



## Assignment No-02

**Course Code :** ICT- 4101

**Course Title :** Telecommunication Engineering

**Assignment Name :** Cellular Communication

**Submitted By**

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**Submitted To**

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C.T-02

1. a) To have high quality standardised, CCITT puts which guidelines? 4
  - b) List the types of Modern long distance transmission system. 4
  - c) What are the categories of long distance radio communication depending on the mechanism of propagation. 6
- 
2. a) Describe fading with its various levels. 3
  - b) Explain small-scale fading & flat fading with examples. 4
  - c) Write down the difference between LAN & MAN. 8
  - d) Describe fibre optic Networks. 3

3. a) How are numbers assigned? What are the three parts of national numbers? 4

b) What is inband & outband signaling? What are the purposes of telephone network signaling functions? What is meant by frequency? 6

c) What is inchannel signaling? Why is voice frequency signalling used? 4

4. a) Explain the major components of a telephone system? 4

b) Discuss the five characteristics regions in the normalized event reliability with respect to reading frequency that are define in the sensor network. 6

Q3) How to use a rotary dial phone for implementing pulse dialing

4

Q5. a) write down the difference between Inlets & outlets.

3

b) Define switching matrix . Define connections in telecommunication network with classifications.

5

c) Describe the essential elements of a switching system with block diagram.

6

Q6. a) What do you mean by Telecommunication & Telecommunication Engineering?

3

b) Describe switching system with block diagram.

5

c) what do you mean by switching systems ? Describe various types of switching system.

6

Spiral switch  
Spiral switch  
Spiral switch  
Spiral switch  
Spiral switch  
Spiral switch

7. a) Describe fading with its various 4 levels.
- b) Explain layer & Entity. 4
- c) write down the layering principles 3
- d) Briefly describe various types 3  
of Layer system.

8. a) which factors affect the received power level? 5
- b) Describe the small scale fading. 5
- c) Describe flat fading. 4

Ans to the Q. No-1(a)

To have high quality standards the following guidelines were put forward by the CCITT:

- i) The maximum number of circuits to be used in international call is 12.
- ii) No more than four international circuits be used in tandem between the originating & the terminating international switching offices.
- iii) In exception cases & for a low number of calls, the total number of circuits may be 14, but even in this case, the international circuits are limited to a maximum of four.

Ans. to the Q. No-1(b)

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

1. Radio Systems.
2. Co-axial Cable System.
3. Optical Fibre System.

The numbering plans for telephone network are described in brief below:

i) Open Numbering Plan: This is also called the Non-Uniform Numbering plan & it permits wide variation in the number of digits to be used to identify a subscriber.

i) Open 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 etc.

ii) 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, Canada, Hawaii

8 in a few parts of USA.

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Ans to the Q. No - 1 (c)

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

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

### Ans to the Q. No - 2 (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

(Q) Ans to the Q. No - 2 (b)

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 larger distance traveled.

### Flat Fading:

- Derivation of fading based on electro magnetic fields.
- Several path's arrive at the receive 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  $\lambda$  is the carrier wavelength.
- The difference patime is the time for over which the received power does not change significantly

### Fleet Fading:

- Derivation of fading based on electromagnetic fields.
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Ans to the Q. No - 2(c)

Difference between Lan & Man:

LAN	MAN
1. LAN stands for local area network.	1. MAN stands for metropolitan area network.
2. LAN is a group of computers & network devices connected together.	2. MAN is a larger network that usually spans several building.
3. It has short propagation delay than MAN.	3. It's high time propagation delay than LAN.
4. It covers the smallest area.	4. It covers the largest area.
5. LAN's ownership is private.	5. MAN's ownership can be public or private.

Ans to the Q. No - 2 (d)

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

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.

Ans to the Q. No-3(a)

The NANP divides the territories of its numbers into numbering plan areas which are encoded numerically with a three-digit telephone number prefix commonly called area code. Each telephone number unique only within its respective plan area.

A national number consists of three parts. They are:

- i) The area-code or the trunk code
- ii) Exchange code.
- iii) Subscriber line number.

Ans to the Q. No-3(b)

In telecommunications, in band signaling is the sending of control information within the same band or channel used for data such as voice or video. This is in contrast to out of band signaling which is sent over a separate network.

A major component of any telephone system is signaling in which electric pulses or double tones are used for all alerting,

In generally, signaling may occur either within the subscriber loop - that is within the circuit between the individual telephone instrument & the local office or in circuits between offices

Frequency: The frequency is the number of oscillation per unit time. It is used for defining the cyclic process like rotation oscillation wave etc.

The completion of the cyclic process at particular interval of time is known as the frequency.

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Ans to the Q. No-3(c)

In channel signalling: This type of signaling is used to carry voice or data & part control signals related to call or connection. There are different types of in-channel signaling. Such as D.C, low frequency, voice frequency PCM. The D.C signaling is simple & reliable even for cheap & reliable even for unamplified audio circuits. However for amplified audio circuits low frequency A.C signaling may be adopted.

The voice frequency signaling is used when low frequency and

The advantages of in-band signaling are:

- i) The control signals can be sent to every part where a speech signal.
- ii) The control signals will be independent of the transmission signals as they are carried along with the signal.
- iii) Analog to digital & digital to analog conversion processes will not affect them.

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Ans to the Q. No - 4 (b)

Small Scale fading:

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Ans to the Q. No - 4 (Q)

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(Q) Ans. To The Q. No-05 (a)

LATA: A LATA is a small or large metropolitan area that according to the divestiture of 1984 was under the control of a single telephone service provider.

Intra-LATA and inter-LATA services:

The LATA services offered by the common carriers inside the LATA are called intra-LATA services.

The services between LATAs are handled by inter exchange carriers.

These carriers, sometimes called long-distance companies, provide communication services between two customers in different LATAs.

Ans. To The Q. No-05 (b)

In order to determine the best design for a telephone switching system a number of criteria must be determined and considered by the operator.

Traffic intensity of the busy hour:

Perhaps the most important factor, traffic intensity of the busy hour is simply the calling rate, the average holding time during the 60 minute period that the traffic intensity is at its highest.

Calling rate:

This is the average number of request for connection per unit of time.

Ans. To The Q. No-05 (c)

Direct Control switching System:

The switching systems where the control sub systems from an internal part of the network are called the direct control switching system.

Benefits of automatic switching System:

- Language barriers will not affect the request for connection.
- Higher degree of privacy is maintained.
- Faster establishment & release of calls in tone.
- Number of calls made in a given period can be increased.
- Calls can be made irrespective of the load on the system or the time of the day.

Ans. To The Q. No-6 (a)

Telecommunication: Telecommunication is the transmission of information by various types of technologies over wire, radio, optical or other electromagnetic systems.

Telecommunication Engineering:

Telecommunication engineering is an engineering discipline centered on electrical & computer engineering which seeks to support & enhance telecommunication systems.

Ans. To The Q. No. 6 (b)

Q. A switching system can be defined as a collection of switching elements arranged and controlled in such a way as to set up a common path between any two distant points.

Switching systems reduced the complexity of writing and made the telephone hassle free.

With the introduction of the switching system the subscribers instead of getting connected directly to one another are connected directly to one a switching office & then to the required subscriber

Ans To The Q. No - 6 (c)

④ Switching System:

A switching system can be defined as a collection of switching elements arranged & controlled in such a way as to set up a common path between any two distant points.

The switching systems in the early stages were operated manually. The connections were made by the operator.

To minimize the disadvantages of manual operation, automatic

switching system.

↳ Electromechanical switching systems are electrically operated.

↳ The usage of electronic components such as diodes, transistors and ICs are useful for the switching purposes.

↳ The switching systems in the early stages are operated manually.

↳ Wide band resources between Line and User

Ans to the Q. No-7(a)

System: A system is one or more autonomous computers & their associated software, peripherals & users.

Sub-System: A logically independent smaller unit of a system.

Ans to the Q. No-7(b)

Difference between Layer & 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 hard-wave sub-systems.
2. The layers are numbered starting with one at the	2. Entities are communicate with peer

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Layer	Entity
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4. A layer obtains services from its intermediate lower layer.	4. Entity obtains services from its intermediate higher layer.

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Ans to the Q. No - 7 (c)

⇒ The layering principle are given below:

- ↳ Create layers to handle functions which are manifestly different in the process performed.
- ↳ Collect similar function into the same layer & create a boundary at a point where the number of instructions across the boundary are minimised.
- ↳ Create a layer of easily localised functions so that the layer could be found totally redesigned & its protocols change.

Ans to the Q. No - 7(a)

Q) Describe various types of layers.

According to OSI model there are seven types of layer in network. They are -

- i) Physical Layer
- ii) Data Link
- iii) Network Layer
- iv) Transmission
- v) Session
- vi) Presentation
- vii) Application

### Physical Layer:

This is the most lowest layer of the OSI model.

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

### Data Link Layer:

The data link layer deals with error detection & automatic recover 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 the packets from

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### Application Layer:

Application layer is the highest layer in the OSI reference model. The application layer provides services of the users of OSI environment.

### Ans to the Q No-8(a)

During transmission from the base station to the mobile the received power function we can generates the factors that affect that received power level into 3 main groups.

# Path loss (doesn't change in time)  
→ Changes only with distance from transmitter

→ there are also losses associated with the frequency of transmission size/height of transmit/receive antenna etc.

# Long-term fading or Shadowing

→ caused by building or tunnel shadowing transmission from BS.

→ changes with mobile position  
(long-normal distribution)

# Short-term fading (or Small Scale fading)

→ due to multiple paths of transmission (reflections) arriving

at the mobile at the same

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Ans to the Q. No-8(b)

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- The maximum Doppler shift is given by  $f_m = v/\lambda$  where  $v$  is the mobile velocity &  $\lambda$  is the carrier wavelength.

→ The paths interfere constructively & destructively causing the received power at the mobile to vary with time.

→ The coherence time is the time over which the received power does not change significantly.

A reasonable "ball park" estimate

is :

$$T_c \approx \frac{9}{16\pi f_m} \approx \frac{9c}{16\pi v_{fc}} \text{ Small Scale}$$

The END