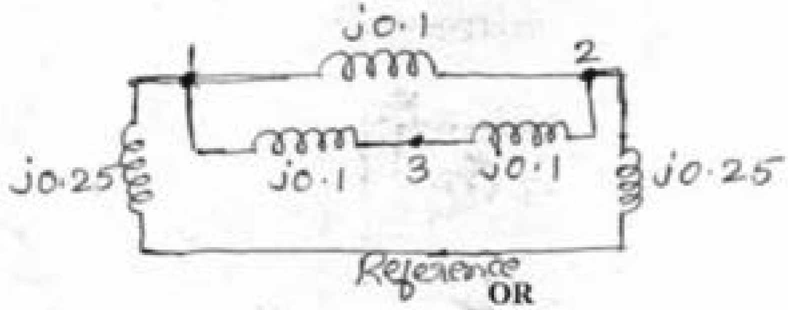
b) For the data given in table obtain Y-bus by singular transformation. Take bus 4 as reference. The system data table is given below. **(10Marks)**

Line No.	Bus (p-q)	Z (pu)	Bus (r-s)	Z (pu)
1	1-2	0.2	-------	
2	2-3	0.3	1-2	0.05
3	3-4	0.4	------	
4	4-1	0.5	------	

PART-B

3. a) Using the generalized algorithmic expression for each case of analysis, explain the load flow procedure, as per the Gauss-Seidal method for power system, having PQ buses. Also write the flow chart & Algorithm of the same. **(10Marks)**

b) Form Zbus using Zbus Building algorithm of given system **(10Marks)**



OR

4. a) A 3 bus power system as shown in the fig. The system parameters are given in Table-A and load and generator data in table-B. The voltage at bus-2 is maintained at 1.03. The maximum and minimum power limits of the generation at bus 2 are 35 and 0 MVAr respectively. Solve by Using NRLF method of load flow. **(10Marks)**

From	To	Impedance in pu	Yi
1	2	0.08+j0.24	0
1	3	0.02+j0.06	0
2	3	0.06+j0.18	0

Bus No.	Bus Voltage	Generation		Load	
		MW	MVAr	MW	MVAr
1	1.05+j0.0	-	-	-	-
2	1.03+j0.0	20	-	50	20
3	------------	-	-	60	25

b) Derive the generalized Algorithm for finding the element of bus impedance matrix Zbus when a link is added to the partial network. **(10Marks)**

Signature of staff

G. H. R

Signature of HOD

Signature of Principal

24/12/21

Power systems-2 15/17/18EE-71.
Internal Assessment Test-II
Scheme & Solution

1 a) Explanation of
slack bus — 2M
PQ bus — 2M
PV bus. — 2M

~~Sigm~~ Significance of slack bus. — 2M

Data required for load flow analysis. — 2M

b)

$$Y_{bus} = \begin{bmatrix} 3-j9 & -2+j6 & 0 & -1+j3 \\ -2+j6 & 3.66-j11 & -0.66+j2 & -1+j3 \\ 0 & -0.66+j2 & 2.66-j8 & -2+j6 \\ -1+j3 & -1+j3 & -2+j6 & 4-j12 \end{bmatrix} \text{ — 2M}$$

$$\left.\begin{aligned} Q_2 &= 0.208 \\ \delta_2 &= 1.051 \angle 1.84 \end{aligned}\right\} \text{ — 2M}$$

$V_2' = 1.04 \angle 1.84$ — 2M

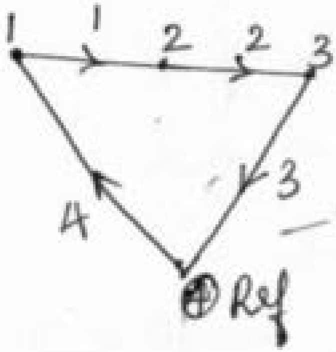
$V_3' = 1.036 \angle -6.815$ — 2M

$V_4' = 1.02 \angle -4.1$ — 2M

2 a) Equation of P & Q } — 6M

Flow chart — 4M

b)



— 1M

$$A = \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \\ -1 & 0 & 0 \end{bmatrix}$$ — 1M

$$A^t = \begin{bmatrix} 1 & 0 & 0 & -1 \\ -1 & 1 & 0 & 0 \\ 0 & -1 & 1 & 0 \end{bmatrix}$$ — ~~1~~2M

$$Z_{pri} = \begin{bmatrix} 0.2 & 0.05 & 0 & 0 \\ 0.05 & 0.3 & 0 & 0 \\ 0 & 0 & 0.4 & 0 \\ 0 & 0 & 0 & 0.5 \end{bmatrix}$$ — 1M

$$Y_{pri} = \begin{bmatrix} B_1 & B_2 \\ B_3 & B_4 \end{bmatrix} = \begin{bmatrix} 5.217 & -0.8695 & 0 & 0 \\ -0.8695 & 3.4782 & 0 & 0 \\ 0 & 0 & 2.5 & 0 \\ 0 & 0 & 0 & 2 \end{bmatrix}$$ — 4M.

$$Y_{bus} = A[Y_{pri}]A^t$$

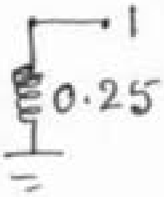
$$Y_{bus} = \begin{bmatrix} 7.217 & -6.0865 & 0.8695 \\ -6.0865 & 10.4342 & -4.3477 \\ 0.8695 & -4.3477 & 5.9782 \end{bmatrix}$$ — 2M

3 a) Explanation with derivation (PQ buses) — 4M

Flow chart — 3M

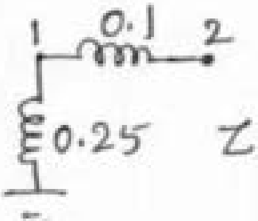
Algorithm. — 3M

b) Step 1:



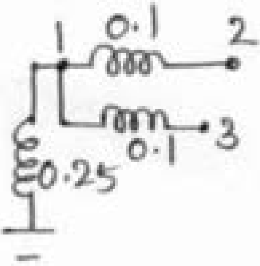
$$Z_{bus\,(new)} = \begin{bmatrix} 0.25 \end{bmatrix}$$ — 1M

Step 2:



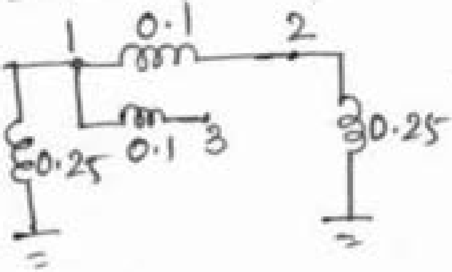
$$Z_{bus\,(new)} = \begin{bmatrix} 0.25 & 0.25 \\ 0.25 & 0.35 \end{bmatrix}$$ — 2M

Step 3:



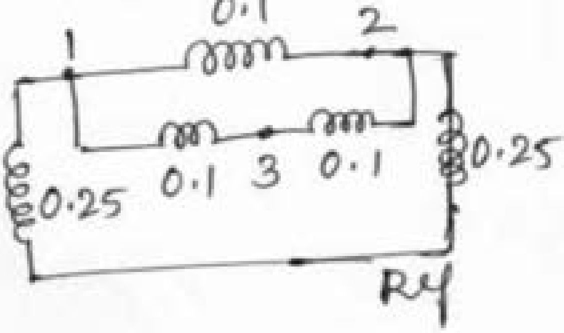
$$Z_{bus(new)} = \begin{bmatrix} 0.25 & 0.25 & 0.25 \\ 0.25 & 0.25 & 0.25 \\ 0.25 & 0.25 & 0.35 \end{bmatrix}$$ — 2M

Step 4:



$$Z_{bus(new)} = \begin{bmatrix} 0.1458 & 0.1042 & 0.1458 \\ 0.1042 & 0.1458 & 0.1042 \\ 0.1458 & 0.1042 & 0.2458 \end{bmatrix}$$ — 2½M

Step 5:



$$Z_{bus\,(new)} = \begin{bmatrix} 0.1397 & 0.1103 & 0.125 \\ 0.1103 & 0.1397 & 0.125 \\ 0.125 & 0.125 & 0.175 \end{bmatrix}$$ — 2½M

④ a)

$$Y_{bus} = \begin{bmatrix} 6.25 - j18.75 & -1.25+j3.75 & -5+j15 \\ -1.25+j3.75 & 2.916-j8.75 & -1.66+j5 \\ -5+j15 & -1.66+j5 & 6.66-j20 \end{bmatrix}$$

— 3M

$P_2 = -0.3$ PU

$Q_{2min} = -0.2$ PU

$Q_{2max} = 0.15$ PU $\quad -0.2 \le Q_2 \le 0.15$ — 3M

$P_3 = -0.6$ PU

$Q_3 = -0.25$ PU

$Q_2 = 0.07725$ —— 1M

$\delta_2 = 1.019 \angle -1.82 \quad \delta_2 = -1.82$ — 1M

$V_2' = 1.03 \angle -1.82$ —— 1M

$V_3 = 1.025 \angle -1.942$ — 1M

b) Defination

Type 1 modification — 2M

Type 2 modification — 2M

Type 3 modification — 3M

Type 4 modification — 3M

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
INTERNAL ASSESSMENT - I, DECEMBER 2021

Semester : III **Subject: ELECTRIC CIRCUIT ANALYSIS** **Sub Code: 18EE-32**
Max Marks: 40 Date: 06-12-2021 Duration: 1½ Hours

NOTE: Answer two full questions

1 a) Explain the different types of dependent voltage sources [CO 1] 06 Marks

b) For the network shown in figure, determine the voltage V using source shift/source transformation techniques [CO 2] 08 Marks

c) Obtain the delta connected equivalent of the network shown in figure 1© [CO2] 06 Marks

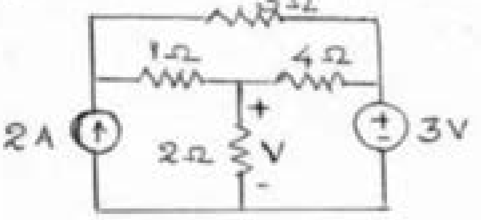


FIG 1(b)

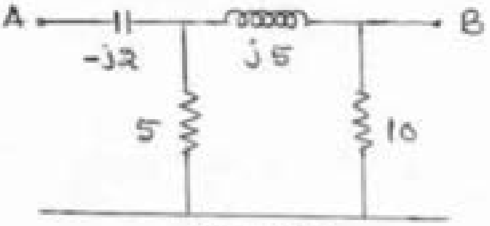


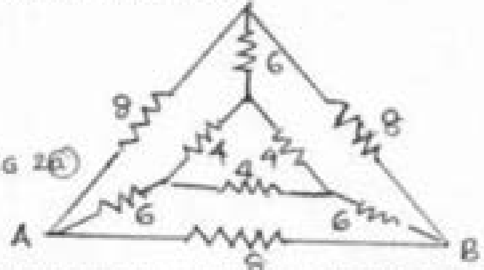
FIG 1©

OR

2 a) In the network shown in figure 2(a), the number represent the value of resister in Ω. Find the resistance between the points A & B [CO2] 10 Marks

b) The network contains two voltage sources V_1 and V_2 with $V_1=30\angle 0$ volts. Determine V_2, such that current in 2+j3 Ω impedance is zero. [CO2] 10 Marks

FIG 2(a)



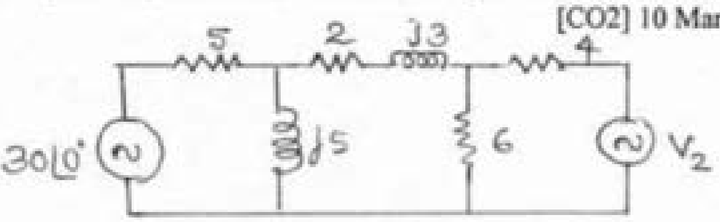


FIG 2(b)

3 a) Find the voltage across the capacitor of reactance 20 Ω by using mesh current analysis [CO2] 10 Marks

b) Use mesh analysis as the circuit shown to find values of all mesh currents. Each resistance in the circuit is equal to 1 Ω [CO2] 10 Marks

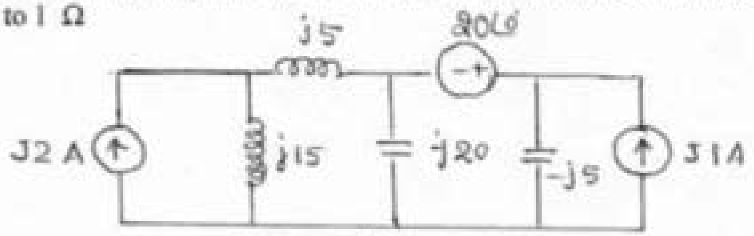


FIG 3(a)

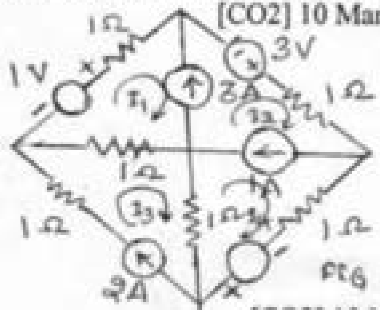


FIG 3(b)

OR

4 a) Find the current I in 28 Ω resistor by mesh analysis [CO2] 10 Marks

b) Find the power dissipated in the 10 Ω resistor by using node analysis [CO2] 10 Marks

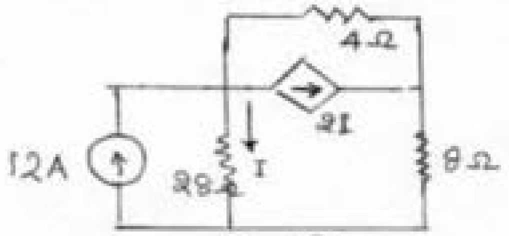


FIG 4(a)

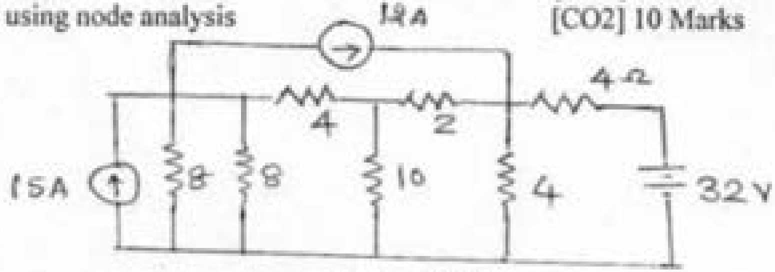


FIG 4(b)

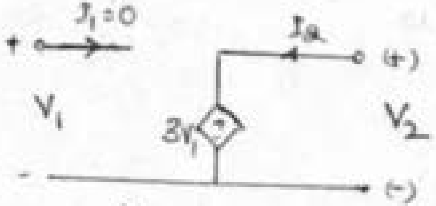
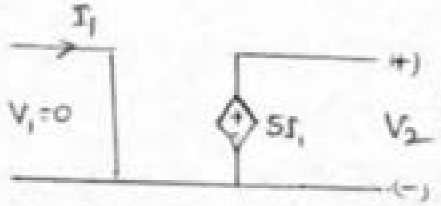
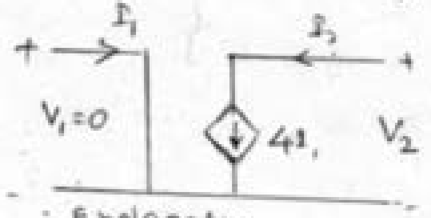
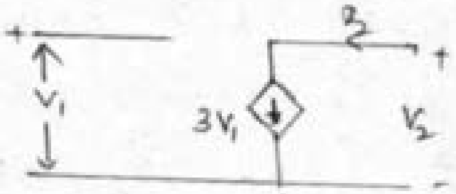
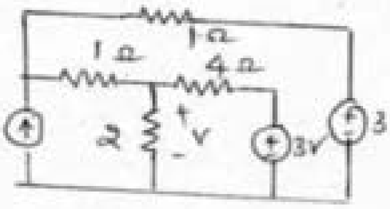
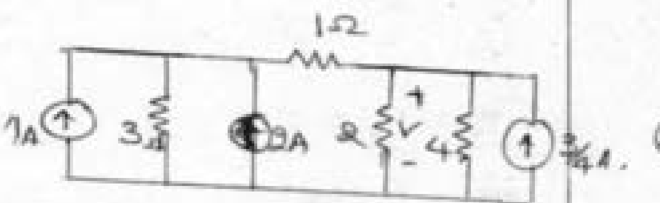
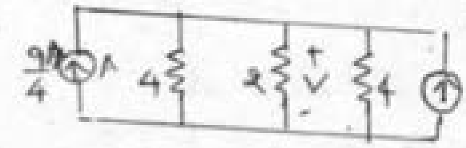
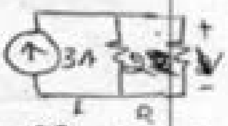
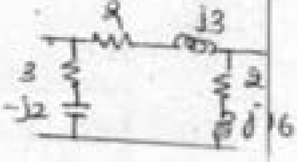
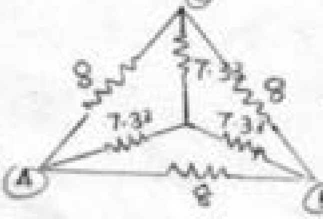
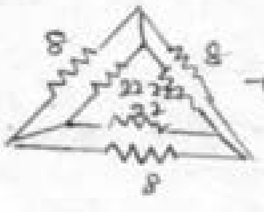
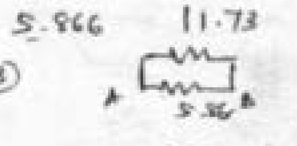
****

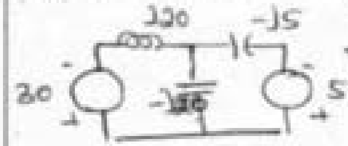
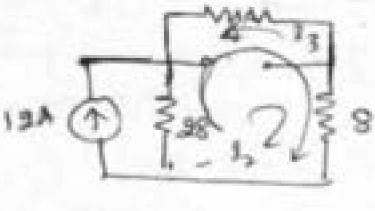
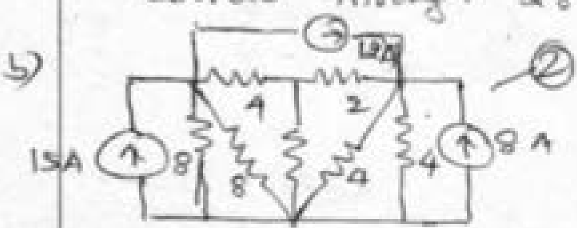
G. H. Ravi
PREPARED BY
Mr. G. H. RAVIKUMAR

APPROVED BY
Dr. NARENDRA VISWANATH
PRINCIPAL

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: ECA **Scheme & Solution** **Course Code:** 15 EE 32

Question Number	Solution	Marks Allocated
1 a)	Voltage controlled voltage source current controlled voltage source current controlled current source voltage controlled current source	2
	    Explanation	4
b)	  	④
	 -② $\frac{9}{4}+\frac{3}{4}=\frac{12}{4}=3A$ $R_1=\frac{4\times4}{4+4}=\frac{16}{8}=2$  $V=3\left(\frac{2}{2+2}\right)2=3$ volt -②	
c)	$Z_{AB}=\frac{Z_A Z_B+Z_B Z_C+Z_A Z_C}{Z_C}=2+j3$ $Z_{BC}=-7.5+j5$ $Z_{AC}=3-j2$	③
	  	③
2 a)	 -②  -③  	②
	 	①

Question Number	Solution	Marks Allocated
2 b)	$(5+j5)I_1 - j5 I_2 = 30\angle 0^\circ$ $-j5I_1 + (8+j8)I_2 + 6I_3 = 0$ $6I_2 + 10I_3 = V_2$ $\Big\}$ ③ $\Delta_2 = -(30+j30)V_5 = -j1500$ $V_2 = 35.35\angle 45^\circ$	③ ④
3 a)	$E_1 = -30$ volt $E_2 = 5$V  —② $I_2 = j1.5$A $I_1 = j1.125$ $\Big\}$ ② $I_2 - I_1 = j0.375$ $V = (-j20)(j0.375)$ V = 7.5 Volt	② ② }②
b)	$I_3 = 2$ Amps —① $I_2 - I_1 = 3$A —② $I_2 - I_4 = 1$A —③ $2I_1 + I_2 + 2I_4 = 13$ —③ $3I_2 + 2I_1 = 19$ —④ Solve ③+④ $I_2 = 4.2$ Amp $I_1 = 1.2$A $I_4 = 3.2$ Amp	2+4 2 2
4 a)	$I_1 = 12$ Amps $I_2 + I_3 = 2I$ $I = I_1 - I_2$ $I_2 + I_3 = 2(I_1 - I_2)$ $3I_2 + I_3 = 24$ —①  KVL for outer mesh $-4I_3 + 8I_2 - 28I = 0$ $36I_2 - 4I_3 = 336$ —② Solve of ① + ② $I_2 = 9$A current through 28Ω $= I_1 - I_2 = 12 - 9 = 3$ Amp	
b)	 —② $\begin{bmatrix} 0.5 & -0.25 & 0 \\ -0.25 & 0.85 & -0.5 \\ 0 & -0.5 & 1 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} 3 \\ 0 \\ 20 \end{bmatrix}$ $V_2 = \dfrac{\Delta_2}{\Delta} = \dfrac{5.75}{0.3375} = 24.91$ volt $I = 2.421$ Amp $P = I^2 R = (2.421)(10) = 58.6$ watts	③ ②+① ②

SHRIDEVI INSTITUTE OF ENGINEERING & TECHNOLOGY, TUMKUR-06
Department of Electrical & Electronics Engineering
INTERNAL ASSESSMENT - II, FEBRUARY-2022

Semester: III Subject: **ELECTRIC CIRCUIT ANALYSIS** Sub Code: **18EE-32**
Max Marks: 40 Date: 07-02-2022 Duration: **90** Minutes

NOTE: Answer any two full questions

1 a) Obtain the impedance parameters in terms of admittance parameters. 06 Marks
b) Find the Y and Z parameters for the network shown in figure 1(b). 07 Marks
c) Find the h-parameters for the circuit shown in figure 1© 07 Marks

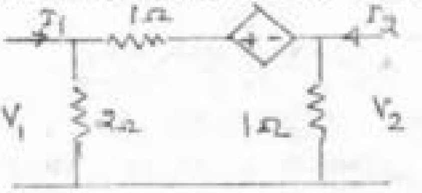


FIG 1(c)

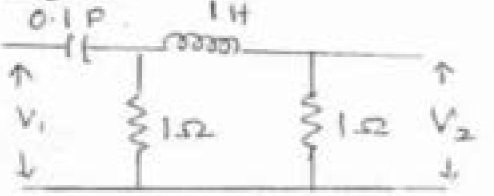


FIG 1(b)

2 a) Find the voltage across 20Ω capacitor in the network shown in figure Q2 (a). Using superposition theorem. 10 Marks
b) State reciprocity theorem. Find i_x and hence verify reciprocity theorem for the network in figure 2(b) 10 Marks

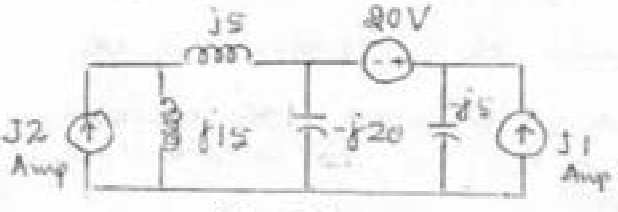
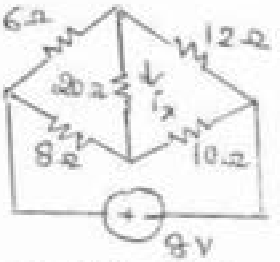


FIG 2(a)



3 a) Obtain Thevenin's equivalent circuit with respect to AB of the network figure 3(a) 10 Marks
b) Find the Norton's equivalent circuit at terminals A and B as shown in fig Q 4(b) and hence determine the power dissipated in a 5 Ω resistor connected between terminals A and B. 10 Marks

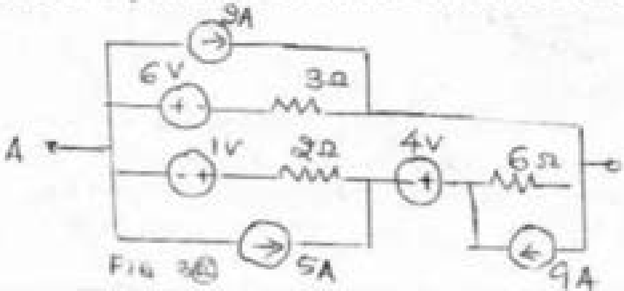


FIG 3(a)

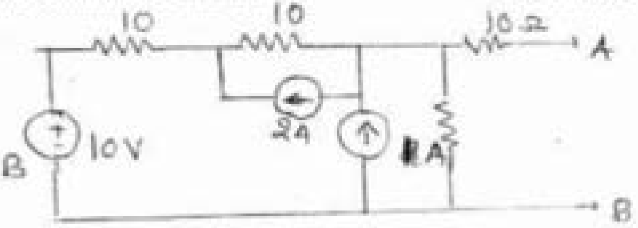


FIG 3(b)

4 a) For the circuit of figure 4(a) i) what is the value of Z_L that will absorb the maximum average power
ii) what is the value of maximum power 10 Marks
b) Find the current through (5+j5) Ω impedance by using Millimans theorem as shown in fig Q4(b). 10 Marks

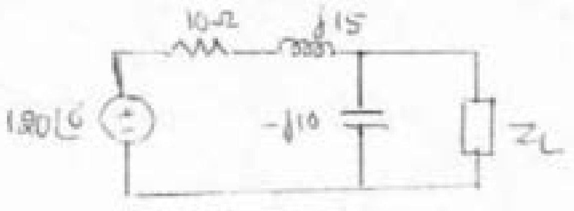


FIG 4(a)

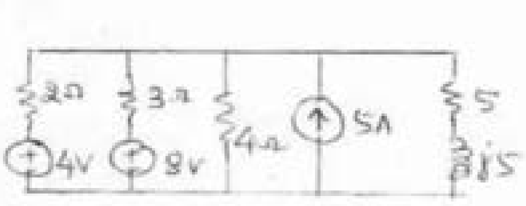
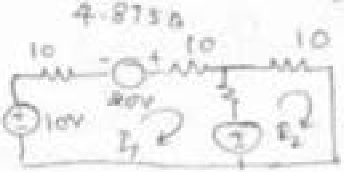
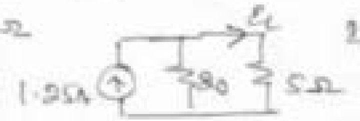


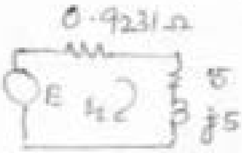
FIG 4(b)

****

SHRIDEVI INSTITUTE OF ENGINEERING & TECNOLOGY
(An ISO 9001:2000 Certified Institution)
Sira Road TUMKUR-572106

Course Title: Electric Circuit Analys **Scheme & Solution** **Course Code:** 18EE32

Question Number	Solution	Marks Allocated
1 a)	$Z = \frac{1}{\Delta Y}\begin{bmatrix} Y_{22} & -Y_{12} \\ -Y_{21} & Y_{11} \end{bmatrix}$ -② $Z_{11} = \frac{Y_{22}}{\Delta Y}$ $Z_{12} = \frac{-Y_{12}}{\Delta Y}$ $Z_{21} = \frac{-Y_{21}}{\Delta Y}$ $Z_{22} = \frac{Y_{11}}{\Delta Y}$	④
b)	$V_1 = 2I_1 + 2I_2$ $0 = -3V_1 + 1I_2 + 2(I_2+I_1)$ $Y_{21} = \frac{I_2}{V_1} = 2℧$ $Y_{11} = \frac{-I_1}{V_1} = -\frac{3}{2}$  $V_2 = \frac{1}{2}I_2$ $I_1 = -I_2\left(\frac{1}{1+1}\right)$ $I_1 = -\frac{1}{2}I_2$ $Y_{22} = 2℧$ -① $Y_{12} = \frac{I_1}{-V_2} = -1$ $I_1 = -\frac{1}{2}2I_2$	② ② -① ①
c)	$h_{11} = \frac{V_1}{I_1} = \frac{S^2+10S+10}{S(S+1)}$ $h_{12} = \frac{V_1}{V_2} = \frac{1}{S+}$ [illegible] $h_{21} = \frac{I_2}{I_1} = \frac{-1}{S+1}$ -② $h_{22} = \frac{I_2}{V_2} = \frac{S+2}{S+1}$	③ ②
2 a)	1 step $I_{-j20\Omega} = 0.375$ $V_c = 7.5$ volts ; 2 step $-j5(j1) = 5$ volt $I_1 = 0$ $I_2 = -j1$ $V_c = -20$ ∴ Total vp = 7.5+5-20 = -7.5	⑤ ⑤
b)	$\Delta = 9216$ $\Delta_1 = 4288$ $I_1 = \frac{\Delta_1}{\Delta} = 0.4652$ $\Delta_2 = 4000$ $I_2 = \frac{\Delta_2}{\Delta} = 0.434$ $I_1 - I_2 = 0.031$ Amp $\Delta = 9216$ $\Delta_3 = 288$ $I_3 = \frac{288}{9216} = 0.0312$ Amp	③ ③ ④
3 a)	 $V_{th} = 4.875(2.18) = 10.6275$ 	2+3+4
b)	 I_{sc} $\begin{vmatrix} 40 & -20 \\ -20 & 30 \end{vmatrix}\begin{vmatrix} I_1 \\ I_2 \end{vmatrix} = \begin{vmatrix} 10 \\ 20 \end{vmatrix}$ $I_{sc} = I_2 = \frac{\Delta_2}{\Delta} = \frac{1000}{800} = 1.25$ $R_{th} = 80\Omega$  $I_L = 1$ Amp	⑤ -⑤
4 a)	$V_{th} = I_1(-j10) = \frac{180\angle 0^\circ}{10+j15-j10}(-j10) = 107.33\angle -116.57^\circ$ V $Z_{th} = \frac{-j10(10+j15)}{-j10+10+j15} = 8-j14\Omega$  $I_L = \frac{107.33\angle -116.57}{8+8} = 6.7\angle -116.57$ A $P_{max} = \frac{1}{2}I_L^2 R_L : 8\Omega$ = 180 watt	⑤ ⑤

Question Number	Solution	Marks Allocated
4 b)	$E = \frac{E_1Y_1 + E_2Y_2 + E_3Y_3}{Y_1 + Y_2 + Y_3 = 1.080} = 8.9231$ Volts	⑤
	 $I_L = \frac{8.9231}{0.9231+5+j5} = 1.15\angle{-40.2}$ Amp	⑤