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CT# Assignment #02

- Q1. (a) Define PSTN.
(b) Write down the different types of system in telecommunication networks.
(c) Describe subscriber loop system and transmission in telecommunication networks.
- Q2. (a) Write down the different categories in radio communication.
(b) Describe signaling techniques in telecommunication engineering with examples.
(c) Explain Service specific networks with examples.

03. (a) Define Signaling techniques.
(b) Explain various types of signaling techniques.
(c) Describe the essential elements of a switching system with block diagram.
04. (a) Explain switching mechanisms with block diagram.
(b) Write down the operation of touch tone telephone.
(c) Describe the features of crossbar switches.
05. (a) Define Telecommunication.
(b) Write down the basic principles of telecom engineering.
(c) Describe wireless pre-cellular Systems.
(d) Write down the advantages of cellular.

06. (a) What do you mean by system and subsystem?

(b) Explain layer and Entity

(c) Write down the layering principles.

(d) Briefly describe various types of Layer System.

07. (a) Describe fading with its various levels.

(b) Explain small-scale fading and flat fading with examples.

(c) Write down the difference between LAN & and MAN.

(d) Describe Fibre Optic Networks.

08. Write down the Short Notes On-

(i) Message Switching

(ii) Circuit Switching

(iii) Folded Networks

(iv) Blocking Networks

(v) Juncutures.

Answer to the Question No-01(a)

PSTN stands for public Switched Telephone Network. PSTN is a world's circuit switched telephone networks which are used for providing public telecommunication.

Answer to the Question No-01(b)

There are many systems may be viewed in any telecommunication networks. They are given below:-

1. Subscriber end instruments
2. Subscriber loop systems
3. Switching Systems
4. Transmission Systems.

Answer to the Question No- D1 (e)

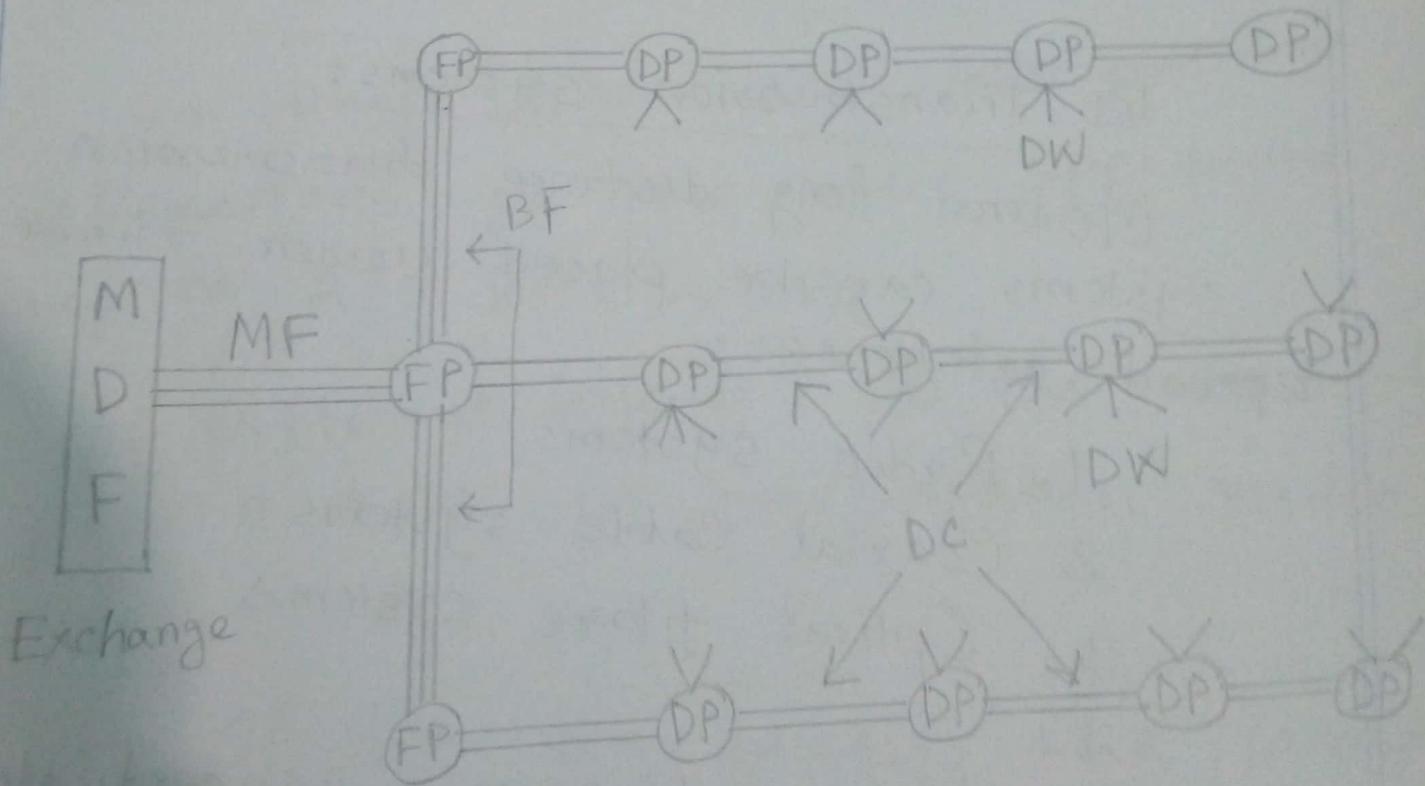
Describe Subscriber Loop system and transmission system in Telecommunication Network:

Sb Subscriber loop system:

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

The laying of lines to the subscriber premises from the exchange office is called Cabling.

As it is difficult to run cables from each subscriber's premises to the exchange, large cables are used through which the drop wires are taken to a distribution point.



MDF = main distribution frame

DP = distribution point

DC = distribution cable

MF = main feeder

BF = branch feeder

FP = feeder point

DW = drop wires

⇒ Transmission systems:

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

1. Radio systems
2. Coaxial Cable systems
3. Optical fibre systems

↳ In this section, we concentrate on radio and coaxial cable systems.

Radio communication deals with electronic radiation of electro-magnetic energy from one point

to another through the atmosphere or free space.

↳ It is possible only in a certain portion of the electromagnetic frequency spectrum.

↳ This portion includes frequencies from 9 kHz to 400 kHz.

↳ While there are international allocations for the radio spectrum up to 275 kHz ~ 0 Hz.

↳ Different layers of the atmosphere play a role in propagation radio waves.

↳ Of the four layers, the ionosphere and troposphere are used for radio communication in certain frequency ranges.

Answer to the Question №-02(a)

In long distance, radio communication can be placed under four categories: ↴

1. Sky wave or ionosphere communication
2. Tropospheric scatter communication
3. Line-of-sight microwave communication limited by horizon
4. Satellite communication.

Answer to the Question №-02(b)

Signaling techniques in telecommunication engineering : ↴

signaling techniques enable the circuit technique to function as a whole by inter connecting all varieties of switching systems.

- ↳ The switching systems are connected using lines called the Trunks.
- ↳ The lines that run to the subscriber premises are called the Subscriber Lines.
- ↳ A telephone switching network is made up of switching systems trunks, subscriber lines and telephone instruments. Trunks and subscriber lines are communication lines which carry information signals from one point to another. There are basically two forms of communication links electrical and optical.
- ↳ At the receiving end, optical to electrical converts are used first then the transducer to reproduce the original signal.

Answer to the Question No-02 (c)

Describe Service specific Networks:

Service Specific Networks:

→ A service specific network is a structure that brings together several entities to deliver a particular service.

→ Different services can different types of end equipments at the customer premises. The signal characteristics of such end equipments very widely.

→ Signalling requirements for different types of end equipments also differ significantly. Such wide variations in electrical characteristics and signalling

requirements have led to the development of different service.

↳ Specific telecommunication networks that operate independently.

Examples are:

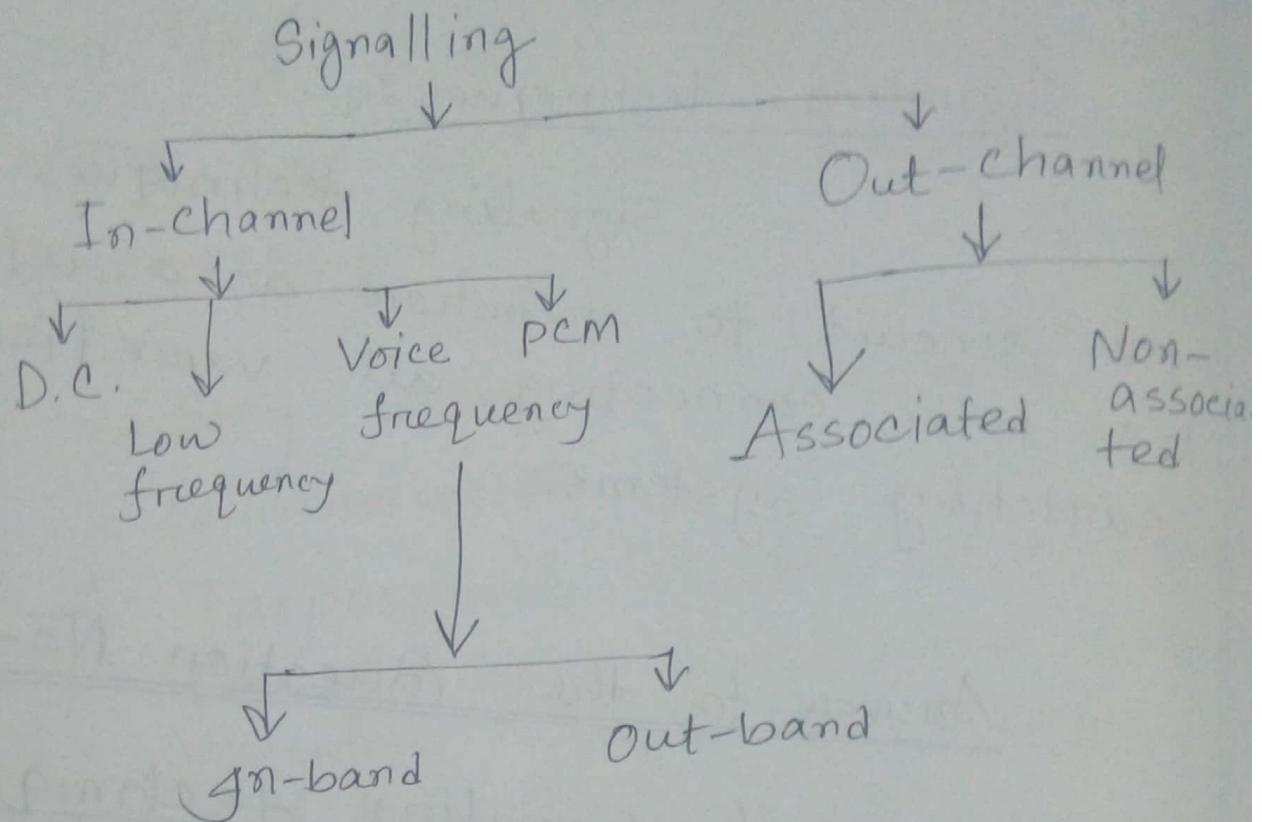
1. Telegraph Network
2. Telex Network
3. Telephone Network
4. Data Network.

Answer to the Question No-03(a)Signaling Techniques:

Signaling techniques enable the circuit to function as a whole by inter connecting all varieties of switching systems.

Answer to the Question No-03(b)Types of signaling technique:

The signaling techniques are categorized into two, the In-channel signaling and the Common-channel signaling. These types are further divided into few depending upon the frequencies and frequency techniques used.



By In-channel signalling:

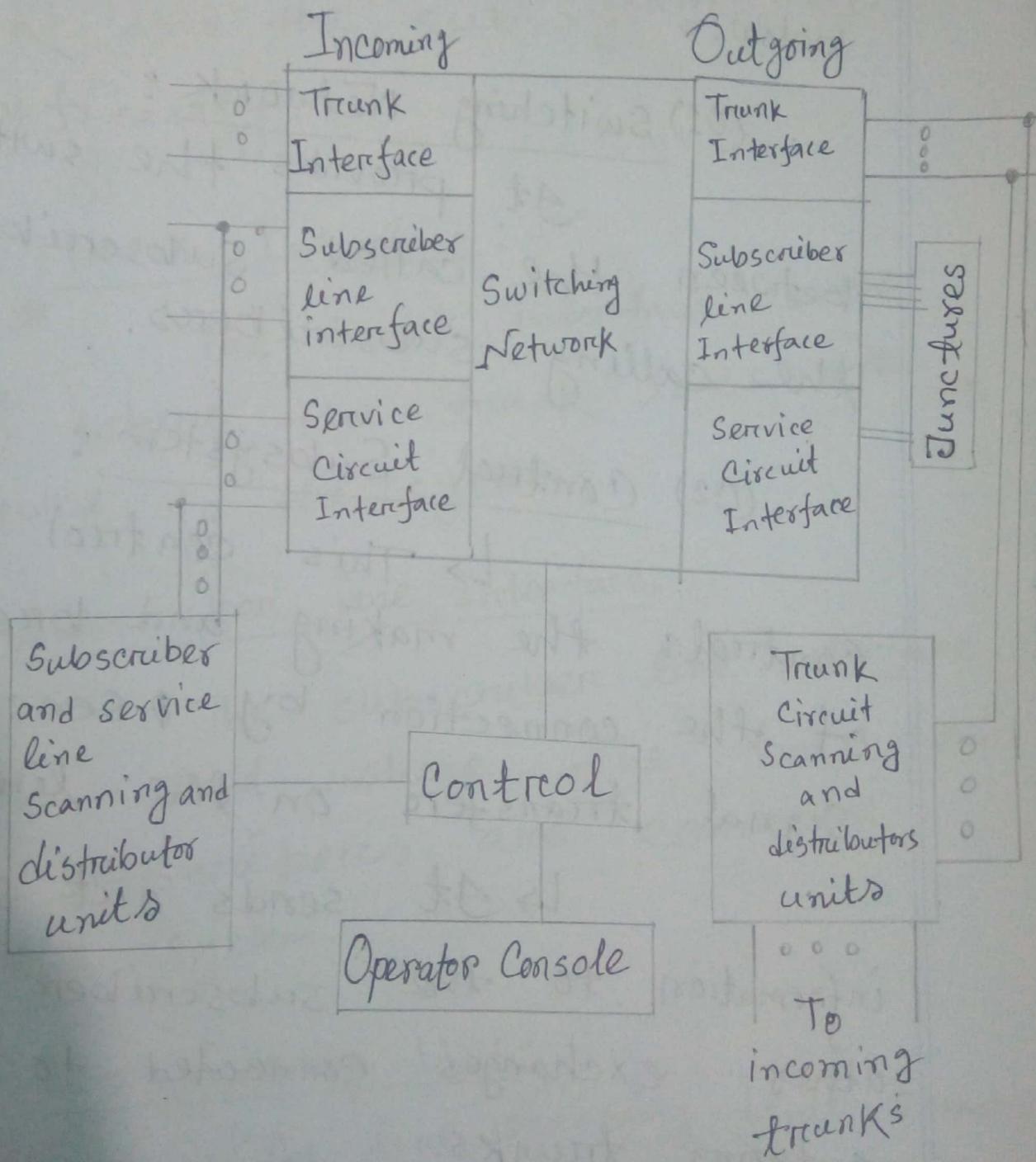
This type of signaling is used to carry voice or data and pass control signals related to a call or connection.

By Out-common-channel signalling:

Common channel signaling uses a separate common channel for passing control signals for a group of trunks or information paths.

Answer to the Question No - 03 (c)

④ The block diagram of the switching system:



This diagram shown above contains different blocks of the switching system. The blocks are discussed below:-

(01) Switching Network:

It provides the switching paths between the called subscribers and the calling subscribers.

(02) Control Subsystem:

→ This control subsystem, controls the making and breaking of the connection by sensing the signal transfers on the lines.

→ It sends out signaling information to the subscriber and other exchanges connected to the outgoing trunks.

(03) Signaling:

The signaling formats and requirements for the subscriber, the trunks and the sub systems differ significantly.

(04) Trunk Interface:

The trunk interface is the point where the trunk lines are connected to the system.

(05) Subscriber line Interface:

The subscriber line interface is the point where the lines from the subscribers are connected to the system.

(06) Line Scanning Unit:

The line scanning unit senses and obtains the signaling information from the respective lines.

(07) Distributor Units:

The distributor units are used for distributing the signaling information on the respective lines.

(08) operator Console:

The operator console permits interaction with the switching system for maintenance and administrative purposes.

(09) Service Circuit Interface:

The service circuit interface provides interaction between the circuits for maintenance and testing purposes.

(10) Junctures:

The junctures is a junction that provides a folded connection for the local subscribers and

the service circuits.

Answer to the Question No-04(a)

④ Switching is the technique by which nodes control etc switch data to transmit it between specific points on a network.

There are three types of switching.
They are given below: ↴

↳ Circuit Switching

↳ Packet Switching

↳ Message Switching

④ The switching mechanism can be consists of two selectors. These Selectors form the building blocks for the switching systems.

↳ Uni Selector switching

↳ Two-motion Selector switching

Uni Selector switching mechanism:

The uni-selector switching mechanism consists of an electromagnet, an Armature with springs, a Pawl, a ratchet wheel with wiper attached and a detent.

The wiper is made to move on the bank contacts in clock-wise direction.

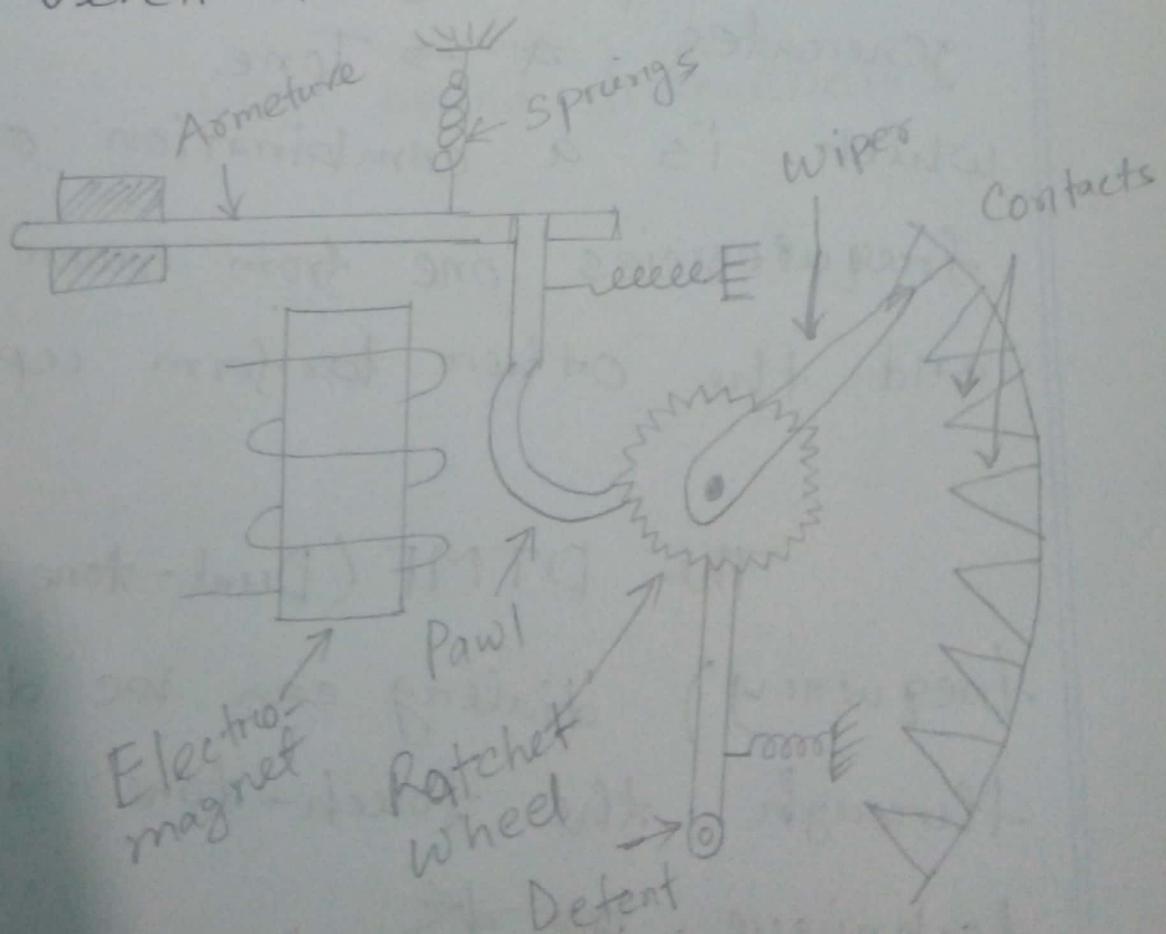
As the wiper moves in one-direction, the process is called Uni- Selector switching.

⇒ Two-motion selectorus mechanism:

The two-motion selectorus mechanism consists of two ways. These are :

- (a) Vertical
- (b) Horizontal

An upwarded movement is made in vertical and horizontal directions. There is no contacts made in the vertical movement.



Answer to the Question No- 04(b)

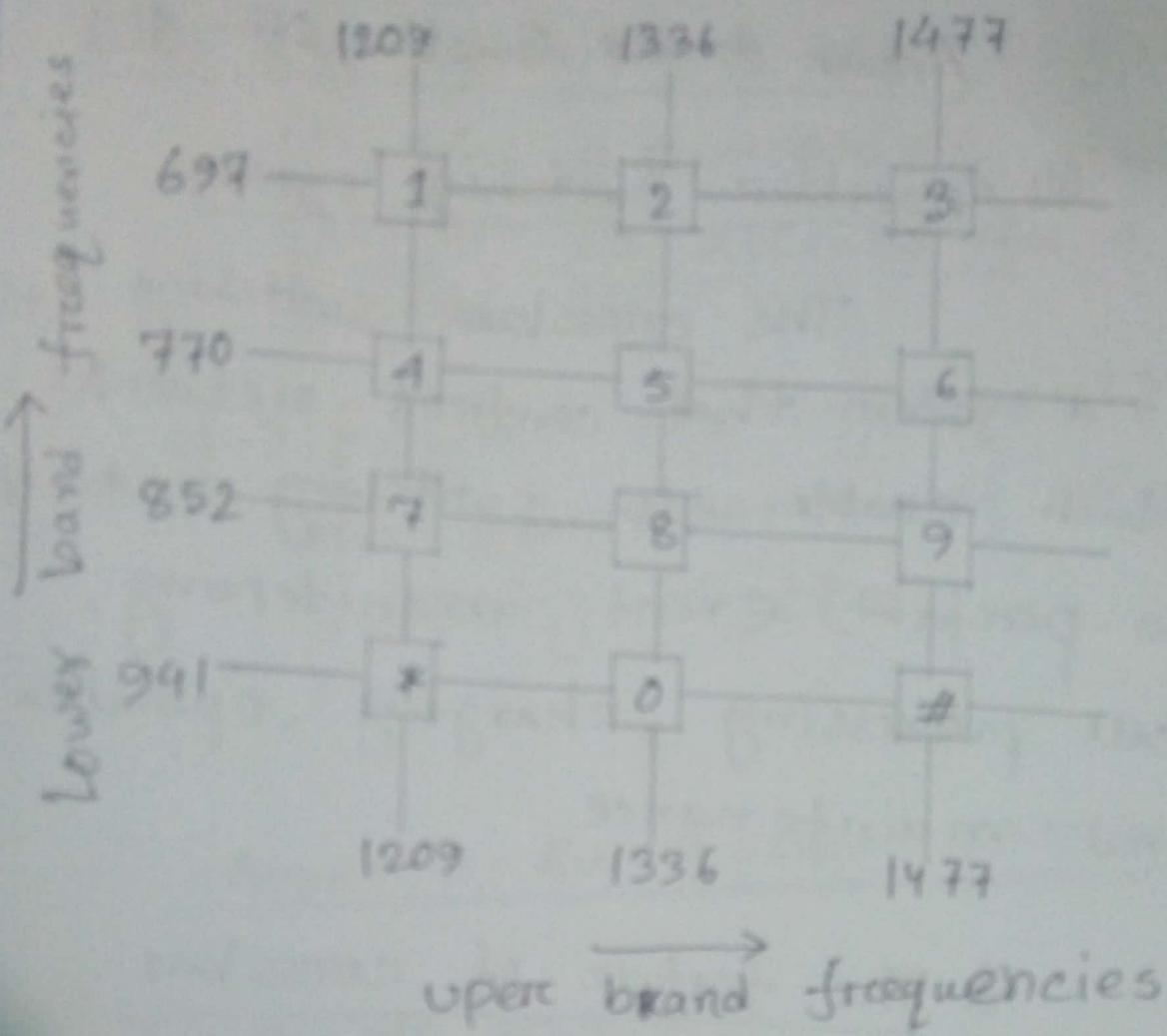
Operation of the Touch-tone

Dial Telephone Operation:-

The press of a button on the touch-tone dial telephone indicates the number dialed using certain frequencies → Touching.

or light pressing of a number generates a → Tone which is a combination of two frequencies one from lower band and the other to form upper band.

The DTMF (Dual-tone Multi-frequency) dialing can be done through the touch-tone dialing technique.



Answer to the Question No- 4(c)

Q1 Crossbar Switching system:

The crossbar switching sys.
is a system that control networks
which enable the switching network
to perform event monitoring,
call processing , charging , operation
and maintenance.

Q2 The feature of crossbar switching system:

- ↳ While processing a call, the common control system helps in the sharing of resources.
- ↳ The specific route functions of call processing are hardware

Answer to the Question No-05(a)

Q Define Telecommunication?

Telecommunication means transfer of meaningful information from one location to another.

Answer to the Question No-05(b)

Q Basic principles of telecom engineering: →

⇒ Traffic engineering

⇒ Telephony principles, digital coding of speech

⇒ Wireless, cellular

⇒ Transmission system design, fiber optics

⇒ Switching system

⇒ Internet

⇒ Optical Networking

Answer to the Question No-05 (b)

Q Wireless pre-cellular systems:

** Wireless transmission was originally shown as a method to remain in continuous contact with ships.

In 1946, FM consumer mobile phone systems were introduced.

↳ A group of frequencies allocated to a large geographic zone

↳ when moving to a new zone, calls had to be reinitiated

↳ 120 KHz per channel due to poor filter technology.

↳ Half - duplex system

↳ Most user not connected to PSTN

Answer to the Question No-05(d)Advantage of cellular: ↴

- ↳ Allows for frequency reuse as two cells in the same geographic area can be use the same frequency
- ↳ Increases the spectral efficiency of the system, but increases infrastructure expense
- ↳ Technology to implement cellular telephony was available only in the late 1970's
- ↳ Base station provides access between to the mobile switching centre.

Answers to the Question No-06(a)

System:

A system is one or more autonomous computers and their associated software, peripherals and users.

Sub-System:

A logically independent smaller unit of a system.

Answer to the Question No-06(b)

Difference between Layer and Entity:

Layer

Entity

① A layer is composed of subsystems of the same rank of all the interconnection systems.

① The functions in a layer are performed by hardware subsystems or software packages.

② The layers are numbered starting with one at the bottom level.

② Entities ~~in~~ communicate with peer entities in the adjacent system.

③ Layering is a natural choice for communication architecture.

③ There is no communication with entities in the intermediate systems.

④ A layer obtains services from its intermediate layer.

④ Entity obtains services from its intermediate higher layers.

Answers to the Question No- 06(c)

Q) The layering principles are given below: ↴

- 1. ↴ Create layers to handle Functions which are manifestly different in the process performed.
- 2. ↴ Collect number similar functions into the same layer and create a boundary at a point where the number of interactions across the boundary are minimised.
- 3. ↴ Create a layer of easily localised functions so that the layer could be totally re designed and its protocols change.

Answer to the Question No-06(d)

F.A Describe various types of Layers:

~~In OSI mot~~ According to OSI model, there are seven types of layers in network. They are given below:-

- (1) physical Layer
- (2) Data Link Layer
- (3) Network Layer
- (4) Transmission Layer
- (5) Session Layer
- (6) Presentation Layer
- (7) Application Layer.

↳ Physical Layer:

↳ This ~~is~~ is the most lowest layer of the OSI model.

It permits the usages of a realistic variety of physical media and control procedures.

↳ Data link Layer:

The data link layer deals with error detection and automatic recovery procedures required when a message is lost or corrupted.

↳ Network Layer:

The highest link-to-link layer in the OSI model is the network layer.

↳ It transmits of packets from the source node to the destination node.

↳ Transport Layer:

Transport layer is the first end-to-end layer in the OSI architecture.

It is responsible for matching user message characteristics and service requirements.

↳ Session Layer:

The session layer organises different sessions between cooperating entities and perform all related functions.

↳ Presentation Layer:

The presentation layer represent information to the communicating application entities in a way that preserves the meaning.

→ Application Layer:

Application layer is the highest layer in the OSI reference model.

The application layer provides services to the users of OSI environment.

Answer to the Question No-07(a)

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.

↳ Path Loss

⇒ Changes only with distance from transmitter

⇒ there are losses associated with the frequency of transmission

↳ Long-term fading

⇒ Caused by buildings transmission from BS.

⇒ Change with mobile position

↳ Short-term fading

⇒ due to multiple paths of transmission arriving at the mobile at the same time

⇒ If there are other paths that arrive with some delay.

Answer to the Question No-07(b)

田 Small scale fading :

⇒ the signal may take different paths to the mobile customer

⇒ Reflections off moving objects, cause a shift in frequency in the signal

⇒ Some path's arrive at the mobile at the same time.

⇒ Other path's arrive much later due to a longer distance travelled.

Flat Fading:

- ⇒ Derivation of fading based on electromagnetic fields
- ⇒ Several path's arrive at the receiver at nearly the same instant
- ⇒ Each path has been shifted in frequency due to the relative motion of mobile.
- ⇒ the maximum doppler shift is given by $f_m = v/\lambda$, where v is the mobile velocity and λ is the carrier wavelength.
- ⇒ The path difference time is the time over which the received power does not change significantly.

- ↳ Date security Threat .
- ↳ LAN maintenance Job
- ↳ Covers Limited area

Answer to the Question No-07 (c)

Q) Difference between LAN and MAN:

LAN

MAN

- | | |
|---|--|
| ① LAN stands for local area network. | ① MAN stands for metropolitan area network. |
| ② LAN is a group of computers and network devices connected together. | ② MAN is a larger network that usually spans several buildings in the same city. |
| ③ It has short propagation delay than MAN. | ③ It has high propagation delay than LAN. |
| ④ It covers the smallest area. | ④ It covers the largest area. |

LAN

⑤ LAN's ownership is private.

⑥ Easy design and maintenance.

⑦ LAN's cost is less than MAN.

MAN

⑤ MAN's ownership can be public or private.

⑥ Complex design and maintenance than LAN

⑦ MAN's cost is higher than LAN

Answer to the Question No-07(d)Fibre Optic:

Fibre optics is the technology used to transmit information as pulse of light through strands of fiber made of glass over long distance.

Q) Characteristics of Fibre optic networks:

The Optical fibre networks are characterised by

1. High speed operation
2. Ability to span large distance
3. Ability to support a moderate number of stations.

Answer to the Question No -08

(e) Message Switching:

In message switching, once the transmission is initiated, a message is transmitted in its entirety without a break from one node to another.

The node processor performs the following functions:

- ↳ Receive the full user message and store the same.
- ↳ Check the message for data transmission errors and perform error recovery if required
- ↳ Determine the destination address from the user message
- ↳ Forward the message to the next node on the chosen link.

(ii) Circuit Switching:

↳ In circuit switching, an electrical path is established between the source and the destination before any data transfer takes place.

↳ The electrical path may be realized by physical wires or coaxial cables or radio.

↳ It remains dedicated to the communication pair for the entire duration of the transmission irrespective of either data.

↳ There are three explicit phases involved in circuit switched data transfer.

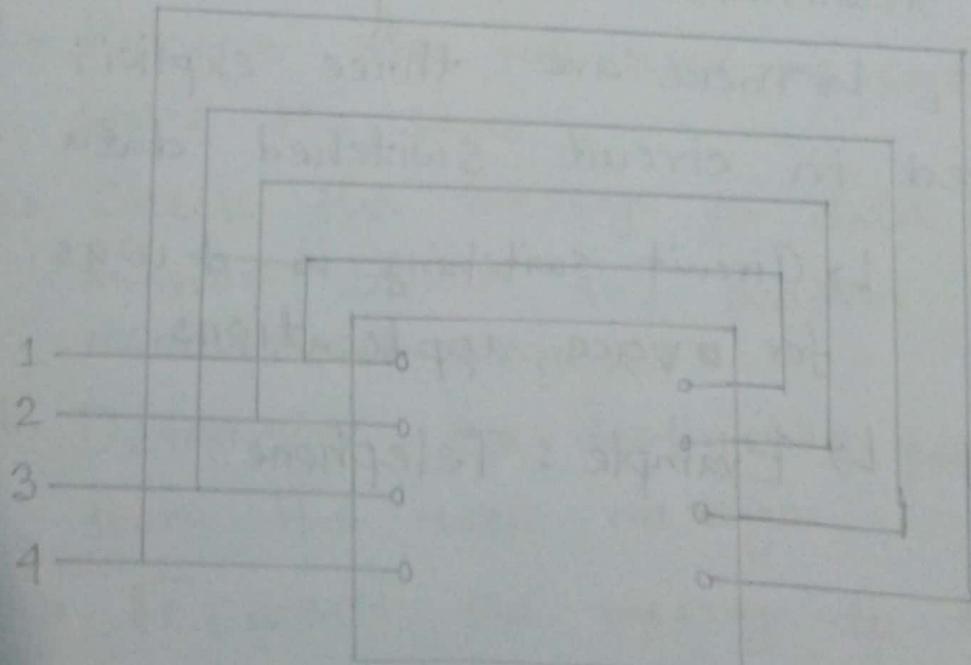
↳ Circuit switching is ~~is~~ was designed for voice applications.

↳ Example: Telephone.

(iii) Folded Network:

- ↳ A network where the outlets are connected to the inlets, is called Folded Network.
- ↳ For a folded network, the N number of inlets then the connections are established by $N/2$.

Block diagram of folded Network:



(iv) Blocking Network:

↳ If there are no switching paths free in the network, the call requested will be denied, where the subscriber is said to be blocked and the network is called the blocking network.

↳ In a blocking network, the number of simultaneous switching paths is less than the maximum number of simultaneous conversations that can take place.

↳ The probability that a user may get blocked is called the blocking probability.

(v) Junctures:

↳ The junctures is a junction that provides a folded connection for the local subscriber and the service circuits.

↳ If the called subscriber and the calling subscriber both are local, then the folded connection helps in making the connection to a local call.