INTERNAL ASSESSMENT MARKS

Date	Test No.	Max. Marks	Marks Obtained	Course Instructor Signature
9/3/18	1	25	19	
13/4/18	2	25	14	
21/5/18	3	25	12	
	Average	25	17	

CERTIFICATE

This is to certify that Kum / Sri Rekha.Y

with USN 1SV15EC412 has satisfactorily completed the course of tests in the subject of Digital Switching Systems as prescribed by the Visvesvaraya Technological University for the 4th year / 8th semester B.E. degree course in the year 2017 - 2018

Rekha.Y
Signature of the Student

Course Instructor

Head of the Department

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TEST No. 1

Q. No.	a	b	c	d	Total
Q1	4				4
Q2	6	6			12
Q3					
Q4	3	3	4		64
Q5					
Q6					
Test - 1 Marks					19/25

TEST No. 2

Q. No.	a	b	c	d	Total
Q1	1				1
Q2	2	3	2		7
Q3	1	5			6
Q4					
Q5					
Q6					
Test - 2 Marks					14/20

TEST No. 3

Q. No.	a	b	c	d	Total
Q1					
Q2	0	2			2
Q3					
Q4	2	4	4		10
Q5					
Q6					
Test - 3 Marks					12/25

REMARKS

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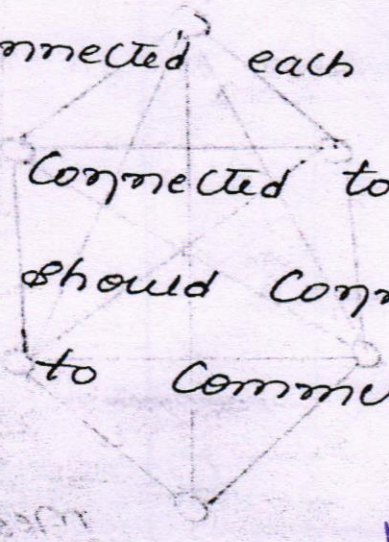
The different network structures are as follows:-

1. Mesh
2. Ring and Bus
3. Star
4. Tree

Mesh Network Structure :-

In the mesh network structure All the stations are connected each other by other. The lines are connected to each other. The each line should connected to the each stations to communicate over the network.



The each station requires (N-1) lines.

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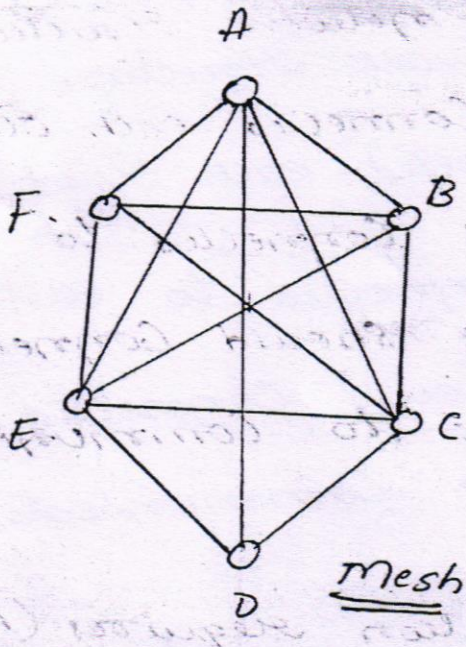
The mesh N/w is used in the small switching sys of no, of telephones in the same office.

The total Number of lines are represented by N

$$\therefore \boxed{N = \frac{n(n-1)}{2}}$$

If $n >> 1$ then it consists of more no, of stations are connected.

If n increases then it number of lines increases + cost is low.



Mesh n/w

figure shows the mesh n/w.

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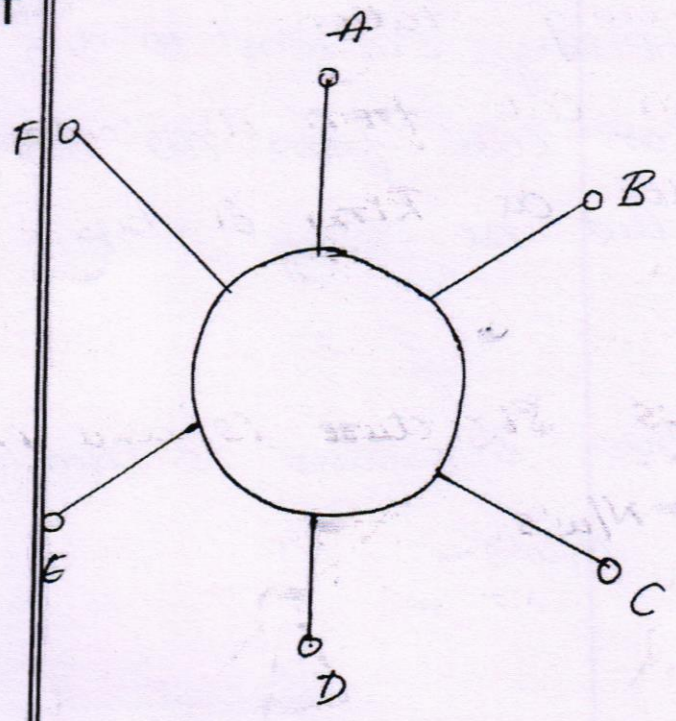
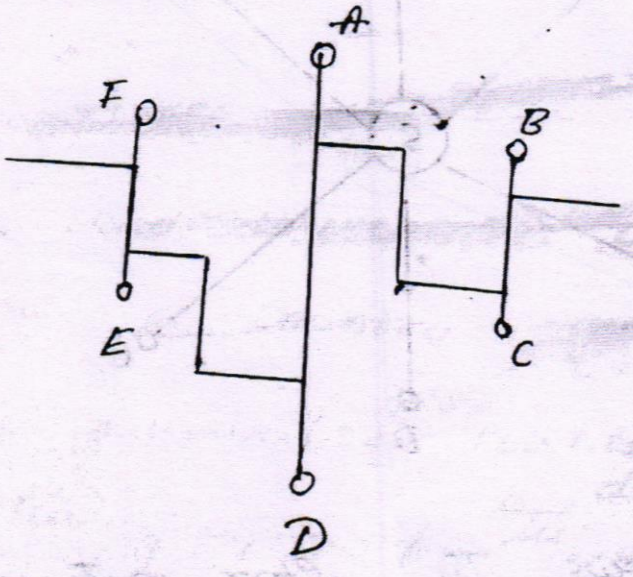
Ring & Bus N/w :-



Ring



Bus Structure

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Pg. No.

Instead of connecting stations to each other. A line can call from the centre office. It is called as Ring or bus structure.

The Ring or bus structure is used in the Local area N/w's.

Star :-

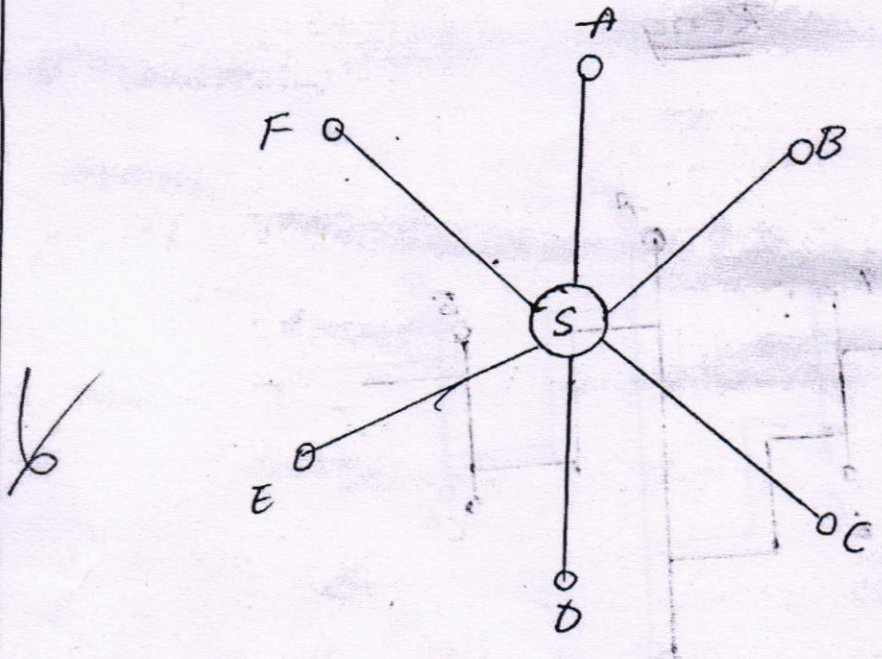

figure shows the star network.

In the star network the lines are connected to the Main Switch or Station.

The Star structure n/w reduces the n-1 lines to N

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i.e. $N = n$.

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Tree :-

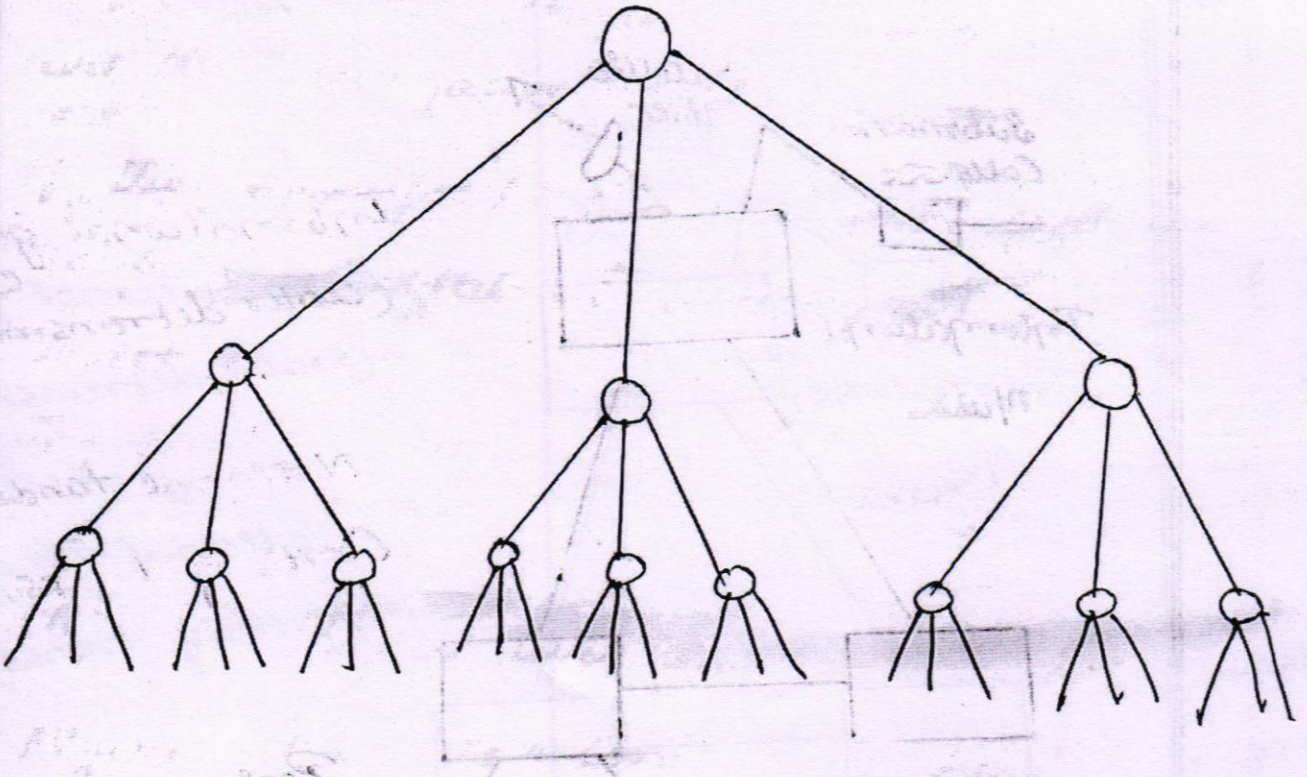

figure shows the Tree structure.

It is used to connect different parts of the area of country.

If the subscribers wants to communicate with the peoples of the different area of the same country. then it is helpful to connect by using Tree.

The user can connected to the local area of the same country or to the other areas of the same country.

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q 2. b). PSTN (Public Switching Telecommunication N/w)

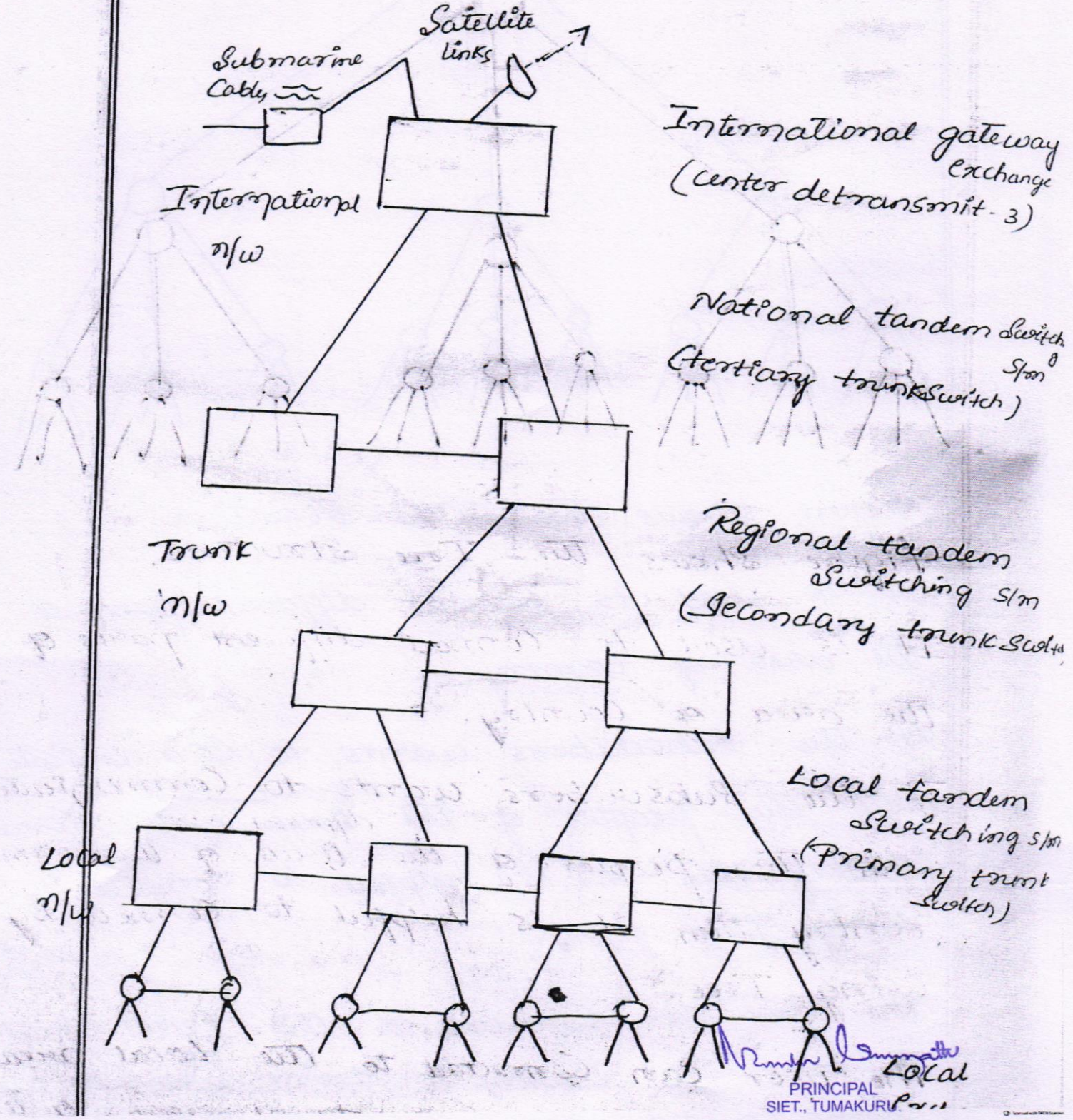

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Figure shows the public Switching Tele Communication N/w.

For every International S/m Interconnection route can not be done. Hence it requires a higher level. to alternative routing

If the S/m is having the same level the route can obtained. directly or Direct routing available for the S/m's when they are in the same level.

The alternative route can also be obtained by the higher level S/m.

Figure shows it consists of higher level hierarchy of the S/m.

The networks are off

1. Local network
2. ~~T~~ network or Junctio network
3. Trunk network.

Local network These networks are used to connect the Local exchanges of the customer lines.

Junction networks are used to connect the Regional n/w.

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The trunk network & the Junctional network are called as Core network.

Trunk n/w → inner Core.

Junction n/w → outer Core.

The National tandem switching can be interconnected using International switching. The number of levels can be connected usin International gateway switch.

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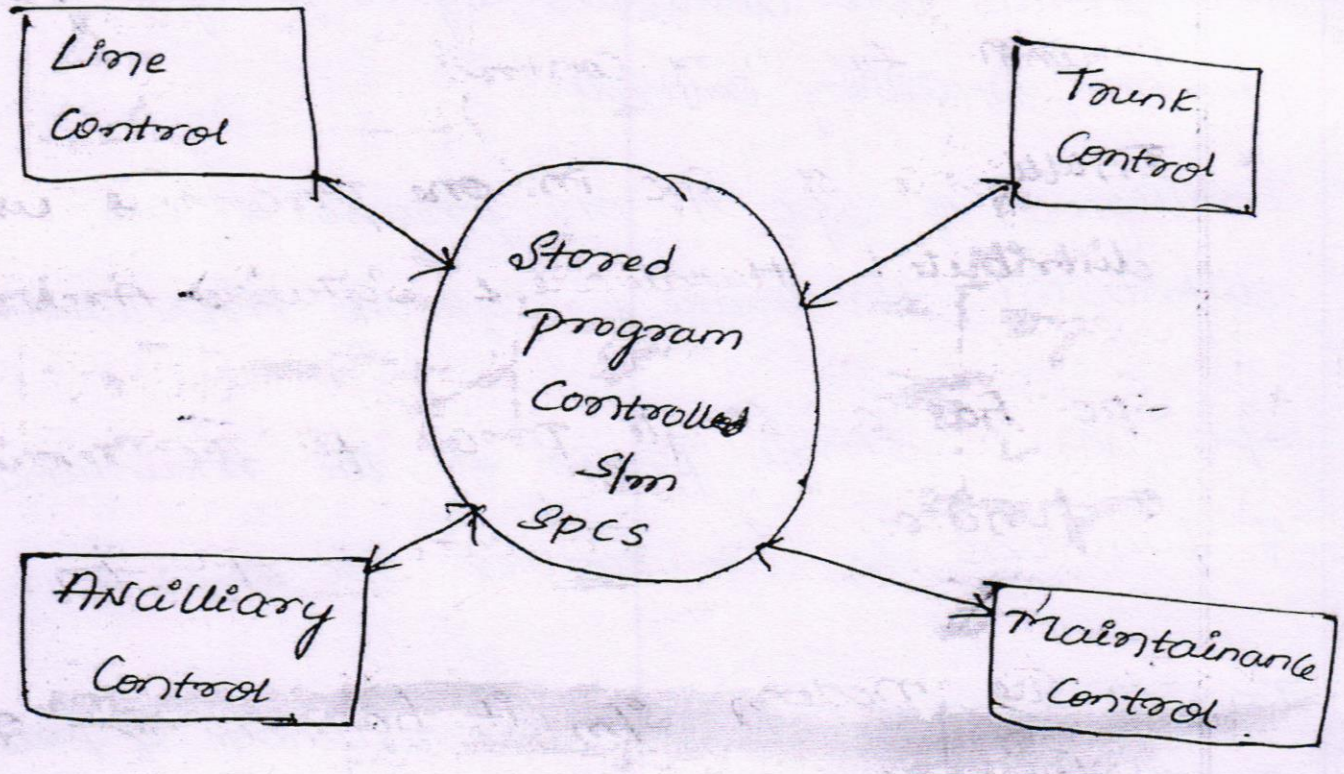
Pg No.

Stored program Control Switching S/m.



The fig shows SPCS S/m.

The Stored program Control the Control of Switching functions are programmed into memory & actions executed by the Controllin g processor.

The basic function of SPC is line Origination & termination & to provide trunk routing to other Center or tandem offic

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[line & trunk Control]

Spc provides Control of special features & Pg. No.
functions Ancillary Control. embedded in one processor. All
Phenipherals are Controlled by a single
processor Ancilliary controll.

Intelligence of Spc in one processor & use
distributed Hardware & Software Architecture.

Spc has a single proces for the maintainc
& functions in the earlier Spc S/m.

In the modern S/m it has number of proc
-or to maintaing functions

The Spc indicates a dedicated processor for the
maintainance fun such as

* Security
* Billing center
* Engineer support
* Special translation support.

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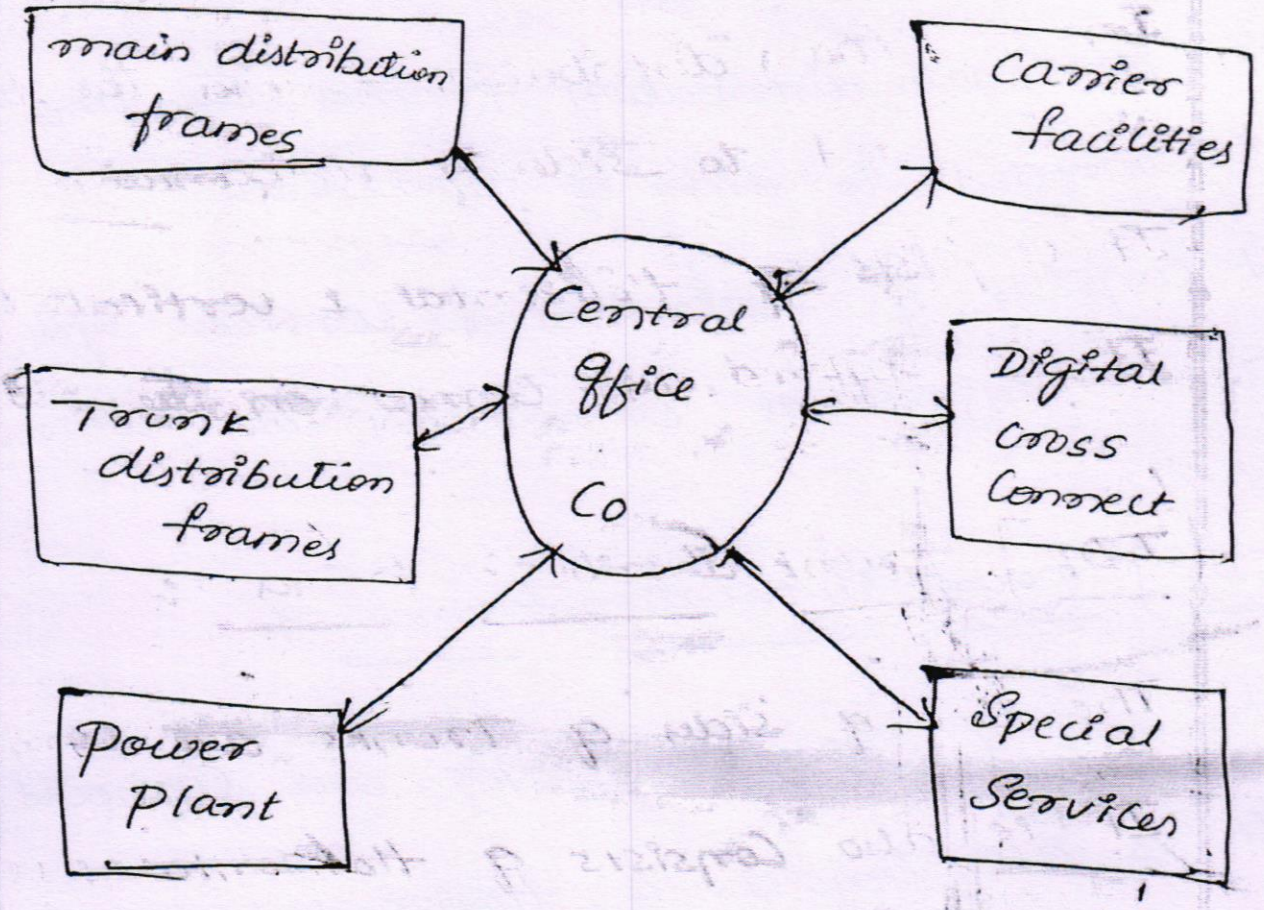
Basic central office linkages

Pg No.



The figure shows the basic central office linkages.

The distribution frames are connected to the central office.

Main distribution frames [MDF] are used to terminate the call.

Its is used in the telephony n/w. Communication.

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Pg. No.

Main distribution frames:- (MDF)

In the main distribution frames the lines are connected to sides of horizontal.

It consists of horizontal & vertical types.

It is reffered as connect on the horizontal

[TDF] Trunk distribution frames :-

The line of sides of trunks are connected.

It is also consists of horizontal & vertical

It is reffered as trunk are connected on Horizontal.

Power plant :-

Power plant consists of battery, power source & It provides dc source & It protects the ac source.

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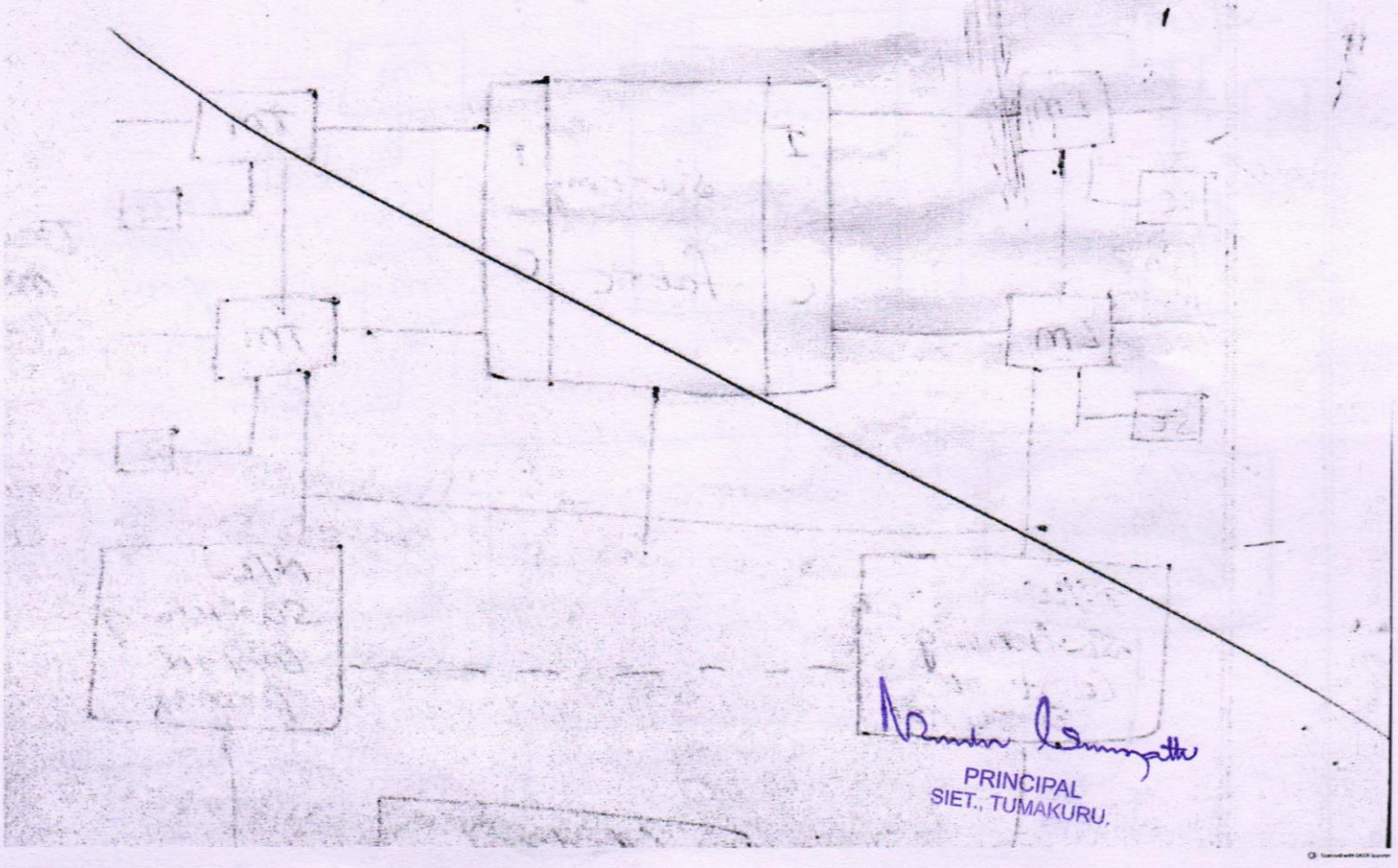
Special Services :-

Pg. No.

Special services are like data services.

Carrier facilities :-

These are the carrier & transmission lines b/w the central office & the user.



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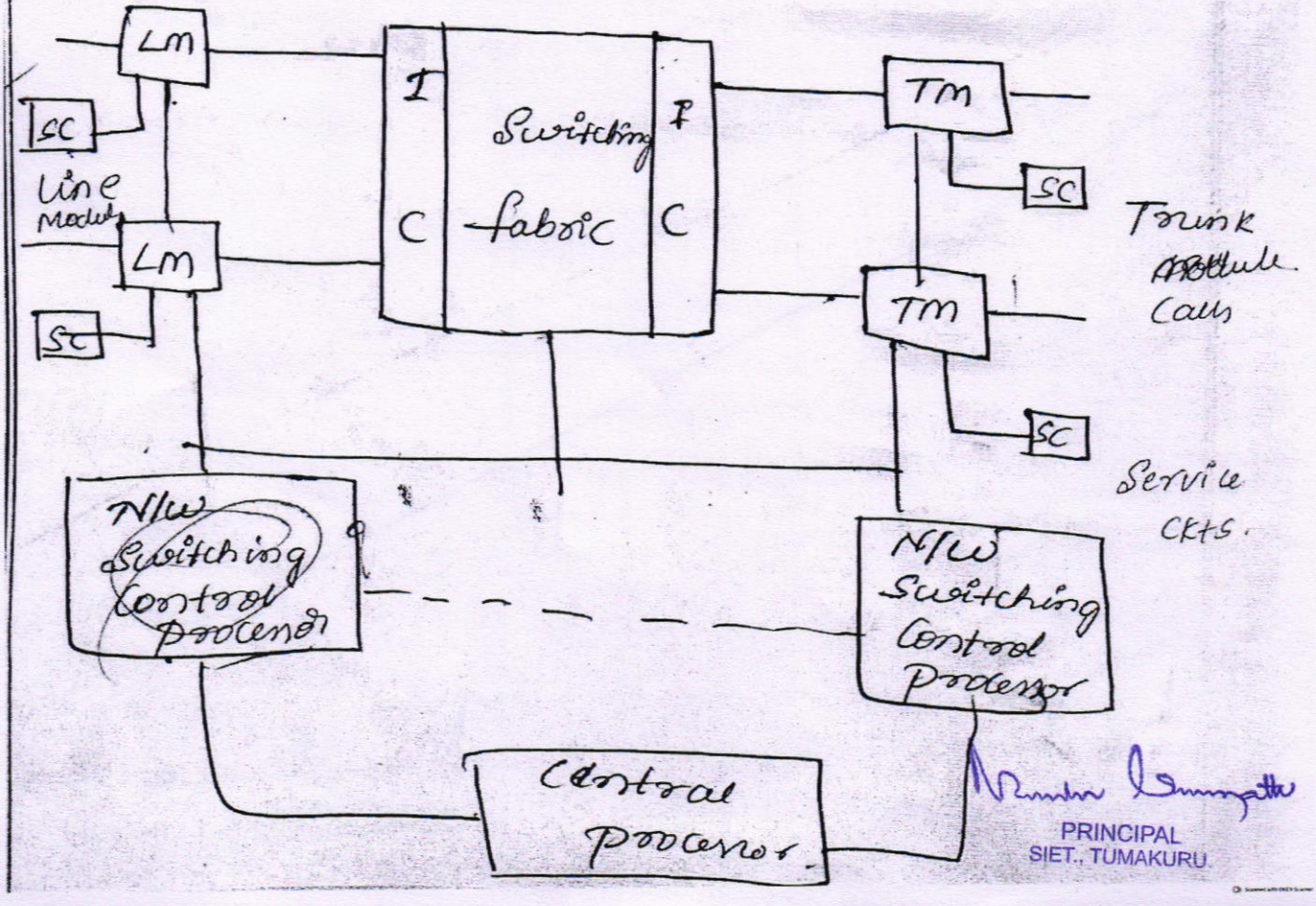
The different basic call processing in digital Switching Sfm are.

* Intra call
* Inter call
* Incoming call
* outgoing call.

~~Internal~~ ~~call~~



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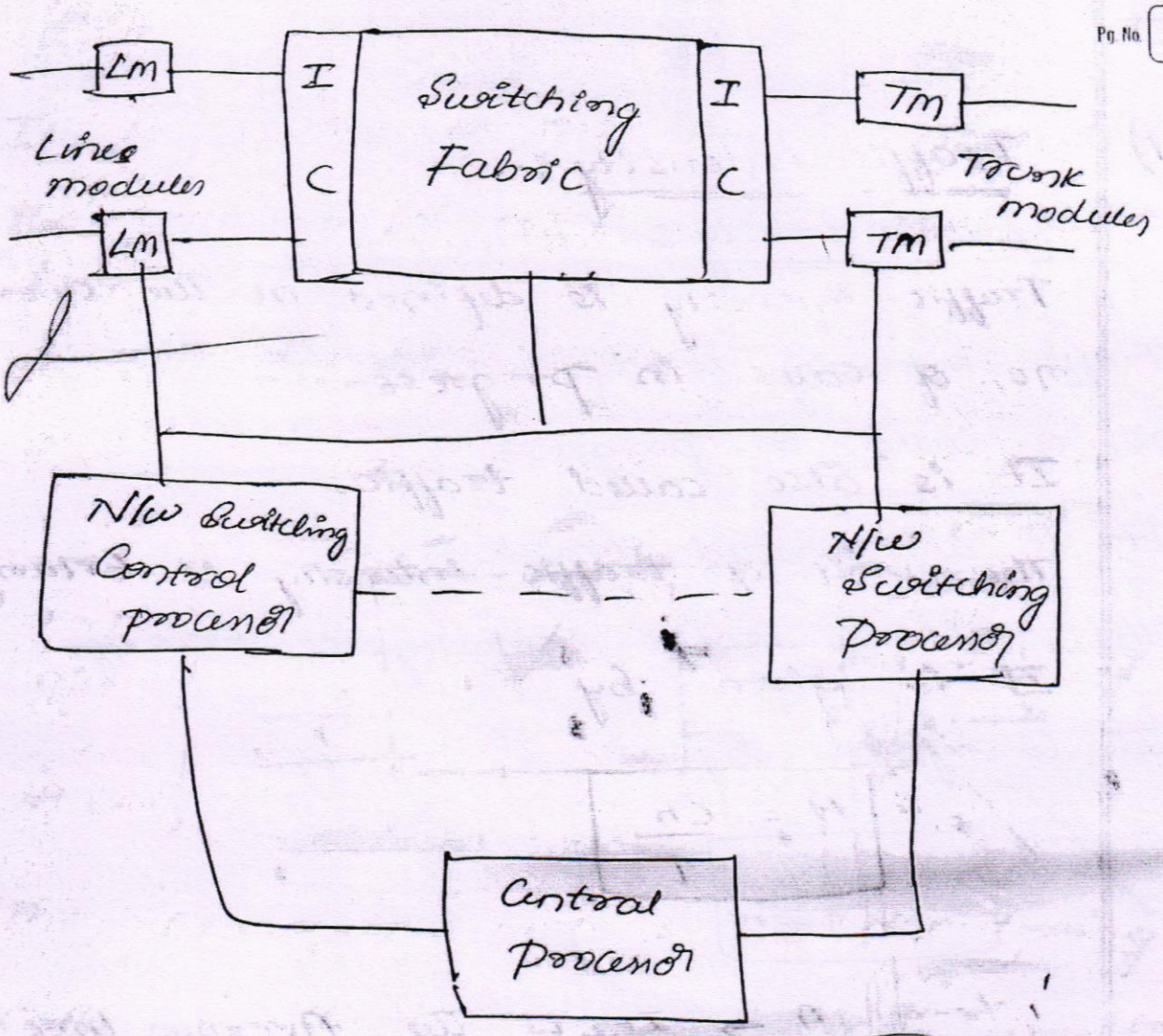

19/25

10/03/18

Graanbell [Alexendar Grahambel]

in the year 1876.

Grahem Bell

Alexendar Grahambell invented telephony in the year 1876.

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II nd internals.

Pg. No

Traffic intensity :-

Traffic intensity is defined as the average no, of calls in progress.

It is also called traffic.

The unit of traffic intensity is Erlangs.

It is given by

$$A = \frac{Ch}{T}$$

where, A → It is the Average loss in the call s/m

h → It is the holding time of call

C → It is the ~~calls~~ average calls arrives over a period of time T.

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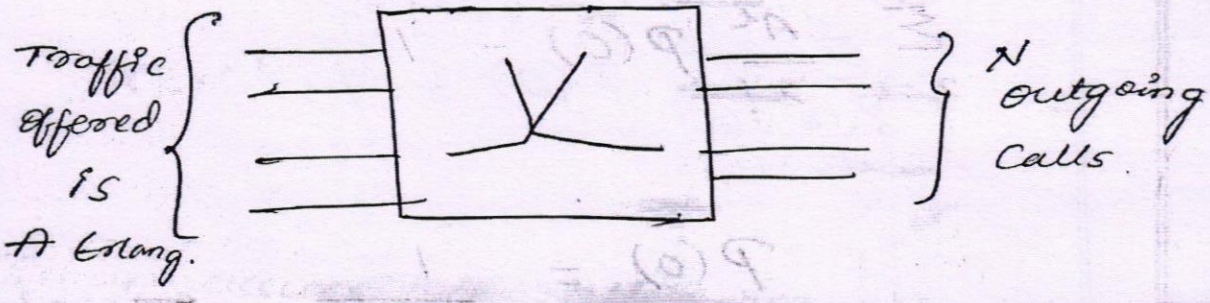
Pg. No.

Busy hour :-

It is period of one hour corresponds to the peak traffic load it is called as busy hour.

Q2.

2).



The Erlang determined the N outgoing calls for the Lost Call S/m having when traffic offered is A.

The following are the assumptions made.

Pure Channel :- Call arrivals & call termin-ations are independent on random event.

Statistical equilibrium :- The probabilities donot change.

Calls encountering the congestion hence it is Lost call S/m.

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It is given by.

$$P(x) = \frac{A^x}{x!} P(0) \quad \text{—— (1)}.$$

$$\sum_{x=0}^{N} P(x) = 1 \quad \text{—— (2)}.$$

Substitute eqn (2) in eqn (1)

$$\sum_{x=0}^{N} \frac{A^x}{x!} P(0) = 1$$

$$P(0) = \frac{1}{\sum_{x=0}^{N} \frac{A^x}{x!}} \quad \text{— (3)}.$$

Substitute eqn (3) in (1).

$$P(x) = \frac{\frac{A^x}{x!}}{\sum_{x=0}^{N} \frac{A^x}{x!}}$$

or

$$P(x) = \frac{\frac{A^x}{x!}}{\sum_{K=0}^{N} \frac{A^K}{K!}}$$

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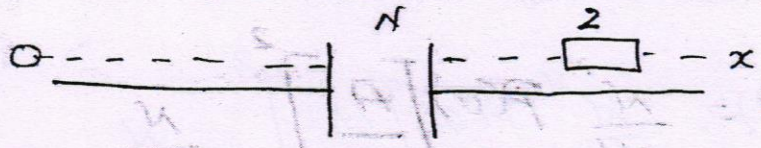
$$\therefore E_{1,N}(A) = \frac{\frac{A^N}{N!}}{\sum_{K=0}^{N} \frac{A^K}{K!}}$$

Pg No.

Delay formula :-



$x < N$ $x = N$ $x > N$

$x > N$.

Delay occurs if all servers are busy. when $x \geq N$ that there exists a z calls in the s/m. $z \geq N$.

It is represented by.

$$P(x \geq z) = \sum_{x=z}^{\infty} P(x) \quad -(1)$$

$$= \frac{N^N}{N!} \frac{A^x}{x!} \cdot$$

$$= \frac{N^N}{N!} P(0) \sum_{x=2}^{\infty} \left[\frac{A}{N}\right]^x$$

$$= \frac{N^N}{N!} P(0) \left[\frac{A^2}{N!}\right] \sum_{x=2}^{\infty} \left[\frac{A}{N}\right]^x$$

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Pg. No.

$$P(x \geq 2) = \frac{N^N}{N!} P(0) \left[\frac{A}{N}\right]^2 \sum_{K=0}^{\infty} \left[\frac{A}{N}\right]^K$$

$$P(x \geq 2) = \frac{N^N}{N!} P(0) \left[\frac{A}{N}\right]^2 \frac{N}{N-A} \quad \text{—} \quad .$$

$$P(x \geq 2) = \frac{N^N}{N!} P(0) \left[\frac{A}{N}\right]^2 \frac{N}{N-A} \quad \text{— (2)}$$

This gives the $x \geq 2$ to determ $x \geq N$. Replace 2 by N in eqn (2).

$$P(x \geq N) = \frac{N^N}{N!} P(0) \left[\frac{A}{N}\right]^N \frac{N}{N-A}$$

$$= P(0) \left[\frac{A}{N!}\right] \left[\frac{N}{N-A}\right]$$

$$B = P_D(x \geq N) = P(0) \frac{A}{N!} \left[\frac{N}{N-A}\right]$$

This is the delay formula

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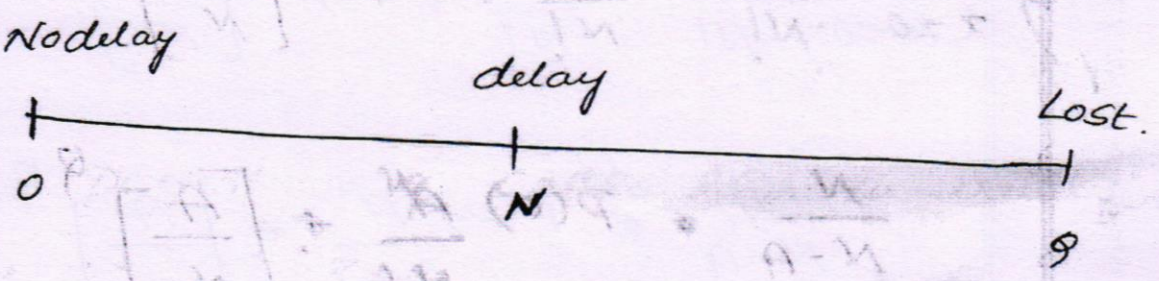
Pg No

2). Finite queue capacity :-

The S/m can not have the infinite queues thus the incoming calls arrives when it fully become busy then that calls arrived will be Last.



The queues of infinite should be $0 \leq x \leq N$.

It is given by.

$$\sum_{x=0}^{N-1} \frac{A^x}{x!} + \frac{A^x}{x!} P(0) \sum_{k=0}^{q} \frac{A^x}{x!} = \frac{1}{P(0)} \quad -(1).$$

where w.k.t $\sum_{k=0}^{N} a^N = \frac{1-[a/N]^{N+1}}{1-a/N}$.

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Pg No

$$\sum_{x=0}^{N-1} \frac{A^x}{x!} + \frac{A^x}{x!} P(0) \cdot \frac{\left[1 - \frac{A}{N}\right]^{q+1}}{1 + A/N}$$

$$\sum_{x=0}^{N-1} \frac{A^x}{x!} + \frac{A^x}{x!} P(0) \cdot \left[\frac{A}{N}\right]^{q+1}$$

$$\sum_{x=0}^{N-1} \frac{A^N}{N!} + \frac{A^N}{N!} P(0) \cdot \left[\frac{A}{N}\right]^{q}$$

$$\frac{N}{N-A} \cdot P(0) \frac{A^N}{N!} \cdot \left[\frac{A}{N}\right]^{q}$$

where $P_D(x \geq N) = P(0) \frac{A^N}{N!} \cdot \frac{N}{N-A}$

$$\therefore P(x > q+N) = \underbrace{P(0) \frac{A^N}{N!} \frac{N}{N-A}} \cdot \left[\frac{A}{N}\right]^{q}$$

$$P(x > q+N) = P_D \cdot \left[\frac{A}{N}\right]^{q}$$

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$$\therefore P(x > Q+N) = \left[\frac{A}{N}\right]^{Q} \cdot P_D$$

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This is finite queue capacity.

3). $A = \frac{400 \times 1}{3600}$

$= 0.11$

$A = 1/9$ Ans.

a) The percentage of calls have to wait for operator is 8 secs.

$T = A(C/h) = 1/9\,(400/30)$

$\bar{T} = 8$ secs.

b). The average delay is

$\bar{T} = (T \geq t) = 8 \times (1/9)$

$= 18.9\%$

$\bar{T} = 18.9\%$

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The percentage of calls are

Pg. No.

$\bar{T} = (T \geq 30) = 18.4 \times 0.01 \times 1/4.$

$\bar{T} = 8.3\%$

$N = 30.$

$K = 10$

$$q = \frac{2N}{K}$$

$$= \frac{2(30)}{10}$$

$$q = 6$$

The factors of 6 are

1, 2, 4, 6.

$$K = \sum_{i=0}^{q} r_i$$

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$$K = \overset{s}{r_1} + \overset{d}{r_2} + \overset{q}{r_3} + r_4$$

Pg. No.

$$N = \sum_{i=1}^{q} r_i \, q_i / f_i$$

$$= r_1 \frac{6}{1} + r_2 \frac{6}{2} + r_3 \frac{6}{3} + r_4$$

$$= 6r_1 + 3r_2 + 2r_3 + r_4$$

$$6s + 3d + 2q + t$$

$$6S + 3d + 2q = N \cdot 30$$

$$S + d + q = K \quad 10$$

$$5S + 2d + q = 20$$

$S = 1 \quad q = 1$

$$5 + 2d + q = 20$$

$$5 + 2d + 1 = 20$$

$$2d = 20 - 6$$

$$d = 14$$

$$\boxed{d = 7}$$

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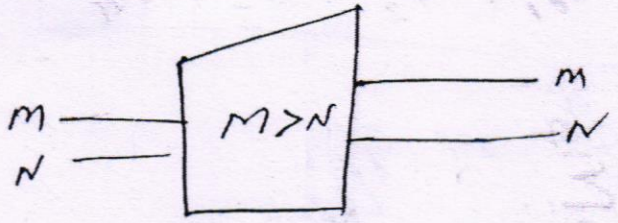
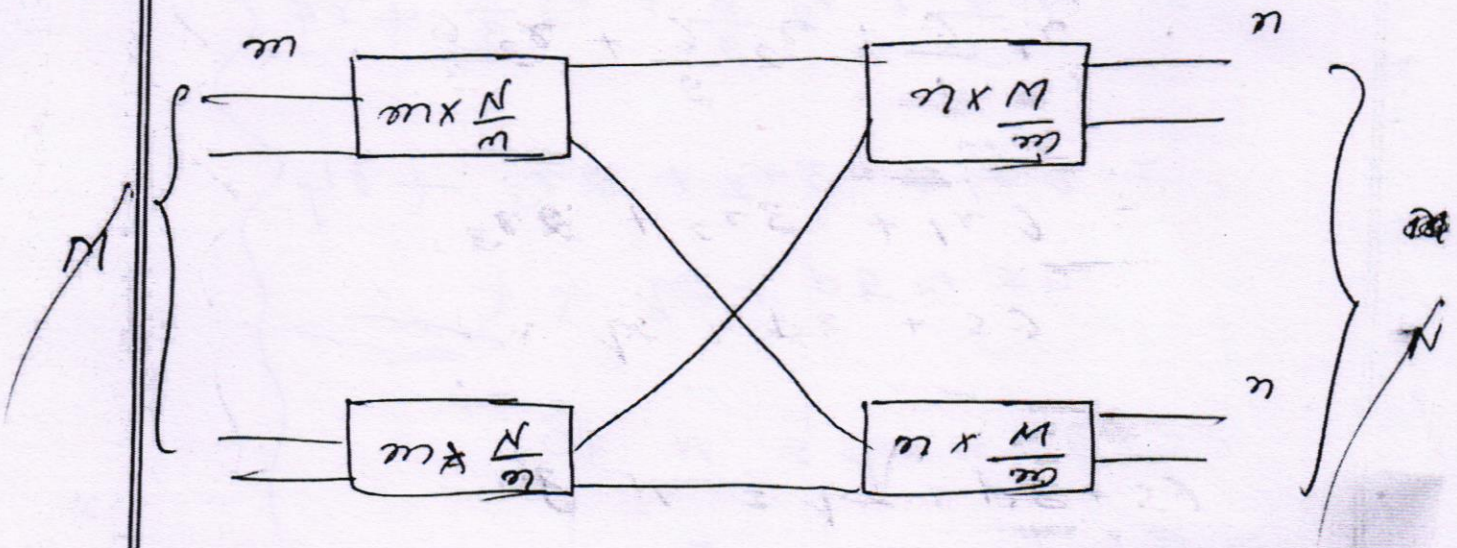
Pg No

4).





$q = \frac{M}{m}$ $\qquad$ $q = \frac{N}{n}$

M → It is incoming trunks of Prima stage

N → It is outgoing trunks of S.e

n → is the outlets of P.S

m → is the inlets of P.S.

The total no, of switches in P.S

$$q = \frac{M}{m}.$$

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The total no, of switches in S.S

$$q = \frac{N}{n}.$$

Pg No

Crospoints in P.S.

$$m \times \frac{N}{n}$$

Crosspoints in the secondary stage

$$n \times \frac{M}{m}.$$

Total no, of crospoints in primary stage

= Total no of Switch × Cross points in P.S

$$= \frac{M}{m} \times \frac{mN}{n}.$$

Total no, of crosspoints in secondary Switch

$$= \frac{N}{n} \times \frac{nM}{m}.$$

Total no, of links = No, of Switches in PS × No, of Switches in S.S

$$\frac{M}{m} \times \frac{N}{n}$$

$M > N$ //

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Total no. of crosspoints in 2 stage n/w is.

$$= \frac{M}{m} \times mN + \frac{N}{n} \quad \frac{nM}{m}$$

$$= MN\left[\frac{1}{n} + \frac{1}{m}\right] \quad \text{---} (1)$$

It is limited by. $\frac{MN}{m} = N$

$$n = \frac{M}{m}.$$

//.

It can be in order to limit by using continous variable & differentiating w.r.t m & equate to Zero.

$$\therefore \frac{dC_2}{dm} = \frac{d}{dm} MN\left[\frac{1}{n} + \frac{1}{m}\right]$$

$$\frac{dC_2}{dm} = MN\left[\frac{1}{M} + \frac{1}{m^2}\right].$$

$$\therefore \frac{1}{M} - \frac{1}{m^2} = 0$$

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where $m^2 = M$

$m = \sqrt{M}$

But w.k.t $n = \frac{M}{m}$

$\therefore m = n = \sqrt{m}$.

Substitute in eqn (1).

we get.

$$C_2 = MN \left[\frac{1}{\sqrt{M}} + \frac{1}{\sqrt{M}}\right]$$

$$\therefore \boxed{C_2 = 2\sqrt{M}.N}$$

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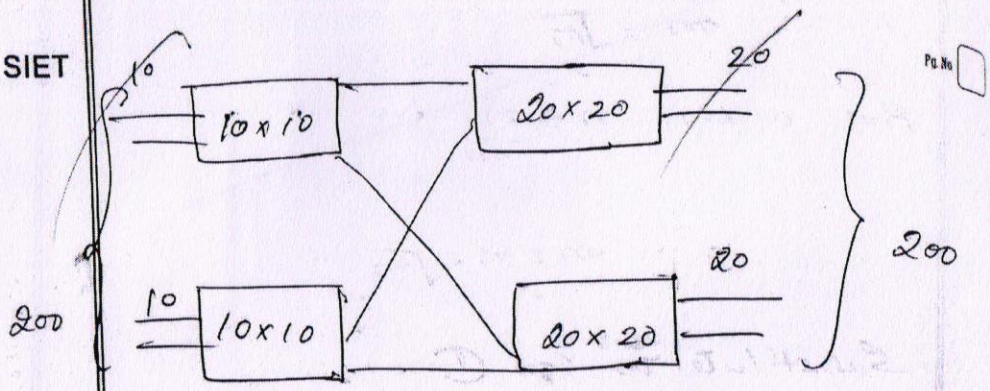
Pg. No.

Case (1) $N = 10$



$$q = \frac{200}{10} = 20 \qquad q = \frac{200}{20} = 10$$

$\therefore$

$$n = \sqrt{m} = \sqrt{200} = 14.46$$

$$C_2 = 2(N)^{3/2}$$

$$= 2(200)^{3/2}$$

$$= 5656.5 //$$

No. of links

$\therefore$ $20(10 \times 10) + 10(20 \times 20)$

$= 6000 //$

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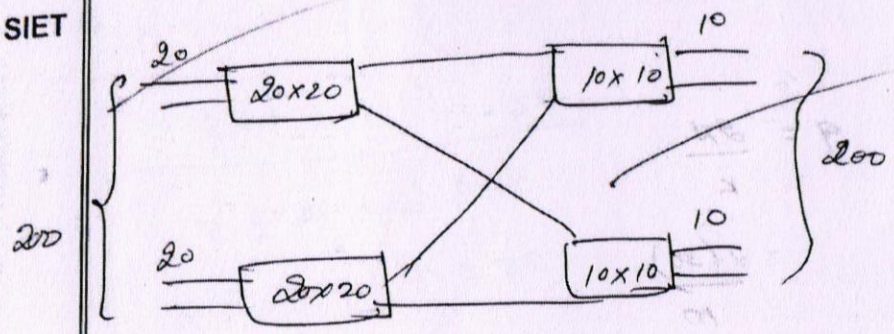
Pg No.

case (2) $N = (20)$.



$q = \frac{200}{20} = 10$ $\quad q = \frac{200}{10} = 20$.

No, of links.

$(20 \times 20)10 + 20(10 \times 10)$

$= 6000$ //.

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3). $q = \frac{2N}{K}$

$= \frac{2(30)}{10}$

$q = 6$

$K = r_1 + r_2 + r_3$.

$N = \sum_{i=1}^{q} r_i \frac{q_i}{f_i}$

$= 6r_1 + 3r_2 + q = 30$

$6s + 3d + q = 30$

$s + d + q = 10$

$5s + d = 20$

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$5 + d = 20$

$5 = 1$

$5 + d = 20$

$d = 20 - 5$

$d = 15$

14/20

16/11/18

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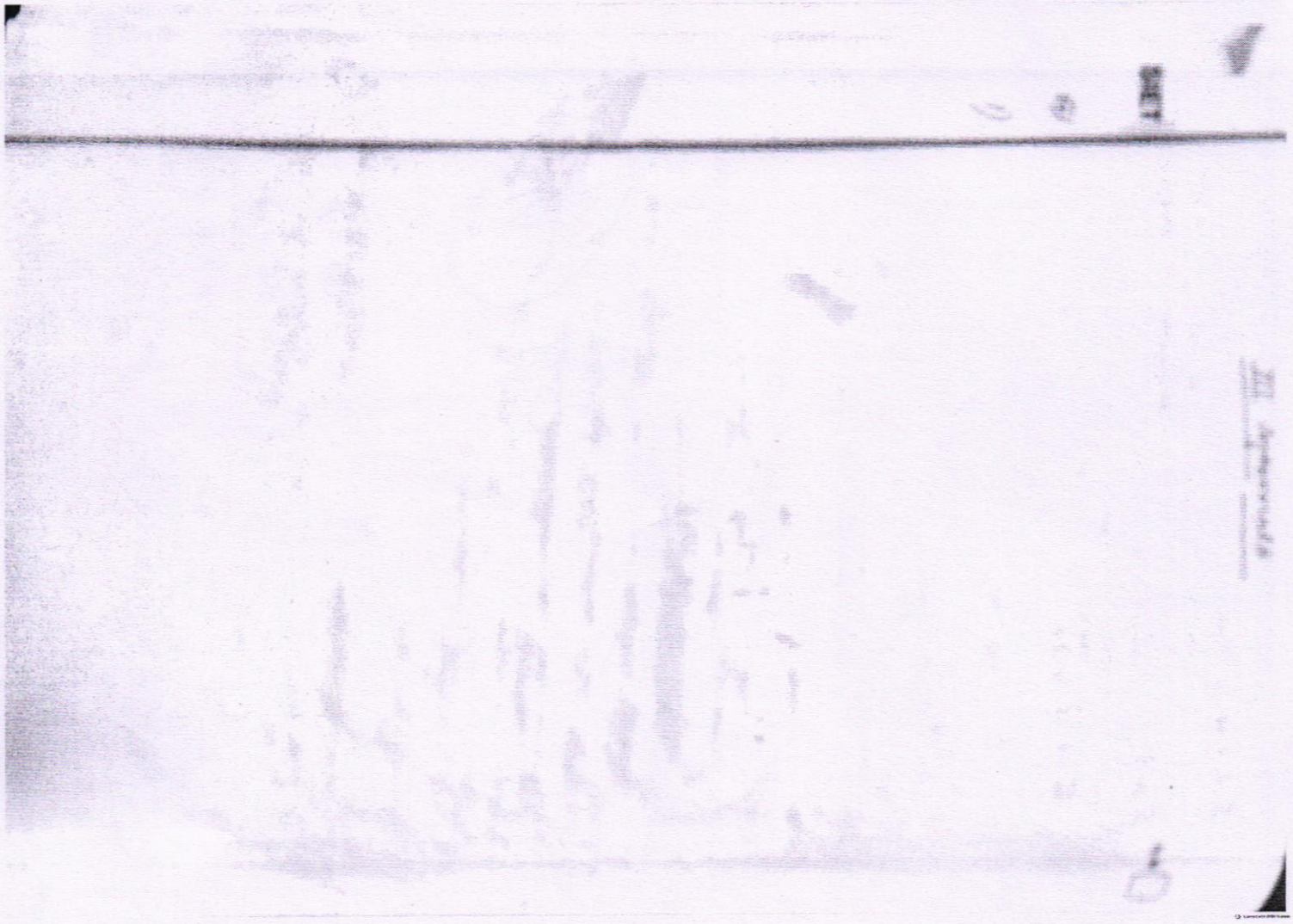

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1). Strategy for improving Software quality.

The Strategy for improving Software quality in digital Switching Systems is as Shown in the figure.

In the digital Switching System is good measurement which can not overemphasize in the areas of the Software process program.

A good example for an is bellcore's. The process quality measurement & field-quality for bell cores in Reliability and quality of the measurement Systems. These two measurement Systems are used in Extensively in the United States. It is now being used in Europe.

The measurement System is independent of any measurement but it depends on the Control of Software functions and the field failures.

It consists of It's improvement is based on the process, metrics & defect analysis and a Continous program Software process.

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Program for Software procas improvement :

In the most digital switching S/m the Pg.No
Continous Software procas improvement is Compl
The System can be formalized & base line
when it undergoes through Configuration mana
-ent S/m.

It Supports the billing System to switch
the calls.

It also supports maintainance System Subscri
records, administator record, office record.

The procas change does not improve the
Proass. The Continous procas only done.
This improves the Software quality.

Thresholds are the i/p's to the S/m. This a
fed to the program for Software procas i
-vement. This are tight together. The new
of thresholds are fed for the different pro
This feedback improves the Software quali
of the S/m.

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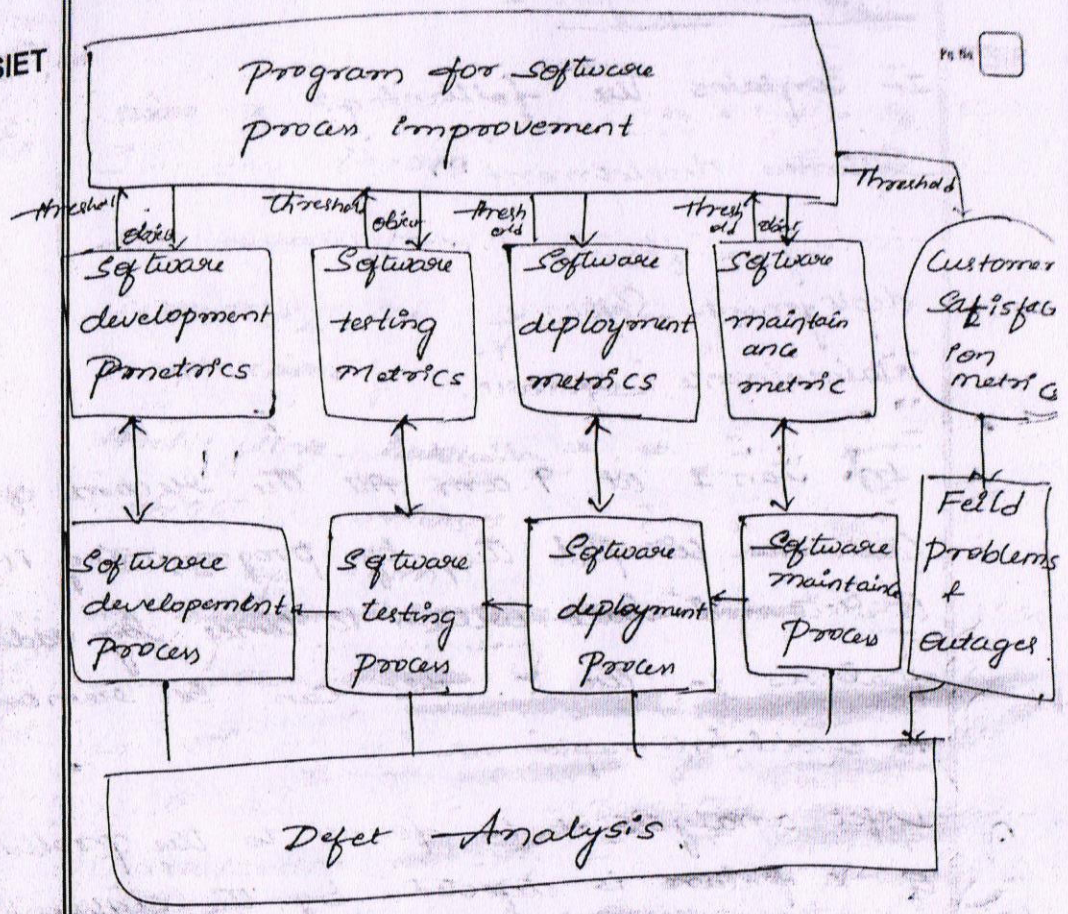

fig:- Strategy for improving software quality.

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Software analysis :-

It contains the following.

Software development process

testing Software process

deployment Software.

maintainance Software.

In Jan 1 at 9.am All the records of Call has corrupted then by programming it is recovered back. within 10 times by addi features to the x. this can be seen ove to avoid. interruption.

Defect analysis it is found to the proble of x feature is defected. by the different life cycles.

Design phase

test phase.

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3). Some of the common characteristics of digital Switching System are.

Dual Capability

Termination capacity

Traffic capacity.

Architecture - hardware

Architecture - Software.

Remote application

Advanced feature Support.

In the digital switching system in the North America it exhibits the some of the characterstis similar. These are pertain to different digital switching system.

* Dual capability :- The most digital switching System covered, class 5 - toll / with some capabilities of the class 4.

* Termination capacity :- The large digital System is terminate approximately

100,000 lines and 60,000 trunks.

Traffic capality :- In the distributed environment. The digital switching system goes as high as 2000000.

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Architecture - hardware :-

The Architecture in this system is quasi Architecture hardware.

The hardware architecture supports different applications in the system.

Architecture - Software :-

The Architecture Software contains the operating system i.e. modular operating system which operates on the Application.

It also supports in maintaining office record Subscribers record, Administrator record.

It also support billing system for switching calls,

Remote control Application :- It will support when the system is in the remote area of Remote allocation.

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Advance feature Support :-

The main digital switching system support advance features such as ISDN, CTP, SCP, AIN.

Hardware Architecture

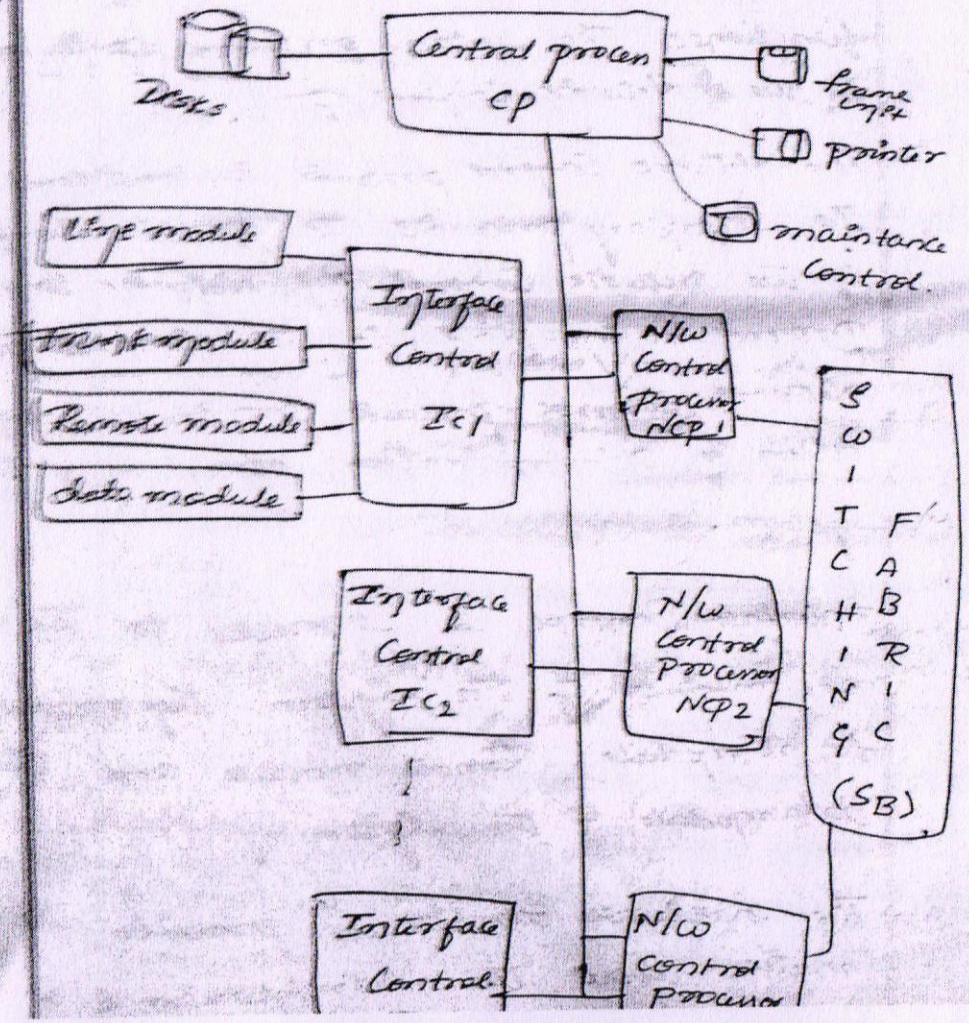

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figure shows the Hardware Architecture. It contains central processor, Switch fabric, Nlw Control processor, Interface Control.

In the digital Switching System central processor is consider as primary processor where the central processor cp performs all the administrative, control, operation functions. The central processor cp is interf. to the Network Control processor.

The Network Control processor is considered as the Secondary processors. It operates the func of the Network Control. The Network Control processor is interfaced to the central proc Network control processor provides the infor ation of administration, operation of the System.

Interface Control is connected to the dif nt modules of the System. Line module, trunk module, Remote module and the data module of the System.

The hardware Architecture provides the in mation about the Administrative operat of the sys.

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6.2)

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2).

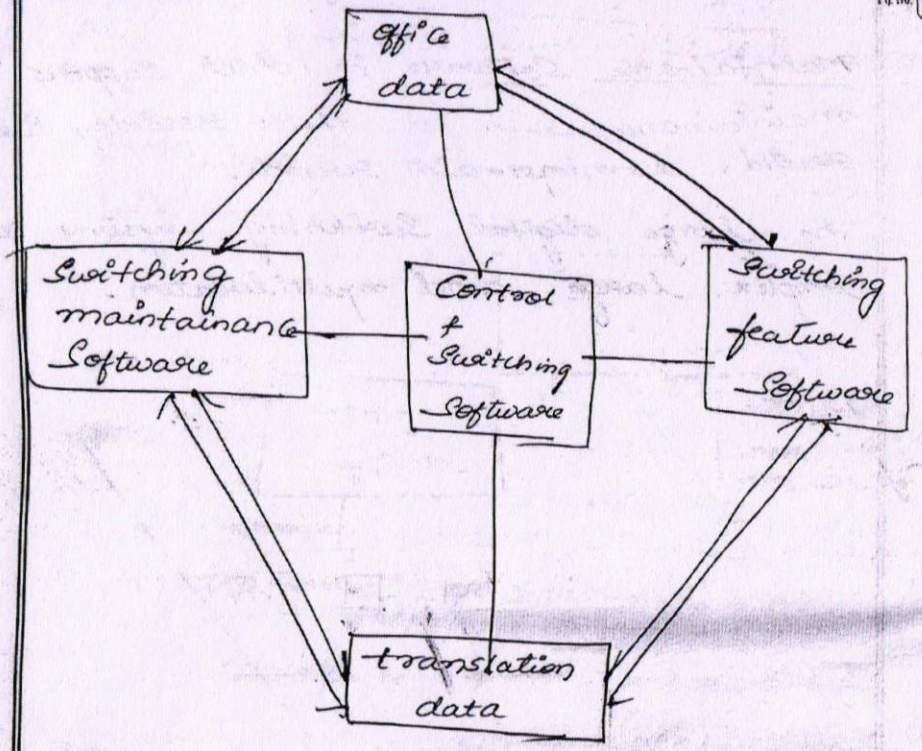

figure shows the classification of digital switch software.

The main classifications of switch software are :

Switching Software
maintainance Software
translation Software.
feature Software.

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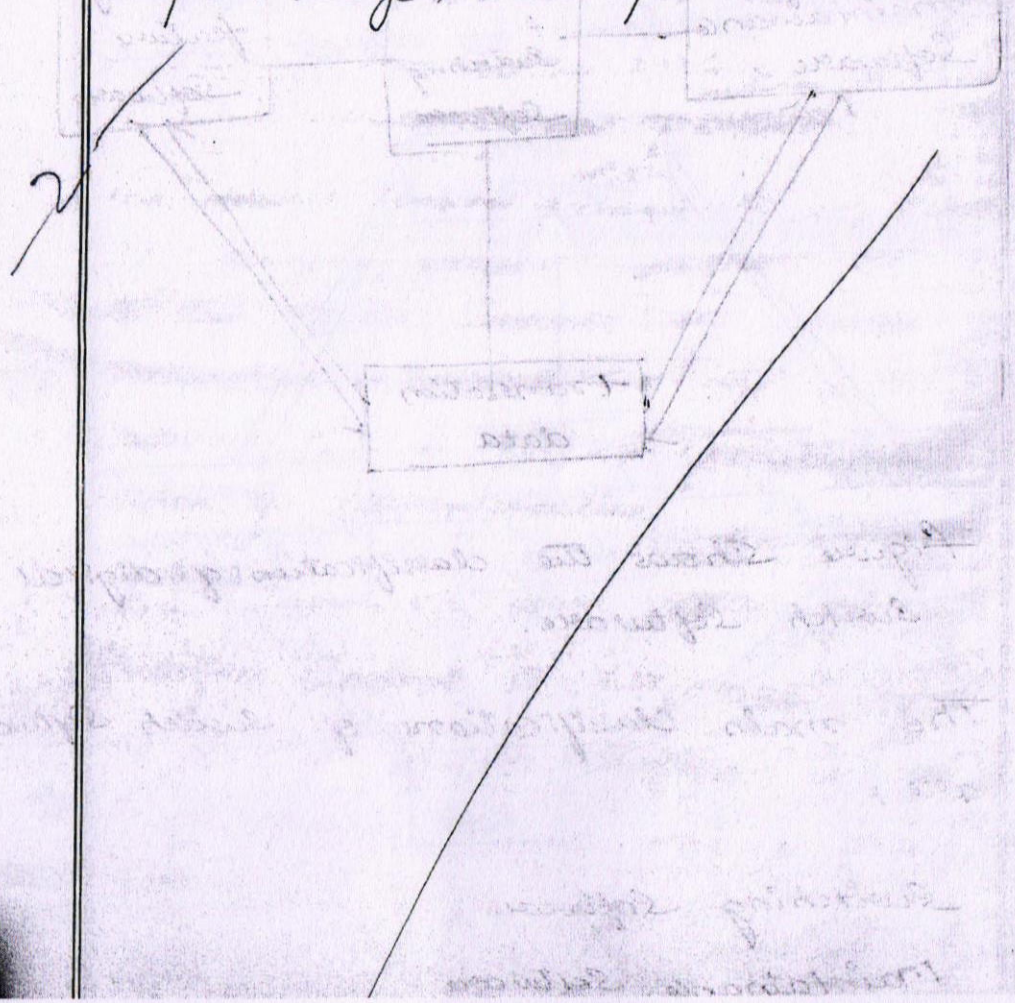
office data

Control Software.

Maintainance Software : which supports the maintainance such as office records, Subscriber record, administration records.

The large digital switching systems are complex, large, and multilocation.



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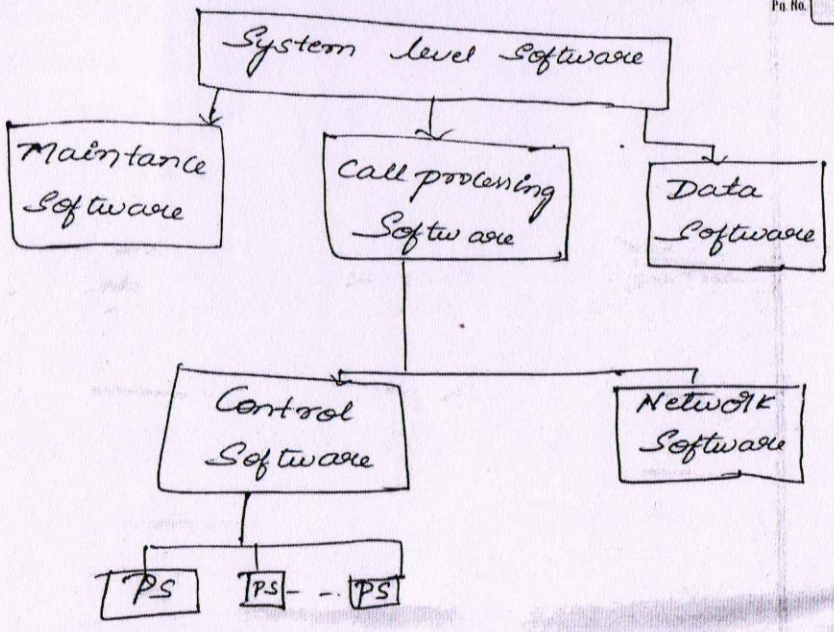

System level Software :- The digital switching Contains System level Software It Contains 3 types.

High level System Software.
low level System Software.
Medium level System Software.

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END

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