

One Year Diploma, Mobil Communication Examination 2014
Model Answer

Subject:- Telephone Exchange Switching Theory

Paper Code:- 410106

Sets (I) / (II)

- Q-1
- (i) (a) - a - (i)
 - (ii) (b) - b - (ii)
 - (iii) (a) - c - (i)
 - (iv) (b) - d - (ii)
 - (v) (d) - e - (iv)
 - (vi) (c) - f - (iii)
 - (vii) (a) - g - (i)
 - (viii) (c) - h - (iii)
 - (ix) (a) - e - (i)
 - (x) (c) - j - (iii)

Q-2 (i) Packet Switching

1. It has high efficiency.
2. It does not require dedicated transmission path.
3. It stores message for short duration.
4. In packet switching, blocking cannot occur.

Circuit Switching

- It has low efficiency.
- It requires dedicated transmission path.
- It does not store message.
- In circuit switching, blocking may occur.

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Sets (I) / (H)

Q.2(ii) PSTN deals with two types of subscribers: public and private.

Subscribers to private sector take services from telephone companies permanently. Equipments, that are provided to private sector subscribers are designed to their use only. For example, banks do not want to share their communication network with other users. But, for this purpose they cannot construct their own network. So, they take services from public telephone companies. Subscribers to the public sector of PSTN share communication network with other subscribers. Subscribers to the public sector, are interconnected temporarily through switches.

Q.2(iii) Telephone receiver or earpiece is a small permanent magnet speaker. Speaker has a diaphragm. This diaphragm is connected to a coil which rests near a permanent magnet. When a voice signal in the form of electrical signal, comes down a telephone line, it develops a current in the coil. Due to this, coil produces a magnetic field that interacts with the permanent magnetic field of permanent magnet. Due to this, diaphragm of the speaker vibrates which converts this electrical signal into voice signal.

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Sets (I) / (II)

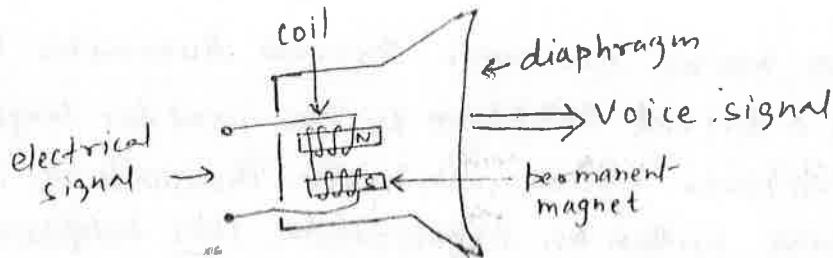


Diagram of a speaker.

Q-3 (i) Busy period = 2+5+6+3 = 16 minutes

Total period = 1 hour = 60 minutes

$$\begin{aligned} \text{Subscriber traffic in erlangs} &= \frac{\text{busy period}}{\text{total period}} \\ &= \frac{16}{60} \\ &= 0.27 \text{ E} \end{aligned}$$

$\therefore 1 \text{ erlang} = 36 \text{ CCS}$

$\therefore 0.27 \text{ erlang} = 36 \times 0.27 = 9.72 \text{ CCS}$

Subscriber traffic in CCS = 9.72 CCS

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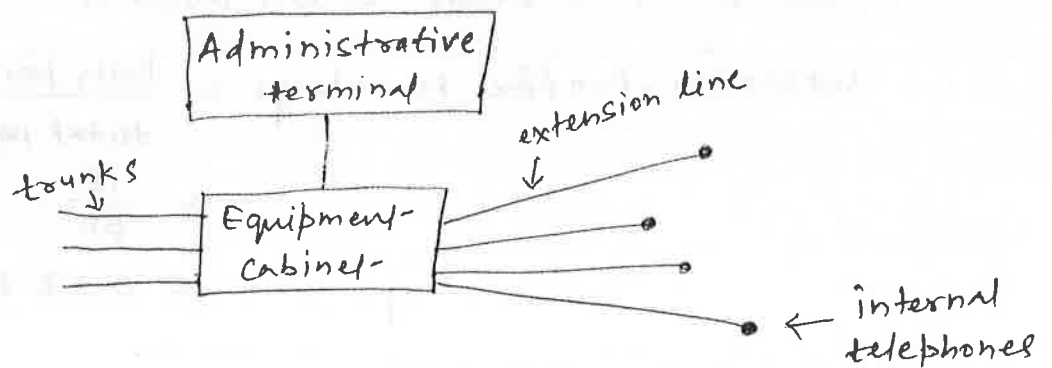
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Sets (I) / ~~(II)~~

Q-3 (ii) EPABX means Electronic Private Automatic Branch Exchange. It is a private telephone system used for large organization. This telephone system can handle thousands of individual telephone within an organization. This telephone system provides baseband interconnections to all the telephones in an organization. EPABX offers high efficiency and low cost when large number of telephone connection is required. Modern EPABX is fully automatic, controlled by computers.



A simple EPABX system

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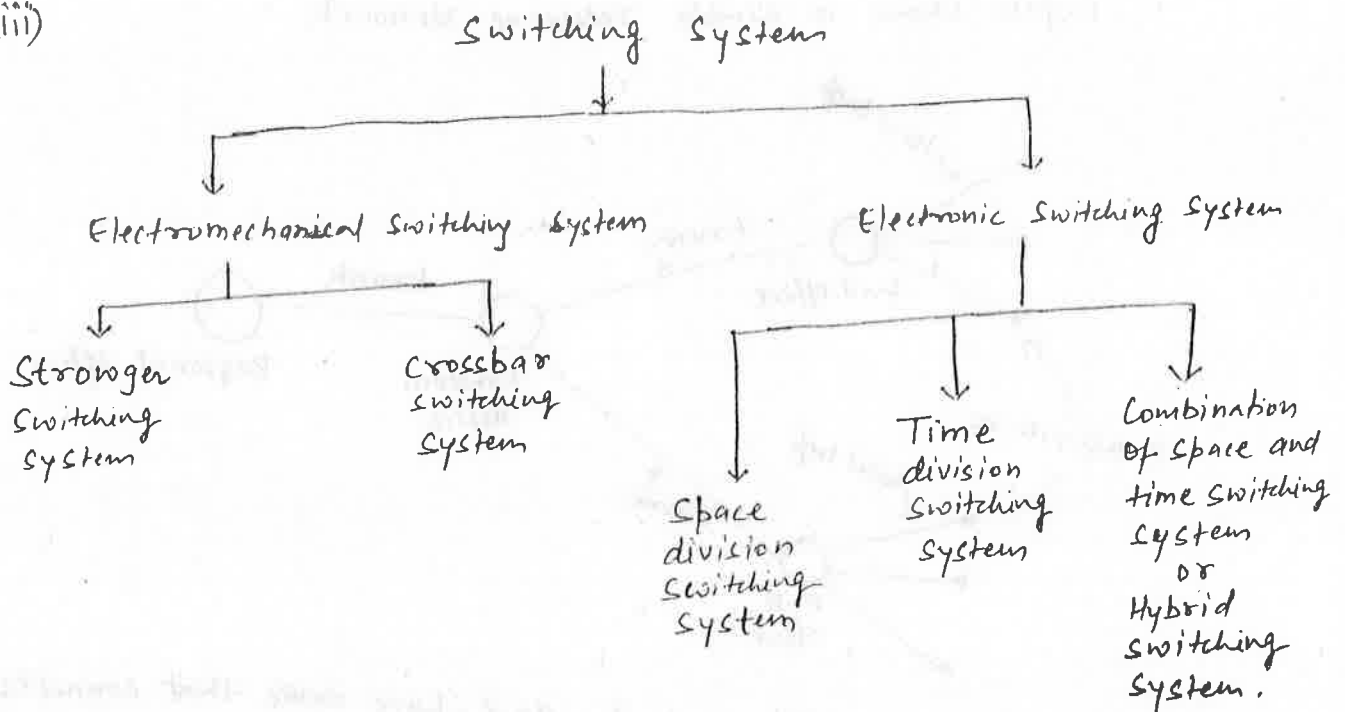
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Set (I) / (H)

Q-3(iii)



Q-4. Telephone Network has three main components -

- (i) Local loop or subscriber's loop
- (ii) Trunk
- (iii) Switching Office

Switching Office is mainly of three types -

- (i) End office or local office
- (ii) Tandem office or toll office
- (iii) Regional office

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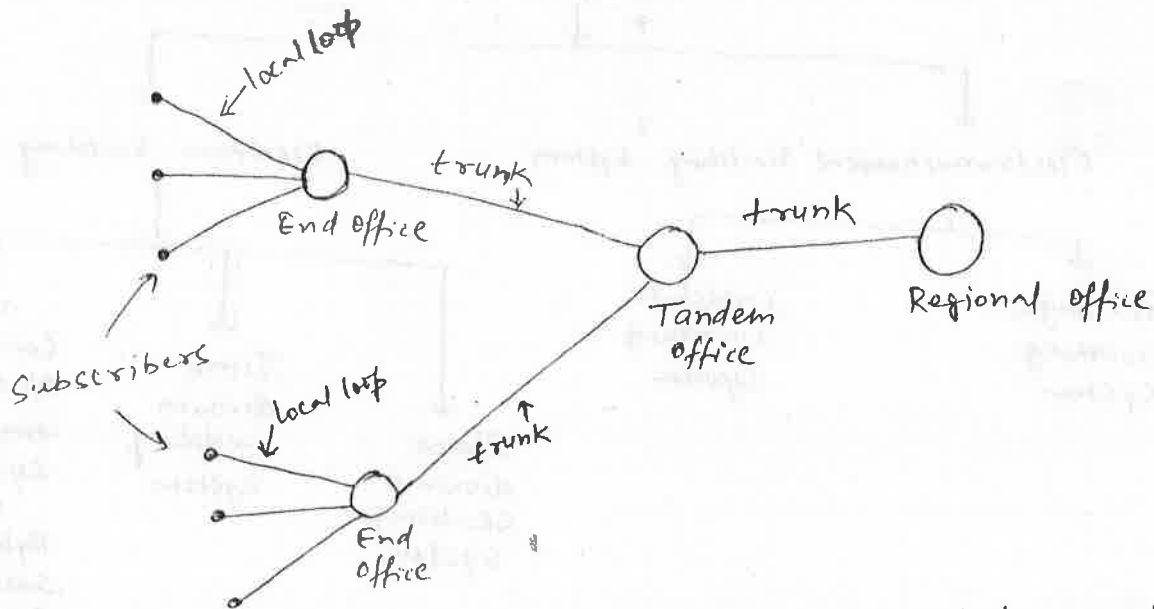
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Sets (I) / (II)

Figure shows a simple Telephone Network



Local loop → It is a twisted-pair cable that connects the subscriber telephone to the nearest end office.

Trunk → Trunk is a transmission medium which connects switching offices. A trunk handles thousands of connections through multiplexing.

Switching office → A switching office connects many local loops or trunks and allows a connection between different subscribers.

End office → It connects many nearby subscribers to each other.

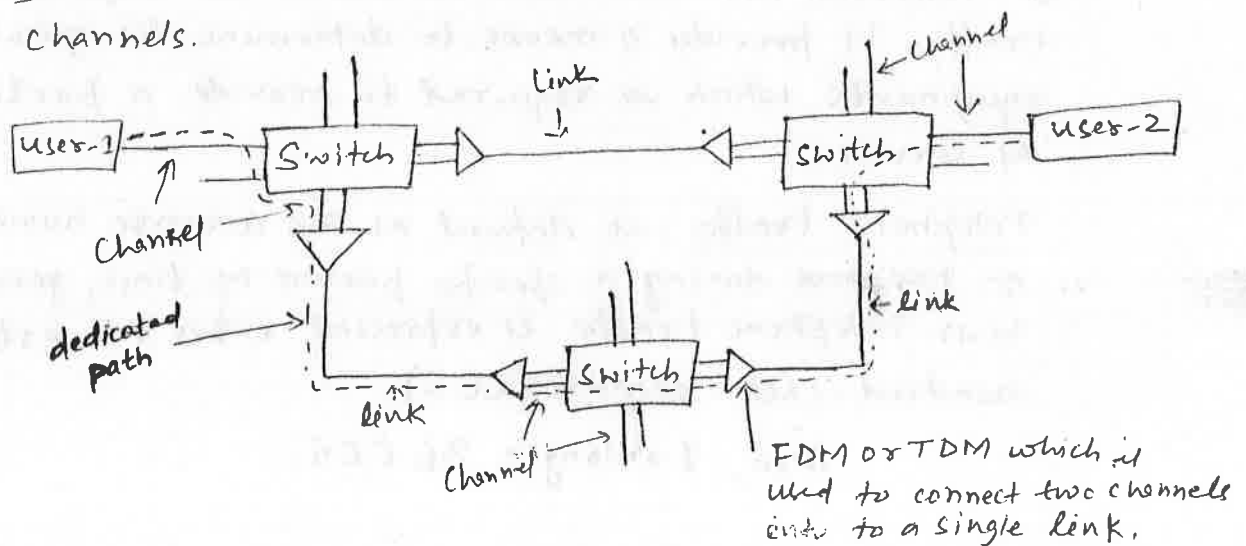
Tandem office → It connects many end offices.

Regional office → It connects many tandem offices.

Q 5. A circuit-switched network has a set of switches. These switches are connected by physical links, in which each physical link is divided into a number of channels by using FDM or TDM.

In this network, a connection between two stations is a dedicated path made of one or more links.

Figure shows a circuit-switched network with three switches and three links. Each link is divided into two channels.



In this figure, user-1 and user-2 are called end systems such as computers or telephones.

user-1 and user-2 are directly connected to switch. When user-1 wants to connect with user-2, then user-1 needs to request all the switches which must be accepted by all switches as well as by user-2 itself. This is called set up phase.

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Sets (I) / (II)

A channel is reserved on each link and combination of channels make a dedicated path over which message is transferred between user-1 and user-2. This is called data transfer phase. When data transfer is over, channels are torn down. This is called connection teardown phase.

Q-6. Traffic Engineering provides a platform for analysis and design a Telecommunication Network to handle a given telephone traffic. It provides a means to determine the quantity of equipments which is required to provide a particular level of service.

Telephone traffic is defined as the average number of calls in progress during a specific period of time, generally one hour. Telephone traffic is expressed either in erlang or hundred-call-seconds (CCS).

Also, $1 \text{ erlang} = 36 \text{ CCS}$.

Busy hour → It is defined as continuous one hour period of time during which number of calls attempts is greatest.

Grade of service → The traffic carried by the network is generally lower than the actual traffic offered to the network by the subscribers. The overload traffic is rejected by the network. The amount of traffic rejected by the network indicates the quality of service offered by the

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Sets (I) / ~~100~~

network and is termed as Grade of Service (GOS).

GOS is given by :-

$$GOS = \frac{\text{traffic lost}}{\text{traffic offered}}$$

$$\text{or, } GOS = \frac{\text{number of calls lost}}{\text{number of calls offered}}$$

← END →

