Class Test - 02

① ⓐ Write the difference between in-channel signaling and common channel signaling? — 4

ⓑ What is PBX? Write briefly about its parts? — 4

ⓒ How does signaling Techniques enable? Describe about subscriber, loop, interexchange signaling and Intraexchange signaling? — 6

② ⓐ what is OSS and BSS architecture? — 4

ⓑ what is switching? Describe the importance of switching and some mathematical concepts about it? — 6

ⓒ what is telecommunication? write some of advantages that future holds? — 4

③ ⓐ Define briefly about the following topics: — 8

(i) AMPS (ii) FDMA (iii) Digital AMPS (iv) GSM (v) CDMA

ⓑ Write about 3G and its advantages? — 6

④

(a) What is C/I ratio and Fading? Describe briefly. — (6)

(b) What is Path loss of a cellular systems? — (4)

(c) What is wireless pre-cellular Systems? — (4)

⑤

(a) Write about Registration and its classification? — (5)

(b) What is Roaming and tell briefly about MSC and cellular structure? — (4)

(c) what is fading systems of a cellular systems? — (5)

⑥

(a) How many basic topologies are used in the process of interconnecting exchange of telephone network? — (6)

(b) What is PSTN? Describe the mejor systems of any telecommunication network? — (4)

(c) What is subscriber loop systems? How it works. — (

(7)

(a) What is transmission plan? Writs about it? — (6)

(b) Drow the echo as reflected signal and drow the diagram of Attenuation vs echo delay. — (6)

(c) ~~Do~~. Write down the basic three categories of transmission system? — (2)

(8)

(a) How a netinal number consists of? Describe this — (4)

(b) What do you mean about the typen of numbering? — (6)

(c) How many categories used to place Radio communication for long distance? — (4)

Ans to the Question no - 01 (a)

The difference between In-channel signaling and common channel signaling is given below:-

In channel signaling	common channel signaling
(I) Trunks are held up during signaling.	(I) Trunks are not required for signaling.
(II) Interference between Voice and control signals may occur	(II) No interference since the voice and control channel are separate.
(III) Separate signalling equipment is required in each trunk hence expensive	(III) Only one set of signalling equipment is required for a large group of trunk circuits hence economical.
(IV) Can be misused by customers since it is easy to mimic voice signalling.	(IV) Control channel is in-accessible to users.
(V) Signaling is relatively slow.	(V) Signaling is much faster.
(VI) It is difficult to change signals or add new signals.	(VII) There is flexibility to add new signals or change existings signals.

Ans to the Question no – 01 (b)

PBX: PBX stands for Private Branch Exchange. Private Branch Exchange is a telephone system within a local area that switches calls between those users on local liner while allowing all users to share a certain number of external phone line. The main purpose of PBX is to save the cost of requirement for a line to each each user to the central exchange office.

The parts of PBX is given below:

(I) A telephone trunk that contains many phone liner, which are terminated at PBX.

(II) A computer that handles the incoming and outgoing calls of PBX along with switching betteween different calls within the local loop.

(III) The networks of liner within the PBX.

(VI) A haman operator console, which is optional.

Ans the Question no-01 (c)

signaling techniqeues enable the circuit to function as a whole by inter connecting all varieties of switching systems. There are three forms of signaling involved in a telecommunication network. There are:

① Subscriber loop signaling:

The subscriber loop signaling depends upon the type of telephone instrument used.

② Intra-exchange signaling:

The intra exchange signaling refers to the internal portion of a switching system that is heavily dependent upon the type and design of a switching system, which varies depending upon the model.

③ Inter-exchange signaling:

The inter exchange signaling takes place between exchanges. This helps in the exchange of address digit, which pass from exchange to exchange on a link by link basis.

Ans to the Question no-02(a)

OSS: OSS stands for Operational Support Systems. It is a term used by operators to manage their communication networks. Originally known as Telecommunication Network Management tools, these solutions are now so much more sophisticated. They allow an organisation to coordinate customers, services, resources, processes and activities. They assist operators to design, build, operate and maintain communications networks.

BSS: BSS stands for Bussiness support system, BSS is the term traditionally used to describe the business or customer-facing functionality. These tool allow an organisation to connect with their customers, create offers for them, issue customers will bill as well as cross-carrier transaction.

Ans to the Question no-02(b)

Switching: Switching is process to forward packets coming in from one port to a port leading towards the destination. when data comes on a port it is called ingress, and when data goes out one port then it is called egress.

Importance of switching:

(I) If there are no switching machine, each phone would have to be directly connected to all others.

(II) It helps to circuit from many essential work that in very useful for switch / system.

(III) It helps to carry information one place to another without any problem.

Approximately 250 million phones.

Fully connected: $\frac{n(n-1)}{2} \approx \frac{250000000^2}{2} \approx 3 \times 10^{16}$ pairs.

Average wire pair cross-section $= \pi r^2 = \pi (2mm)^2$

$= 12.5\ mm^2 = 12.5 \times 10^{-12}\ km^2$

Assume average connection is 2000 km long:

Therefore volume of wiring $= 3 \times 10^{16}$ pairs $\times 2000\ km \times 12.5 \times 10^{-12}$

$= 750$ million km^3

$\therefore$ Depth of wiring $= \frac{750\ \text{million}\ km^3}{12.5\ \text{million}\ km^2} = 60\ km.$

So deep is 60 km.

Ans to the Question no-02(c)

Telecommunication: "tele" - Greek for distant. And "communicatio" - Italian for connection.
So Telecommunication is distant connection or transfer of meaningful information ~~one~~ from one location to another.

Some of advantages that ~~hol~~ future hold:

(I) Expansion to the developing world -
- opportunities to build "green fields" network design.
- Short cut to the latest technology.
- Huge role for fixed wireless and satelite.

(II) Machine to Machine Communication -
- more machines than humans.
- Can exchange data more quickly.
- pervasive computing
- Seamless human - machine interfaces, wearable Computers

(III) "Convergence" of -
- Telephone, TV, Movies, Telemetry, Monitoring, Internet.

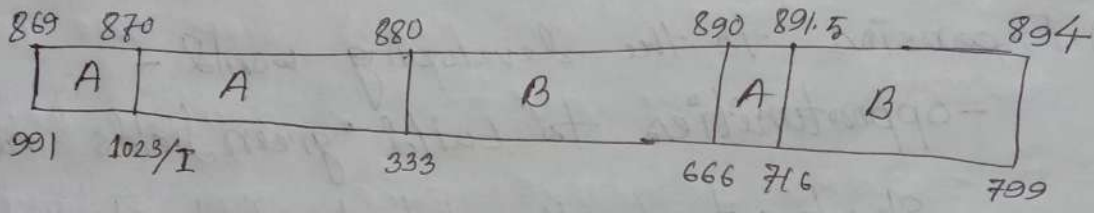
(IV) "Future Applications" - Virtual reality, 3D holography, tele-presense, web agent, robots, weather prediction.

Ans to the Question no-03(a)

① **AMPS:**

(i) Advanced mobile phone system (First generation system)
- still used in Alberta and across North America.
- Analog system (FM). Developed in 1977, introduced in 1983

(ii) FDMA system as 'pairs' of frequencies assigned. Each pair of frequencies is dedicated to a call in each cell.



- Block A: non-wireline companies
- Block B: Wireline.

- FDD: Uplink frequencies are the same, but 45 MHz lower for the same channel.

② **Digital AMPS:**

(i) Digital system in AMPS bands.
(ii) the first digit to arrive here
(iii) intended in to backwards compatible with AMPS.
(iv) FDD and same frequencies band as AMPS
(v) In this manner, the MSC and many components of the BS are the same.
(vi) TDMA method - each frequency channel is divided into 3 time channels.

③ GSM:

(i) Originally, Groupe ~~Social~~ special mobile, until 1992. Then Global system for mobile Communication.

(ii) European digital standard, later brought to Canada by Microcell and later, Rogers.

(iii) In Europe, usually used in 800/900 MHz band.

(iv) TDMA system, that hopes from one frequency channel to the next to avoid being in a frequency selective fade for a long period of time.

(v) Digital (GMSK, ~ 3.69 μS symbol duration).

④ CDMA:

(i) A 2-2.5 generation standard.

(ii) A mobile is assigned a channel code.

(iii) - transmission occurs at the same time and over the same frequency band.

(iii) Bandwidth of channel is 1.25 MHz in PCS band.

(iv) FDD system.

(v) uses fast power control on uplink.

Ans to the Question no-03(b)

3G mobile networks:

(I) 3G technology allows for advanced technology, multimedia services and larger network capacity.

(II) It helps a wider variety of cell phones to operate on the network.

(III) It allows a wider spectrum which helps in faster data transmission.

(IV) The carriers can deliver 3G at a reduced cost compared to 2G.

Advantages:

(I) 3G Technology allows location based services such as the weather reports on the mobile.

(II) It is cheaper for the providers.

(III) The plans are more expansive due to the high cost of implementation of 3G networks.

(IV) 3G enables video calls, business conferencing between cities, states and even countries.

(V) The picture messaging allows this generation.

(VI) It helps people to access music, pictures and videos.

Ans to the Question no- 04(a)

C/I ratio:

① The carrier to interference ratio, C/I, of the signal of the mobile from the transmitter in a given cell, can be found in an approximate manner by summation of interference from all base stations using the same frequency. Usually expressed in dB.

$$\frac{C}{I} = \frac{R^{-n}}{\sum_{i=1}^{m} D_i^{-n}}$$

② If we assume all base stations are identically spaced, and are at the centres of their cells, we have the C/I approximation of:

- m is the number of interference base in the first tier (this is always $m = 6$ for hexagonal cells with the standard patterns $k = 3, 4, 7, 12, 19 -)$

$$\frac{C}{I} = \frac{(\sqrt{3}k)^n}{m}$$

Fading:

During transmission from the base station to the mobile, the received power fluctuates. We can generalize the factors that affect the received power level into 3 main groups.

① Path loss (does not change in time)
- change only with distance from transmitter.
- there are also losses associated with the frequency of transmission, size/height of transmit/receive antenna

② Long term fading or shadowing:
- caused by buildings or tunnels. "shadowing" transmission from BS
- changes with mobile position

③ Short term fading
- due to multiples paths of transmission arriving at the mobile at the same time.
- If there are other paths that arrives with some delay. It is called multipath fading.

Ans to the Question no-04(b)

Path loss:

→ Power radiates from the transmitter all antenna in a spherical manner

- the power at d metres away from the transmitter is given in reference to the power P_0, some d_0 metres away.

$$\frac{P_d}{P_0} = \frac{4\pi d_0^2}{4\pi d^2}, \quad P_d = P_0\left(\frac{d}{d_0}\right)^{-2}.$$

→ In general, and terrain characteristics can result in a different power law for the previous equation. We generalize the power law by the coefficient n, where n usually ranges from 2 to 4.

$$P_d = P_0\left(\frac{d}{d_0}\right)^{-n}, \text{ or in dBm, } P_d(\text{dBm}) = P_0(\text{dBm}) - 10n\log\left(\frac{d}{d_0}\right)$$

Ans to the Question no-4(c)

Wireless pre-cellular systems:

→ Wireless transmission was originally shown as a method to remain continous contact with ships.

→ In 1946, FM consumer mobile phone systems were

introduced.

- A group of frequency allocated to a large geographic zone
- when moving to a new zone, calls had to be reinitiate
- 120 KHz per channel due to poor filter technology.
- Half-duplex system
- most users not connected to PSTN.
- Later progressed to GMTS.

→ By the 1960's. IMTS (Improved mobile Telephone system)

- 30kHz channels in the 450 MHz range.
- only 12 channels in NYC in 1976
  - poor service due to call blocking and useage over a few channels.
- still in use in the U.S in 1995.

Ans to the Question no-05(a)

Registration: Registration is the process of notifying the network that a phone is active on the system.

- when a phone is switched on, it registers by signalling to the MSC via the base station on a step-up or control channel.

→ Periodic registration is when the phone announce itself on a regular basis.

→ Forced registration is when the phone monitors a control channel which provides information including the cell identification

- If the channel strength fades below a threshold, the phone selects another channel.
- If the new channel has a new cell ID, then the phone registers.

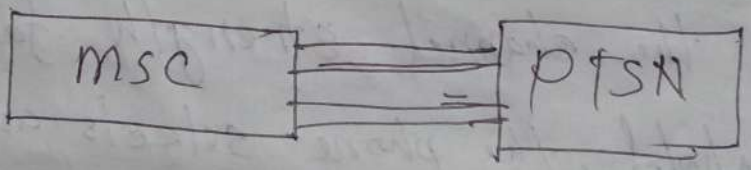
Ans to the Question no- 05(b)

Roaming: Roaming is when a phone in outside its home area or local region.

- If the phone register outside its home area, the MSC contacts the phone's home area and confirms that the phone is ok.
- MSC then notifies home area of the phones current location and provides instructions for routing incoming calls to the phone.

Cellular structure:

→ MSC – Mobile switching centre (also called MTSO - mobile telephone switching office)
→ PSTN – Public switched telephone network.



Ans to the Question no-05(e)

Fading: During transmission from the base station to the mobile, the received power fluctates, we can generalize the faefors that affeef the received power level into 3 main groups.

① Path loss (does not change in time)
- changes only with distance from transmitter
- there are also losses associated with the frequency of transmission, size/height of transmit/receive anteena etc.

② Long-term fading or shadowing
- caused by buildings or tunnels 'shadowing" transmission from BS
- changes with mobile position (log-normal distribution)

③ Short term fading (or small scale fading):
- due to multiple paths of transmission (reflections) arriving at the mobile at the same time (flat-fading)
- If there are other paths that arrive with some delay, it is called multi path fading.

Ans to the Question no – 06(a)

In the process of interconnecting exchanges, there are three basic topologies, such as,

① Mesh Topology: Mesh topology, as the name implies, is a fully connected network. The number of trunk groups in a mesh network is porportional to the square of the exchanges being interconnected. Hense, these mesh topologies are widely used in metropolitian areas where there is heavy traffic.

② Star topology: Star topology is connected in the shape of a star, which utilizes an intermediate exchange called a tandem exchange which all exchanges communicate. The star network is used when traffic levels are comparatively low. Many star networks can be used by interconnecting through additional exchange.

Hierarchical: The Hierarchical topology is used to handle heavy traffic with minimal number of trunk groups. The traffic flows through the final route which is the highest level of hierarchy. If the traffic intensity between any pair of exchanges in high, direct trunk routes may be established between them as indicated by dashed lines.

Ans to the Question no – 06(b)

Public switched Telephone Network (PSTN):

PSTN is understood as an aggregante of world's circuit switched telephone networks, used for providing public communication. The PSTN networks are called POTS (Plain old Telephone systems). These networks are operated regionally, locally, nationally and internationally using telephone liner, fiber optic cables, microwave transmission links or cellular communication.

The mejor system of any telecommunication network is given below:

(I) Subscriber end instruments or equipments.

(II) Subscriber loop System.

(III) Switching System.

(IV) Transsmission systems.

(V) Signaling systems.

Ans to the Question no-06(c)

Subscriber loop systems:

In general telephone network, every subscriber has two dedicated liner connecting to the nearest switching exchanger, which are called the loop liner of that subscriber. The laying of liner to the subscriber premises from the exchang office is called cabling. As it is difficult to run cables from each subscriber is premises to the exchange, large cables are used to through which the loop wires are taken to distribution point.

The drop wires are connected to wire pairs distribution point, in the cables. Such distribution cables from nearby geographical area are connected at a same feeder cables which in turn, are connected to the main feeder cable. the subscriber cable pairs from the exchange will also terminate at MDF through main feeder cables that carry large number of wire pairs. There subscriber pairs and exchange pairs are interconnected at the MDF using jumpers.

Ans to the Question no-07(a)

Transmission Plan:

For reasons of transmission quality and efficiency of operation of signaling, it is desirable to limit the number of circuits connected in tandem. In tandem chain, the apportionment of links between national and international circuit is necessary to ensure quality telecommunication. CCITT lays down certain guidelines in this regard in its recommendation

(I) The maximum number of circuits to be used in an international is call 12.

(II) No more than four transmission international circuits can be used in tandem between the originating and the terminating international switching centres.

Transmission loss budget should provide for two factors other than the line and switches losses:

(I) keeping echo levels within limits.

(II) Control sining.

Ans to the Question no-07(b)

The figure of echo as reflected signal and the Attenuation vs echo delay is given below:

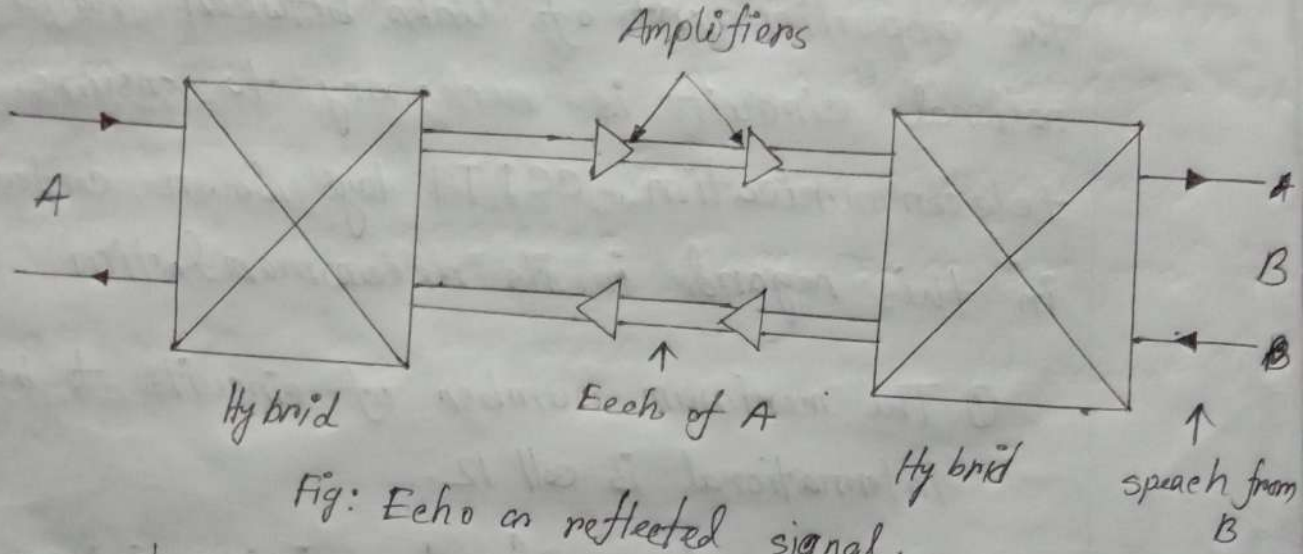


Fig: Echo as reflected signal.

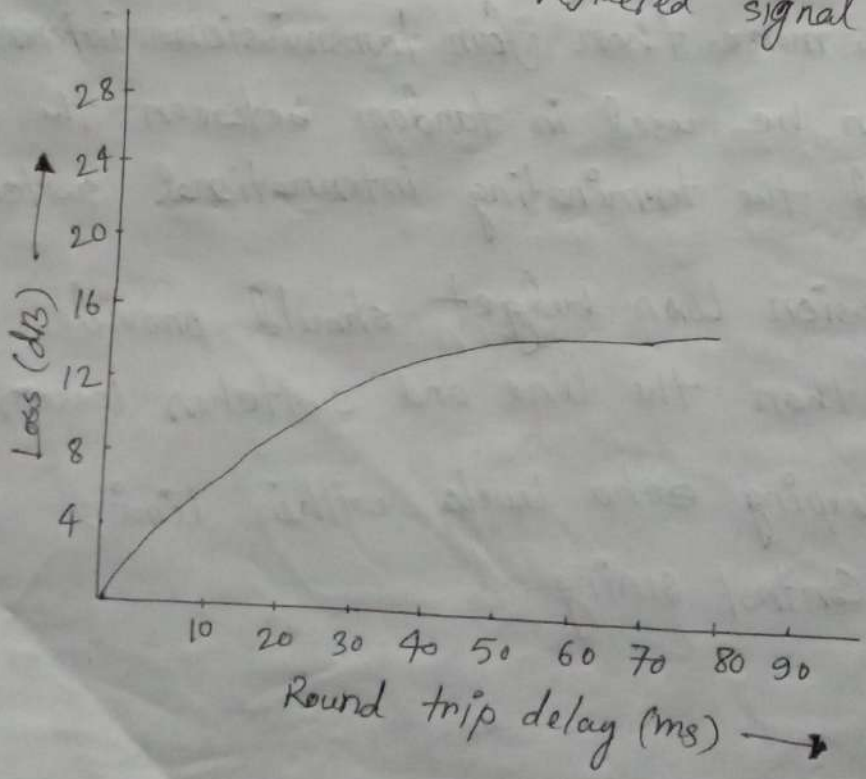


Fig: Attenuation vs echo delay.

Ans to the Question no-07(c)

There are three types of transmission systems:

(i) Radio systems.

(ii) Coaxial cable systems.

(iii) Optical fibre systems.

Ans to the Question no-08(a)

A national number consist of three parts. these are below:

(i) The Area Code or the trunk Code:

This code identifies a particular area or multiexchang area of the called subscriber. It is with this code, the routing for a trunk call is determined and charged for it.

(ii) Echange Code:

This code identifies a particular exchange within a numbering area. It determines the routing for incoming trunk call from onother numbering area or for a call originating from one exchange and described to another in the same numbering area.

(iii) Subscriber Line Number:

It is used to select the called subscriber line at the terminating exchange. The combination of the exchange code and the subscriber line number is called the Subscriber Line number in CCITT terminology.

Ans to the Question no-08(b)

Types of Numbering plan:

The numbering plans are described briefly in below:

(I) Open numbering plan: This is also called the Non-Uniform Numbering plan and it permits wide variation in the number of digits to be used to identify a subscriber within a multi-exchanges area or within a country.

(II) Semi Open numbering Plan: This plan permits number lengths to differ by almost one or two digits. The semi open numbering plan is commonly used in countries such as India, Sweden, Belgium, Switzerland and UK.

(III) Closed Numbering Plan: This is also called Uniform Numbering Plan where the number of digits in a subscriber number are fixed. This is used in a few countries such as France, Belgium, Canada, Hawaii, and in a few parts of USA.

Ans to the Question no-08(c)

Radio Communication is the modern long distance transmission systems.

It ~~is~~ ~~deal~~ deals with electronic radiation of electromagnetic energy from one point to another through the atmosphere or free speace. It is possible only in a certain portion of the electromegnetic frequency spectrum. This portion includes frequencies from 9 KHz to 4000 MHz, while there are international allocation for the radio spectrum upto 275 0 Hz, most of the commercial users take place between 100 KHz and 20 0 Hz. Different layers of the atmosphere play a role in propagating radio wavers. The atmosphere consist of four layers. Of the four layers, the ionosphere and tropsphere are useful radio communication in certain frequency ranges. Certain other radio frequencies pass straight the atmosphere and can be beamed towards ~~satHeli~~. sattelites. placed in the inter plannet an space.