Name: Tusar Sarker
ID: IT-16015

Class Test-03

01.

(a) What is Trunk switch? —(2)

(b) Explain: —(6)

(i) Circuit switching
(ii) Message switching
(iii) Packet switching

(c) Describe technique of separating circuit. —(6)

02.

(a) What is access switch? —(2)

(b) How does a time-space-time switch work? —(6)

(c) Explain time-slot interchanger (ISI). —(6)

03.

(a) What is traffic offered? —(2)

(b) Describe traffic engineering trade offers. —(6)

(c) Explain types of blocking model. —(6)

04.

(a) What is poison traffic model? —(3)

(b) Differentiate time congestions and call congestion. —(7)

(c) Calculate probablity of blocking. —(4)

05.

(a) What are the failure of the poison model as valid for situations with high blocking. —(3)

(b) Explain Erlang B model. —(5)

(c) Explain B Birth - Death process. —(6)

06.

(a) Define Receiver. —(2)

(b) What is transmitter? Differentiate between early telephone system and todays telephone system. —(7)

(c) Show PSTN circuit model. —(5)

07.

(a) What is DTME signalling? —— (3)

(b) What are the procedures of establishing a call? —— (6)

(c) Describe pulse dialling. —— (5)

08.

(a) Define SRL. —— (2)

(b) Describe subscriber loop. —— (6)

(c) How do you determine the target resistance? —— (6)

Answer to the Question No-1(a)

Trunk switch: Trunk switch also called traffic switch. Trunk switch is defined as one-to-one connection which has one specific intel that is must connect to one specifit outlet.

Answer to the Question No-1(b)

(i) **Circuit switching:** *A path is established between the caller and destination.

* Real time connection formed
* Example : PSTN

(ii) **Message switching:**

* Also called store and forward
* A message is first stored in a buffer and then sent on in its entirely.

* No real time connection (i, e: connection-less)

(iii) Packet switching:

* A message is broken down into parts and each part is sent separate (possible via different routes)

*Example: Internet upp protocol

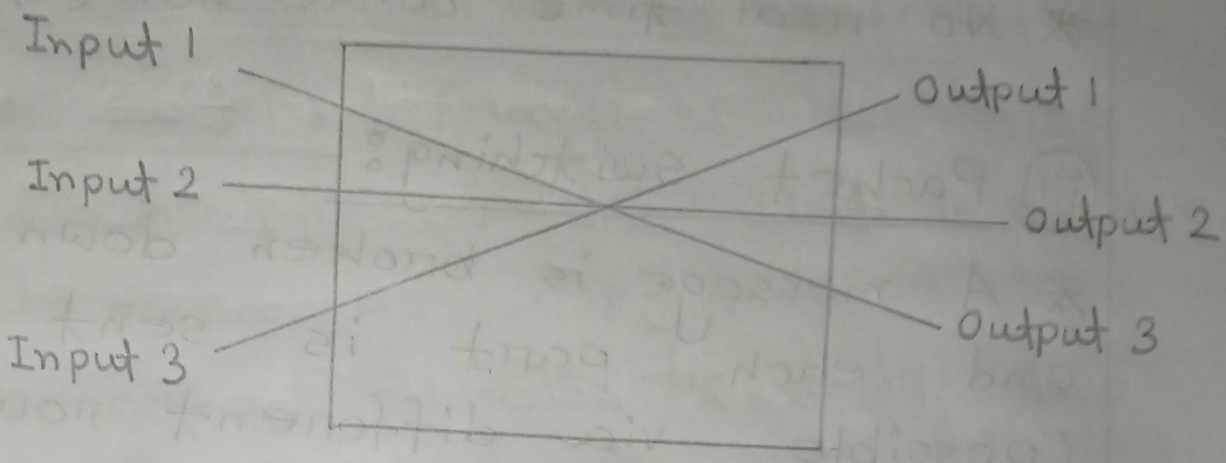
Answer to the question No - 1(c)

Separating circuit: For technologies for separating circuits.

(i) Space
(ii) RF Frequence
(iii) Time
(iv) Optical Wavelength

There is logically connects circuits coming in to a switch with circuits at the output.

*Example: "space division" equivalent inter connection pattern.



Answer to the Question No - 2(a)

Access switch is considered as one to one connection which has one specific inlet must connect to one free outlet.

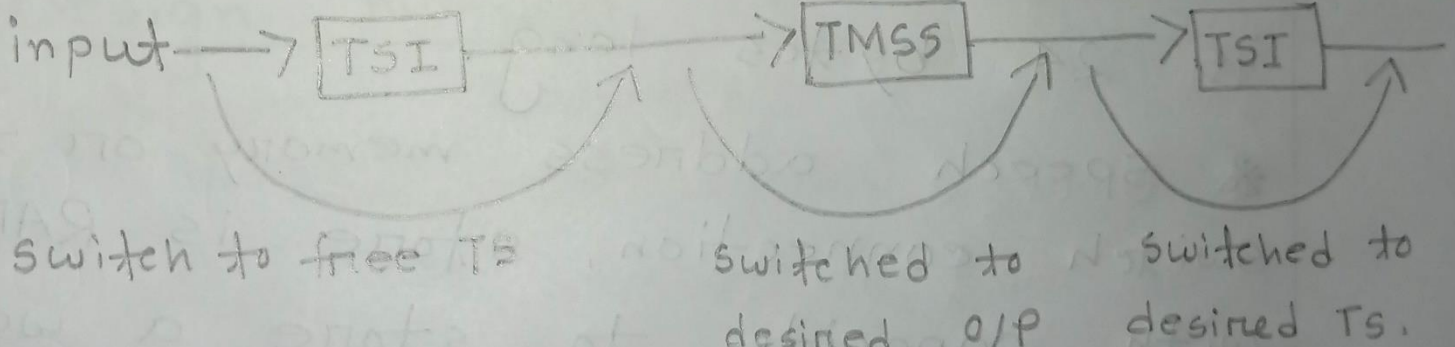
Answer to the Question No - 2(b)

Time - space - time switching working process:

* First, find a time slot that is free from the input TST to the and from the mess to the

output TST to connect to.

* Next, switch the input channels time slot in question to the free time slot.
* Then at the TNSS, connect the proper input line to the proper output line during free time slot.
* Finally, at the output lines TST, switch the free time slot to the time slot we wish to switch to.



Answer to the Question No-2(c)

Time slot interchanger:

* In a TSI, one time slot is switched to another.
* Performed through use of two memory stores.
* Speck store is RAM with to store one full frame of data.

For DSI (1544 Mbps) with 24 channels of 8 bits, the speech store is 24 bytes long.

* Speech address memory on time switch connection, store is RAM is with capacity to store a word for each time slot, each word being a number identifying a specific time slot.
* For DSI the SAM has capacity to store 24 words of 5 bits per word (need 5 bits to store a number between 1 and 24).

Answer to the Question No-3(a)

Offended traffic (OT) equivalent to traffic intensity (A). It takes into account all attempted call whether blocked or not and uses their expected holding times.

Answer to the Question No-3(b)

Traffic Engineering Trade offs:

Design number of transmission pathsor channels:

* How many regeirred normally
* What if there is an overload
* **Design switching and routing mechanisms:**
* How do we route efficiently?
* E.g
* High usage trunk groups
* Overflow drunk groups

* Where should traffic flows be combined.
* Design network topology
* Number and sizing of switching nodes and locations.
* Number and sizing of transmission systems and locations.
* Survivability

Answer to the Question No-3(c)

Blocked calls cleared (BCC):

* Blocked calls leave system and do not return.
* Good approximation for calls in first choice trunk group.

Blocked calls Held (BCH):

* Blocked calls remain in the system for the amount of time for.
* If a server feeds up, the call links up in the middle and continues.

* Not a good model of real world behaviour.
* Tries to approximate call attempts efforts.

Blocked Calls Wait (BCW):

* Blocked calls enter a queue until a server is available.
* When a server becomes available the calls holding time beging.

Answer to the Question No-4(a)

Poisson Traffic Model: Poisson approximation Binomial with large and small A/m

$$P_K = e^{-x} - \lambda^K$$

where λ = mean # of Busy sources

and possion = $\lim_{m \to \alpha}$ (Bionomial)

Answer to the Question No-4(b)

Time congestions vs call congestions:

Time Congestion:

* Proportion of time a system is congested (all servers busy)
* Probablity of blocking from point of views of servers.

Call congestion:

* Probablity that an arriving call is blocked.
* Probablity of blocking from point of view of calls.

For call, $P(B) = A\ p(K>N)$

↑ Probablity that there are more service than there are servers.

For time,

$P(B) = P(K \geq N)$

↑ Probablity that all servers are busy.

Answer to the Question No - 4(c)

Probablity of blocking:

$$P(B) = P(K \geq N) = P(N) + P(N+1) + \cdots + P(\infty)$$

$$= \sum_{K=N}^{\infty} \frac{e^{-A} \cdot A^K}{K!} = \sum_{K=N}^{\infty} \frac{K^K}{K!} e^{-A}$$

[where $P(K) = \frac{e^{-A} \cdot A^K}{K!}$]

$$= 1 - \sum_{K=0}^{N-1} \frac{A^K}{K!} e^{-A}$$

$P(B) = P(N, A)$ ← offered traffic

↙ poisson

$N = \#$ servers

Example, $P(7, 10)$

↑

possion $P(B)$ with 10E offered to 7 servers

Answer to the Question No-5(a)

Failure of the poisson model:

(i) Poisson only good approximation, when low blocking.

(ii) Use Erlang B if high blocking

Above are the failure of poisson modelas valid for situations with high blocking.

Answer to the Question No-5(b)

Erlang B model:

* More sophisticated model than Binomial or poisson.
* Blocked calls cleared (BCC)
* Good for calls that can reroute to at-terminaroute if blocked.
* No approximation for reattempts if alternate route blocked too.
* Derived using birth-death process.

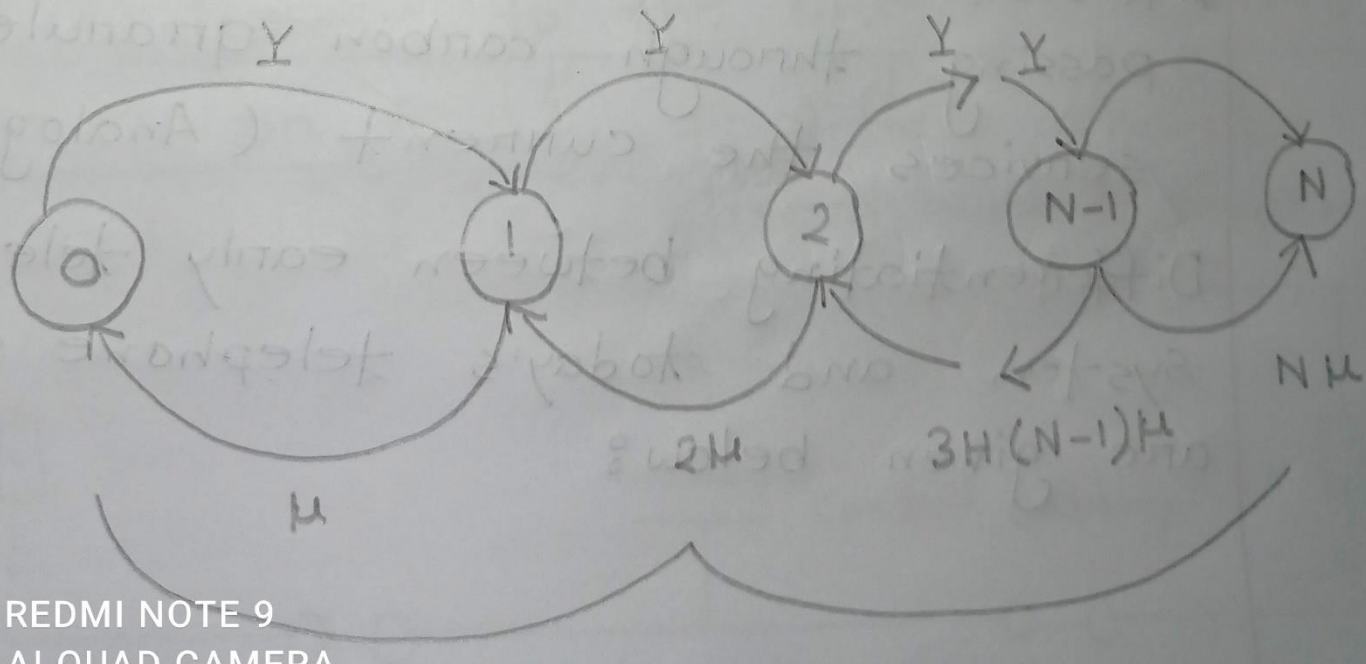
Answer to the Question No-5(c)

Erlang B Birth-Death process:

* Consider infinitesimally small time. It during which only one arrival or departure (or none) may occur.
* Let Y be the arrival rate from an infinite pool of sources.
* Let $\mu = 1/h$ be the departure ~~hr~~ rate per call.

→ if K calls in system, departure rate is $K.\mu$

* Steady State Diagram:



Answer to the Question No-6(a)

Receiver: Varifying electrical current passing through windings on magnet, moves a diaphragm, such as in a misic Loudspeaker.

Answer to the Question No-6(b)

Transmitter: (Carbon Granade Micro-phone)

* Air pressure of sound waves impact on diaphragm varying pressure on carbon granules.
* Resistance of electrical current passing through carbon granule services the current (Analog).

Differentiating between early telephone system and today's telephone system are given below:

* Early telephone system:

→ Powered by self contained local battery

→ Ringing created by cranking generator

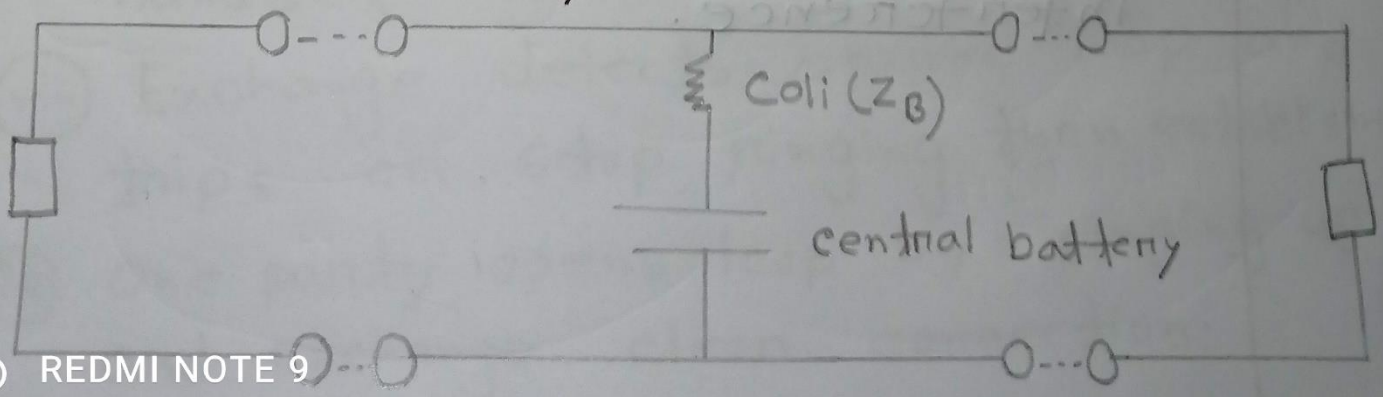
* Today's Telephone System:

→ Powered through the line by battery at the central office (-48V)

→ Circuit is closed when handset is lifted from the cradle.

Answer to the Question No-6(c)

PSTN or POTS: Simplified circuit model of any speech current connection.



cc The coil is a transmission bridge coil with a high impedance (Z_B) preventing out the speech current from shorting out at the central battery.

Answer to the Question No-7(a)

DTMF signalling:

* Faster than pulse dialling (1-2 seconds for ten digit numbers)

→ reduces call set up time

* Each digit produced by combination of 2 pure frequency tones.

→ Reduces changes of error or interference.

Answer to the Question No-7(b)

Establishing a call:

(i) Calling customer takes phone of hook which closes the circuit to the C.O

(ii) C.O detects the loop and indicates readiness with dial tone.

(iii) Calling Customers hears dial tone and dials number.

(iv) The network checks on the called party status and decides on a routing for the combination.

(v) If connecting possible the called party is alerted.

(vi) Ringtone is returned to the caller.

(vii) The called party picks up the handset and closes his/her loop.

(viii) Exchange delects second loop and trips or stop ringing then establishes

(ix) One party opens loop by hanging up and exchange clear connection.

Answer to the Question No-7(c)

Pulse Dialing:

* Line is rapidly disconnected and reconnected in sequence with one pulse for digit value "1", two pulses for digit value "2"
* Each pulse lasts 0.1 second
* Inter-digit pause (IDP) must be > 0.5 second.
* → It not current digit may combine with previous digit.
* Ten digit phone number typically takes 6-15 seconds total.
* This is the kind of signalling old "rotary dail" phones produced.

Answer to the Question No-8(a)

SRL defines as singing return loss which has minimum attenuation to reflected power at any frequency coming back from the 2w-1w interface.

Answer to the Question No-8(b)

Subscriber loop:

(i) Wire network from the central office to the station sets.

(ii) Longest portion of capital capabilities (50%) and workforce requirements (30%-40%)

(iii) Prime candidate for replacement by optical fibre but costs often prohibitive.

(iv) Main goal is to desing and work with length limits.

(v) Limited by resistance and attencation long line.

Answer to the Question No-8(c)

Target resistance determination:

(i) We need a high enough current at the customer premises to operate the station set (20mA minimum in North America)

(ii) Use $V = IR$, with a know battery voltage of $48V > 20mA \times R \rightarrow R \leq 2400\Omega$ total

(iii) Budget $\approx 400\Omega$ for the battery feed bridge at the CO.

(iv) Budget $\approx 300\Omega$ for other ~~os~~ miscelloneous wire resistance (e.g subset wiring etc)

(v) The subscriber loops wire resistance must not exceed 1700Ω.