Assignment 2

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IT-17014

1. a) What is telecommunication network? 04

→ A telecommunication network is a group of nodes interconnected by links that are used to exchange messages between the nodes. The links may use a variety of technologies based on the methodologies of circuit switching, message switching or packet switching, to pass message and signals. For each message, multiple nodes may cooperate to pass the message from an originating node to the destination node, via multiple network hops.

b) What are the mejor systems of telecommunication network? 05

→ Any telecommunication network may be viewed as consisting of the following major systems:

1) Subscriber end instruments or equipments.
2) Subscriber loop systems.
3) Switching systems.
4) Transmission systems.
5) Signaling systems.

c) Describe PSTN. What is loop lines?

→ The Public switched telephone network is understood as an aggregate of world's circuit switched telephone networks, used for providing public telecommunication. The PSTN networks are called POTS (Plain Old Telephone systems). These networks are operated regionally, locally, nationally and internationally using telephone lines, fiber optic cables, microwave transmission links or cellular communications.

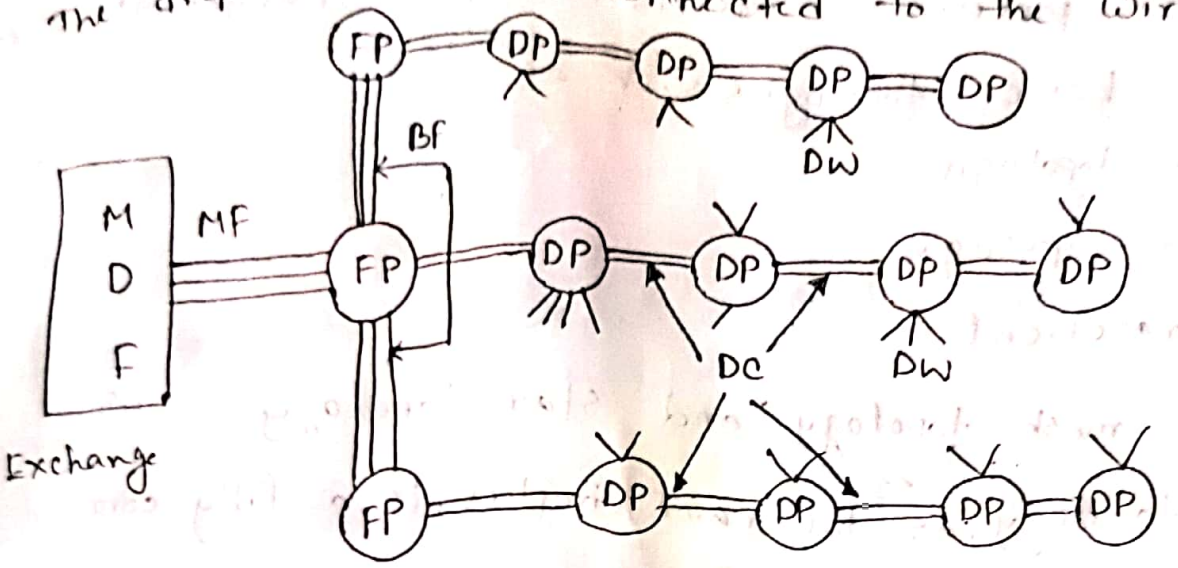
In a general telephone network, every subscriber has two dedicated lines connecting to the nearest switching exchange, which are called loop lines of that subscriber.

2. a) What is cabling? Describe subscriber loop systems. 05

→ The laying of lines to the subscriber premises from the exchange office is called cabling. It is difficult to run cables from each subscriber's premises to the exchange, large

cables are used through which the drop wires (subscriber lines) are taken to a distribution point

The drop wires are connected to the wire pairs.



MDF = main distribution frame.

DP = distribution point

DC = distribution cable

MF = main feeder

BF = branch feeder

FP = Feeder point

DW = Drop wires

b) How switching hierarchy and routing works? What are the topologies? 05

→ The switching hierarchy and routing is important of the telephone lines. The interconnectivity of calls between different areas having different exchanges is done with the help of trunk lines between the

exchanges. The group of trunk lines that are used to interconnect different exchanges are called the trunk groups.

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

1) Mesh topology.
2) Star topology,
3) Hierarchical.

c) Define mesh topology and star topology. · 03

→ Mesh topology, as the name implies, is a fully connected network. The number of trunk groups in a mesh network is proportional to the square of the exchanges being interconnected. Hence, these mesh topologies are widely used in metropolitan area where there is heavy traffic.

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

3. a) Define transmission plan. What are the guidelines of CCITT? 05

→ For reasons of transmission quality and efficiency of operation of signalling, it is desirable to limit the number of circuits connected in tandem.

CCITT lays down certain guidelines in this regard in its recommendations.

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

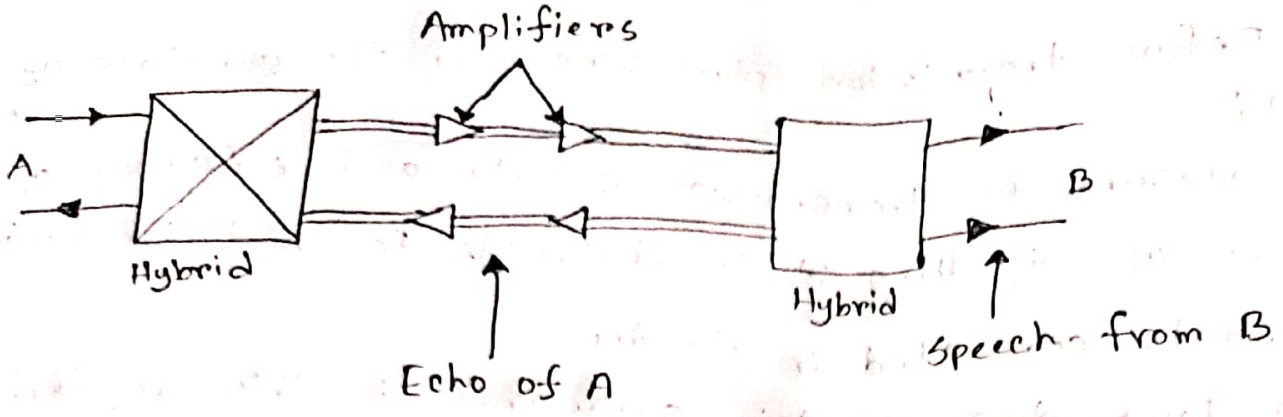
2) No more than four international circuits be used in tandem between originating and terminating international switching centres.

3) In exceptional cases and for a low number of calls, the total number of circuits may be 14, but even in this case, international circuits are limited to a maximum of four.

b) What are the catagories of transmission system? draw the figure of echo as reflected signal. 05

→ Modem long distance transmission systems can be placed under three broad categories:

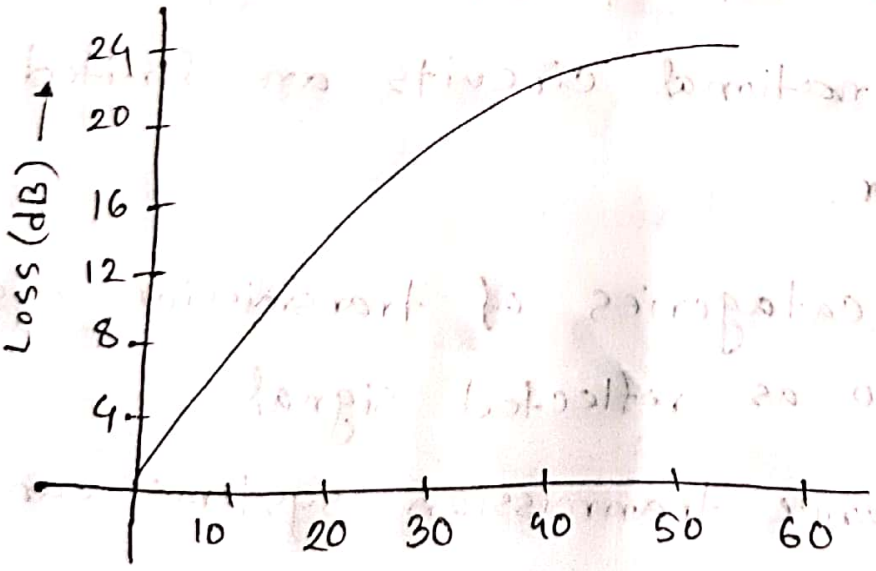
1) Radio systems.
2) Coaxial cable systems.
3) Optical system.



Echo as reflected signal

e) What is echo? Show attenuation vs echo delay. 04

→ Because of the long distances, the circuits need amplifiers and repeaters at appropriate intervals to boost the signals. At the subscriber-line interfaces, mismatch occurs; this results in reflecting a part of the incoming singnal onto the outgoing circuit, which returns to the speaker as Echo.



Attenuation vs echo delay

4. a) What are the categories of long distance communication? Draw the layers of atmosphere. 05

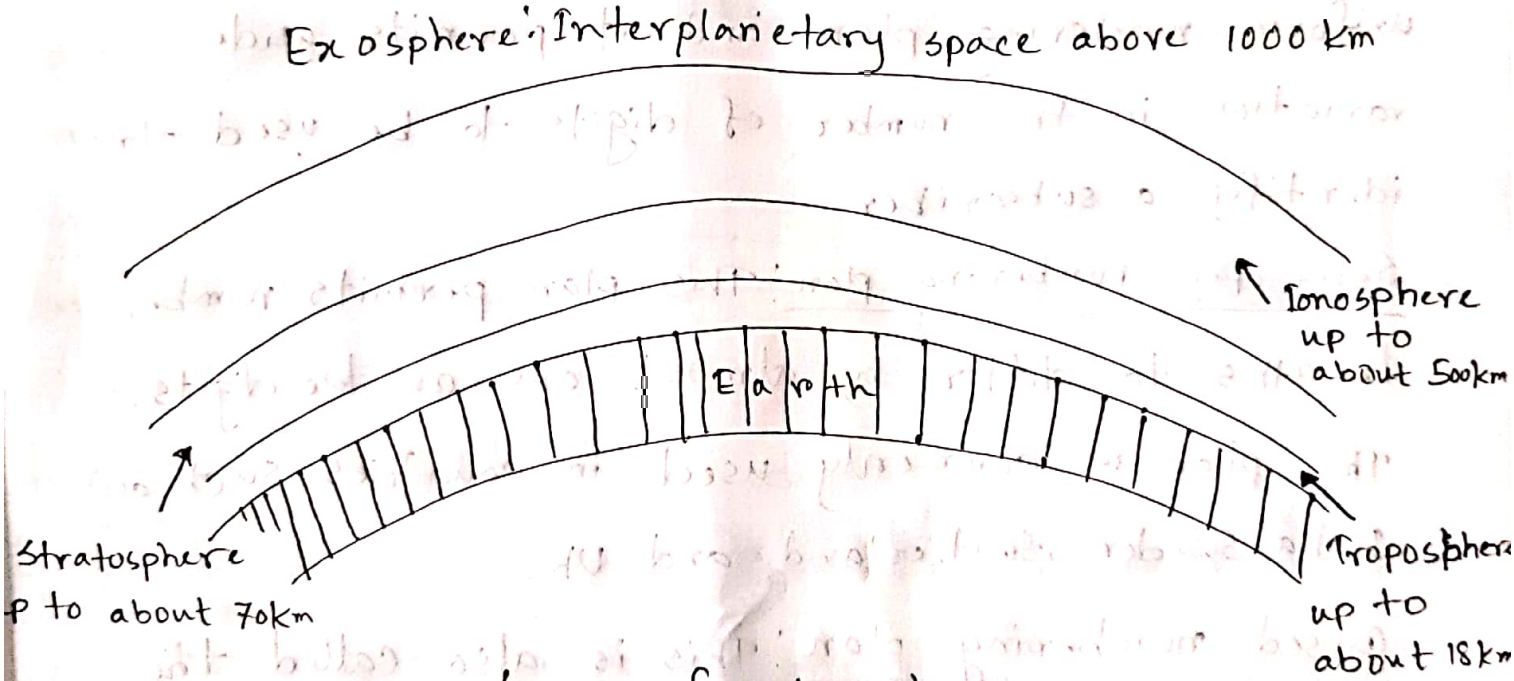
→ Depending on the mechanism of propagation, long distance radio communication can be placed under four categories:

1) Sky wave or ionosphere communication.

2) Line-of-sight (LOS) microwave communication limited by horizon.

3) Tropospheric scatter communication.

4) Satelite communication.



Layers of atmosphere

b) Describe numbering plan. What is linked numbering scheme? 05

→ During the early stages of development, the numbering scheme was confined to a small single exchange, which

used to connect to the other exchanges by identifying them with the names of the towns in which they were located. But with increase in the number of subscribers, many exchanges were introduced.

The common numbering scheme is called the linked numbering scheme, where all the exchanges in a town were collectively identified by the name of the town.

c) Describe types of numbering plans. 04

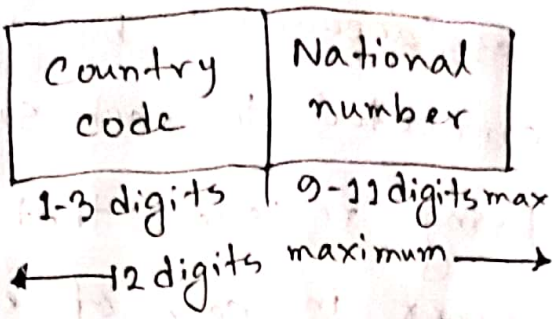
→ Open numbering plan: This is also called the Non-uniform numbering plan and it permits wide variation in the number of digits to be used to identify a subscriber.

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

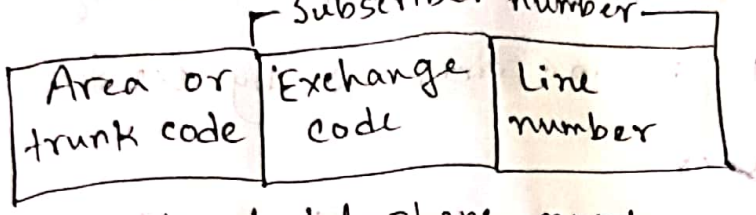
Closed numbering plan: This is also called the uniform numbering plan where the number of digits in a subscriber number are fixed. This is used in a few countries such as France, Belgium...

5.a) Draw the figure of national and international telephone number. 04

→



International telephone number



National telephone number

b) What are the parts of national number? 05

→ A national number consists of three parts. The parts are described below:

The area code or trunk code: This code identifies a particular numbering area or the multi-exchange area of the called subscriber. It is with this code, the routing for a trunk call is determined.

Exchange code: This code identifies a particular exchange within a numbering area. It determines the routing for incoming trunk call from another numbering area.

Subscriber line number: It is used to select the called subscriber line at the terminating exchange.

c) Describe charging plan. What are the categories of individual calls? 05

→ The calls are charged as accounted by the metering instrument connected to each subscriber line or as per a metering register that is assigned to each subscriber in case of electronic exchanges. A meter counts the number of charging units, and the count is incremented by sending a pulse to the meter.

The individual calls can be charged based on the following categories.

1) Duration independent charging.

2) Duration dependent charging.

6.a) What is multi-metering? 03

→ Multi-metering refers to a metering mode selectable on a camera which is designed to meter a scene accurately in challenging lighting situations. Multi-metering reads light levels in multiple areas or zones within a scene and compares the results to calculate exposure settings that will produce the clearest exposure.

b) What are the basic principles of various topics in telecom. engineering? 05

→ Principles of various topics in telecom.

1] Optical networking.

2] traffic engineering.

3] Telephony principles, digital coding of speech.

4] Wireless, cellular.

5] Transmission system design, fiber optics.

6] switching system.

7] Internet.

c) Describe some of future hold of telecom engineering? 05

→ Future holds of telecom.

i) Expansion to the developing world.

ii) Machine to machine communication.

iii) • More machines than human.
• can exchange data more quickly.
• Pervasive computing.
• Seamless human machine interface.
• Wearable computers.
• virtual reality.

iv) Convergence of telephone, TV, movies, Internet storage and so on.

iv) Future application such as virtual reality, 3D holography, web agents, robots weather prediction, telepresence and so on.

7.a) Define C/I ratio. 04

→ The carrier to interference ratio. C/I of the signal at 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 name frequency usually expressed in dB.

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

b) Describe fading. 05

→ Fading: During tranmission from the base station to the mobile, the received power fluctuates. These factors are generalized into 3 main groups.

- Path Loss (does not change in time)
- changes only with distance from transmitter.
- there are also lossess associated with frequency/ size/height etc.

- Long-term fading or shadowing.
- changes with mobile position.
- short term fading (or small scale fading)
- due to multiple paths of transmission arriving at the mobile at the same time.
- If there are other patchs that arrive with some delay, it is called multi path fading.

c) Explain cellular structure. 05

→ Cellular structure: Two parts as,

- MSC - mobile switching center (also called MTSO - mobile telephone switching office.
- PSTN - Public switched telephone network.

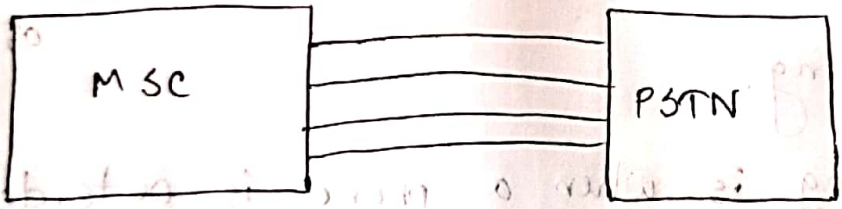


fig: Cellular structure

8.a) Define registration. 04

→ 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 calling or signalling to the MSC via the base station on a set up or control channel.

05

b) What are the types of registration?

→ There are two types of registration as,

1) Periodic registration - is when the phone announces itself on a regular basis.

2) Forced registration - is when the phone monitors a control channel which provides information including the cell identification (i.e which cell are you in?)

- If the channel length fades below a threshold, the phone selects another channel.
- If the new channel has a new cell IP then the phone reregisters.

c) Explain roaming. 05

→ Roaming: Roaming is when a phone is outside it's home area or local region.

If the phone registers outside its home area, the MSC contracts the phone's home area and confirms that the phone is okay.

- MSC then notifies home area of the phones current location and provides instructions for routing incoming calls to the phone (and billing information etc)