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### Class Test - 01

01.

- ① @ What do you mean by Telecommunication and Telecommunication Engineering? — (3)
- ② b) Describe switching system with block diagram. — (5)
- ③ c) What do you mean by switching system? Describe various types of switching systems with flow chart. — (6)

02.

- ④ a) Write down the difference between electromechanical and electronic switching systems. — (4)
- ⑤ b) Define Telecommunication Network. — (5)  
Write down the operating principle of a telecommunication network with block diagram.



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- Q3 Describe service specific networks with examples. — (5)
- (a) Write down the difference between Inlets and Outlets. — (3)
- (b) Define switching matrix. Define connections in telecommunication networks with classifications. — (5)
- (c) Describe the essential elements of a switching system with block diagram. — (6)

04.

- (a) Write down the switching mechanisms with block diagram. — (5)
- (b) How does the Touch-tone Telephone operate? — (5)
- (c) Define crossbar switches. Write down the features of crossbar switches. — (4)

Define the networks. Describe briefly various types of data networks. — ⑤

- (b) Write down the switching technique for data transmission? — ⑤
- (c) Write down the difference between store and forward switching vs circuit switching. — ④

- (a) Define System and subsystem. — ②
- (b) Write down the difference between Layer and Entity. — ③
- (c) Write down the layering principles. — ④
- (d) Briefly describe various types of system. — ⑤

- Define LAN with examples. —③
- Write down the advantage and disadvantage of LAN.
- c) Write down the difference between LAN and MAN.
- d) Define Fibre Optic Networks with its characteristics.

08.

- Write down the short note on: —⑭
- i) Message Switching
  - ii) Circuit Switching
  - iii) Folded Network
  - iv) Blocking Network
  - v) Junctions

### Answer to the Question No - 1(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 and computer engineering which seeks to support and enhance telecommunication systems.

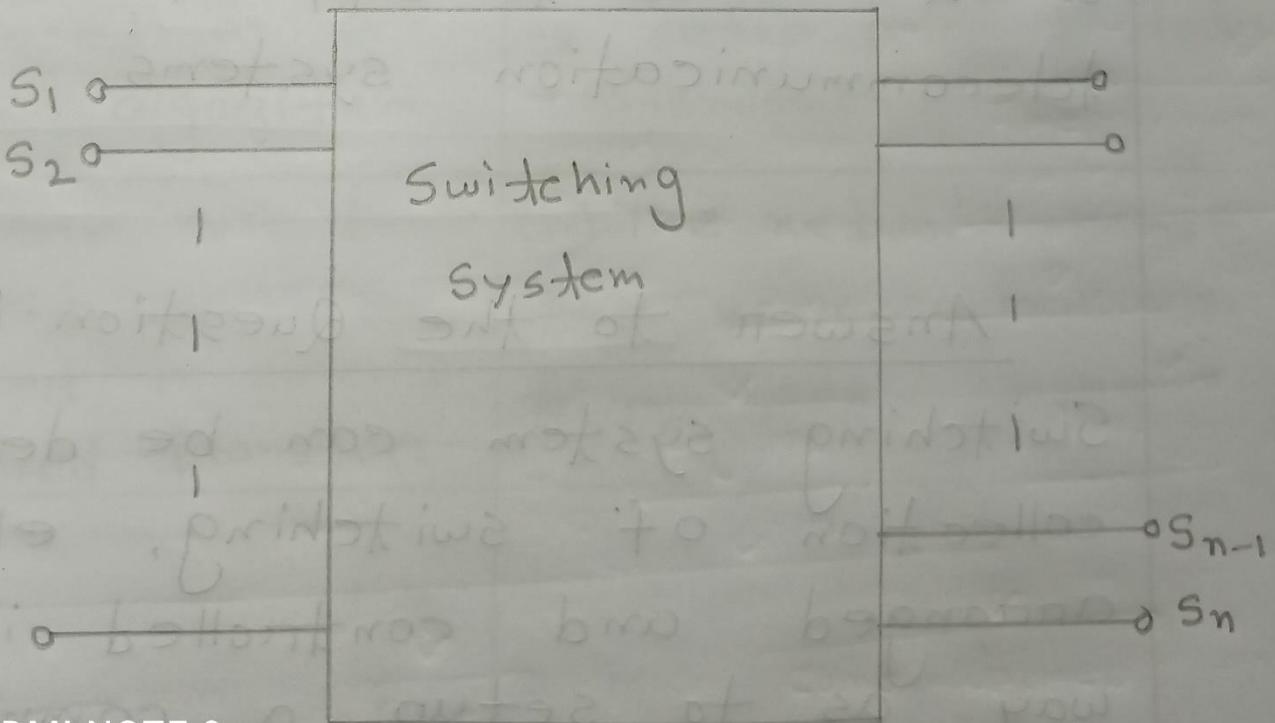
### Answer to the Question No - 1(b)

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

Switching systems reduced the complexity of wiring and made the telephony hassle-free.

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

### Block Diagram of Switching System



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with the introduction of switching system, the need for traditional connections between the subscribers reduced.

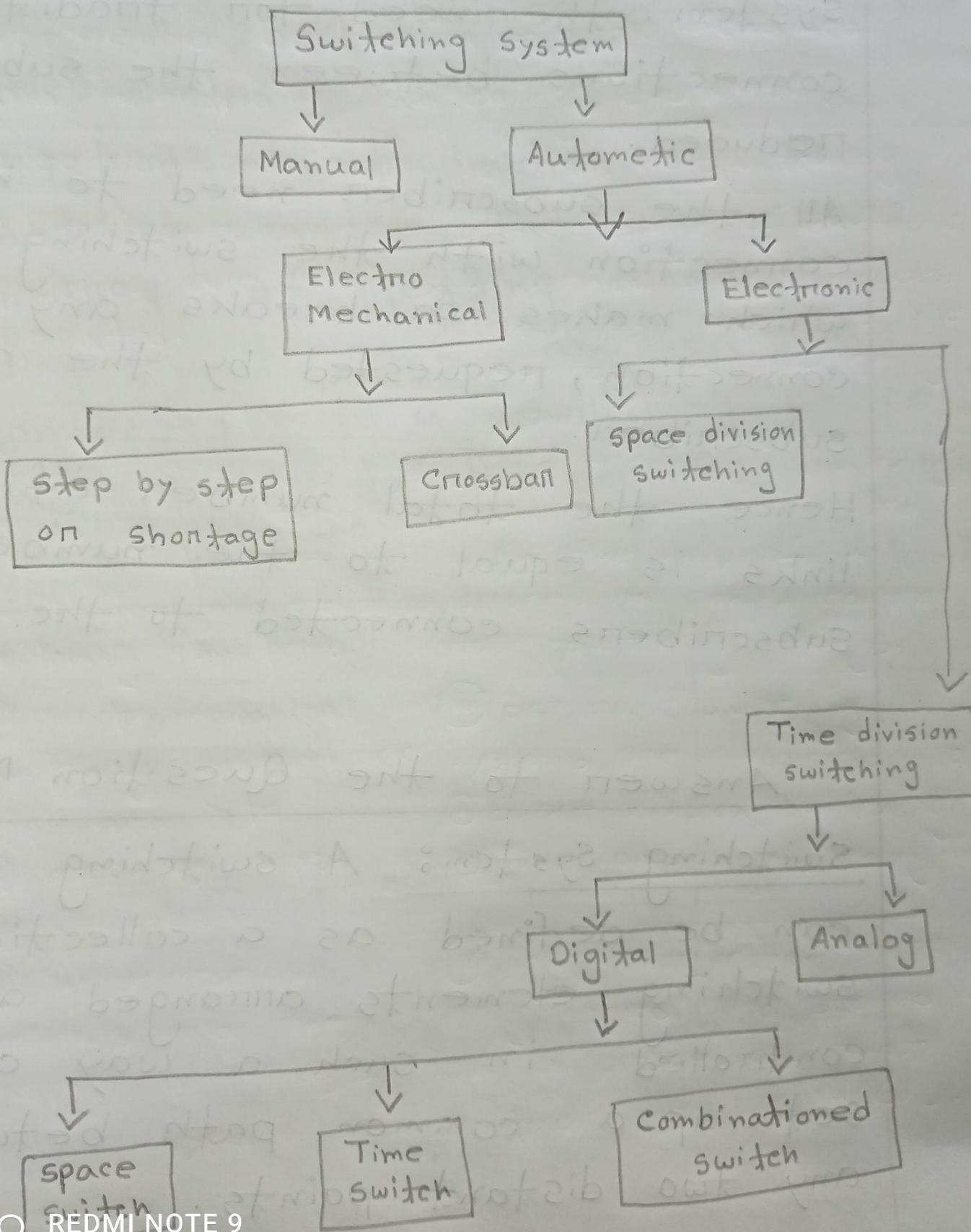
All the subscriber need to have a connection with the switching system, which makes or breaks any connection, requested by the calling subscriber.

Hence, the total number of such links is equal to the number of subscribers connected to the system.

Answer to the Question No-1(c)

Switching System: 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.

# Classification of Switching Systems



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 systems were introduced.

The automatic switching systems are classified into two types.

They are

i) Electromechanical Switching Systems:

Electromechanical switches are electrically operated.

ii) Electronic Switching Systems:

The usage of electronic components such as diodes, transistors and IC's are used for the switching purposes.

## Answer to the Question No - 2(a)

Difference between electromechanical and electronic switching systems:

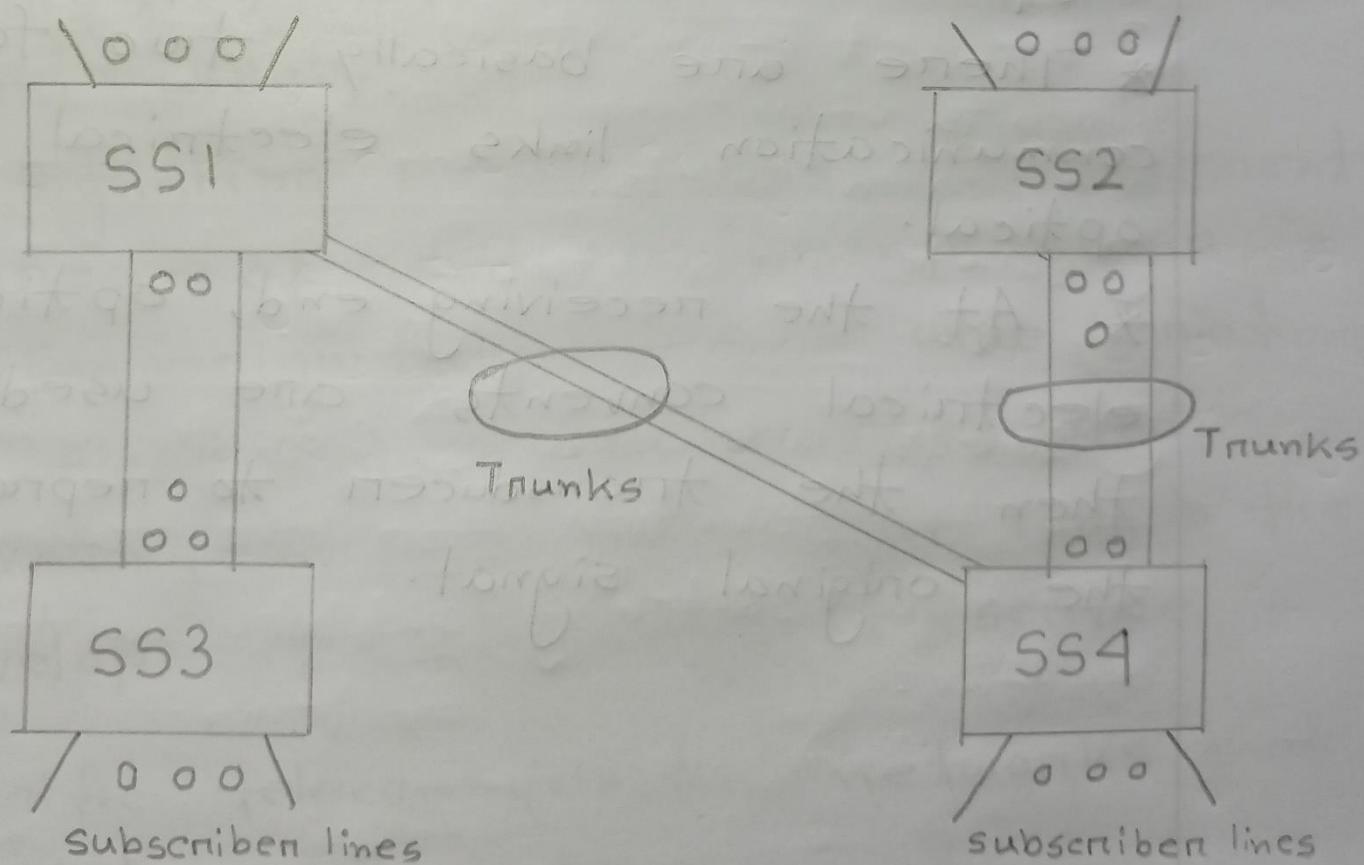
Electromechanical	Electronic Switching
i) Electromechanical switches are electrically operated.	i) The usage of electronic components such as diodes, transistors and IC's are used for the switching purposes.
ii) The electromechanical switching systems are a combination of mechanical and electrical switching systems.	ii) The electronic switching systems are operated with the help of a processor which control the switching things.
iii) Electromechanical switching systems are classified into a) Step-by-step b) Crossbar	iii) Electronic switching systems are classified into a) Space division switching b) Time division switching
iv) The electrical circuits and the mechanical relays are deployed in them.	iv) The instructions are programmed and stored on a processor that control the operations.

Answer to the Question No-2(b)

## Telecommunication Network:

A telecommunication network is a group of systems that establishes a distant call.

Operating principles of telecommunication network: The switching stations provide connection between different subscribers such switching systems can be grouped to form a telecommunication network.



- \* 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 - 2(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 and equipments vary 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:

- (i) Telegraph Network
- (ii) Telen Network
- (iii) Telephone Network
- (iv) Data Network

Answer to the Question No - 3(a)

Difference between Inlets and Outlets:

Inlets	Outlets
i) The set of input circuits of an exchange are called Inlets.	i) The set of output circuits of an exchange are called outlets.
ii) Inlets are denoted by N.	ii) Outlets are denoted by M.
iii) Inlets are used for the function of input switching systems.	iii) Outputs are used for the function of output switching systems.



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Answer to the Question No-3(b)

Switching Matrix: The hardware used to establish connection between Inlets and Outlets is called Switching Matrix.

Connection of Telecommunication Network:

The connection of telecommunication networks can be defined as the process of connecting Inlets and Outlets in the switching Networks.

Types of connections in the Tele-communication Network: There are

four types of connections that can be established in a telecommunication network.

The connections are as follows:

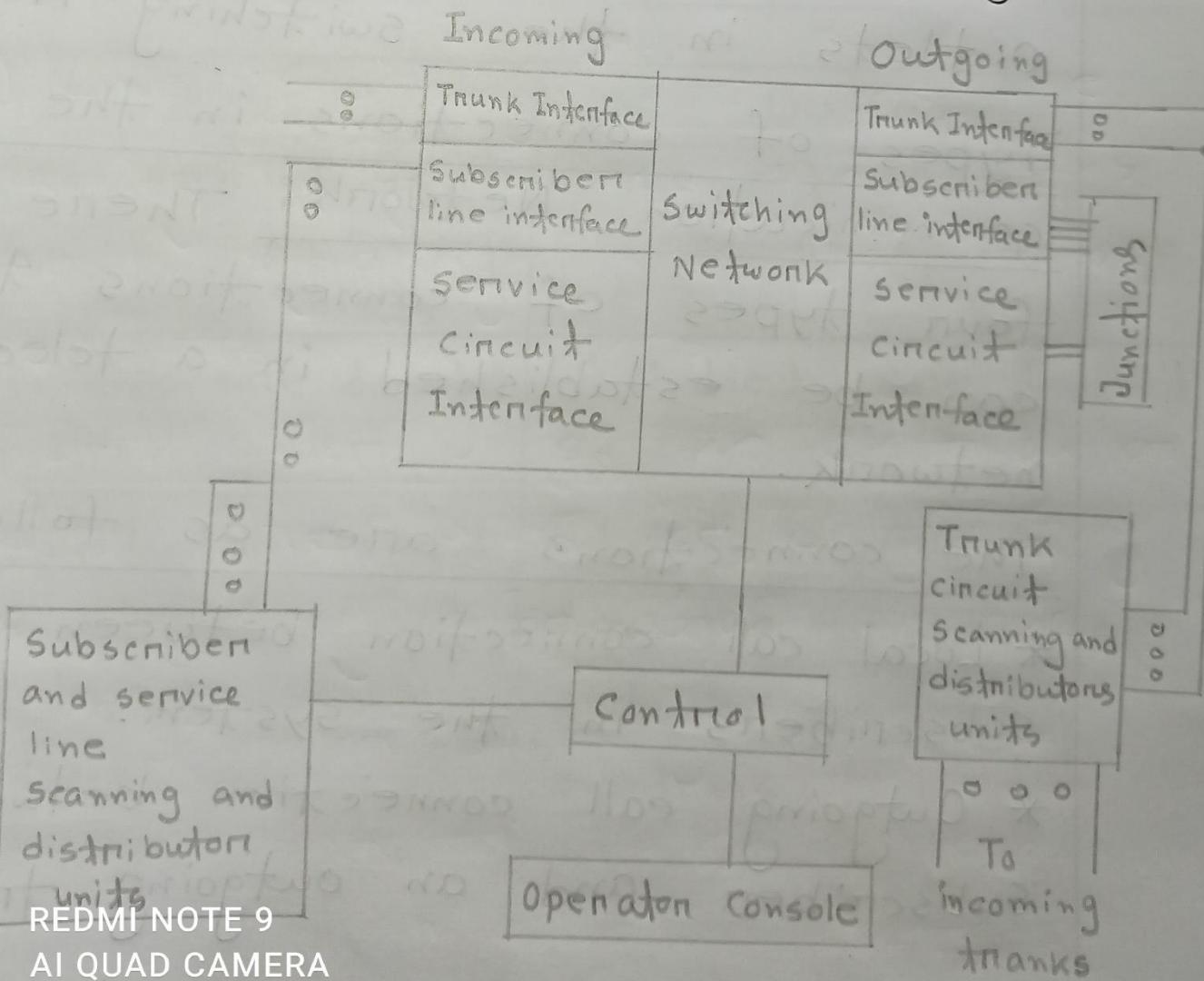
\* Local call connection between two subscribers in the system.

\* Outgoing call connection between a subscriber and an outgoing trunk.

- \* Incoming call connection between an incoming trunk and a local subscriber.
- \* Transit call connection between an incoming trunk and an outgoing trunk.

### Answer to the Question No - 3(c)

The block diagram of the switching system:



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

- i) Switching network: It provides the switching path between the call subscriber and the calling subscribers.
- ii) control Subsystem: This control subsystem controls the making and breaking of the connection by sensing the signal transfer on the lines. It sends out signaling information to the subscribers and other exchanges connected to the outgoing trunks.
- iii) Signaling: The signaling formats and requirements for the subscribers, the trunks and the subsystems differ significantly.

iv) Trunk Interface: The trunk interface is the point where the lines from the subscribers are connected to the system.

v) Subscriber line Interface: The subscriber line interface is the point where the lines from the subscribers are connected to the system.

vi) Line Scanning Unit: The line scanning unit scans and obtains signalling information from the respective lines.

vii) Distribution Units: The distribution units are used for distributing the signaling information on the respective lines.



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(Viii) Operator console: The operator console permits interaction with the switching system for maintenance and administrative purposes.

(ix) Service Circuit Interface: The service circuit interface provides interaction between circuits for maintenance and testing purposes.

(X) Junctions: The junctions is a junction that provides a folded connection for the local subscribers and the service circuits.



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## Answer to the Question No-4(a)

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

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

- i) Circuit switching
- ii) Packet switching
- iii) Message switching

The switching mechanism can be consists of two selections. These selections from the building blocks for the switching systems.

- i) Unit selector switching
- ii) Two-motion selector switching

## Unit Selector Switching Mechanism:

The uni-selector switching mechanism consists of an electromagnet and

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.

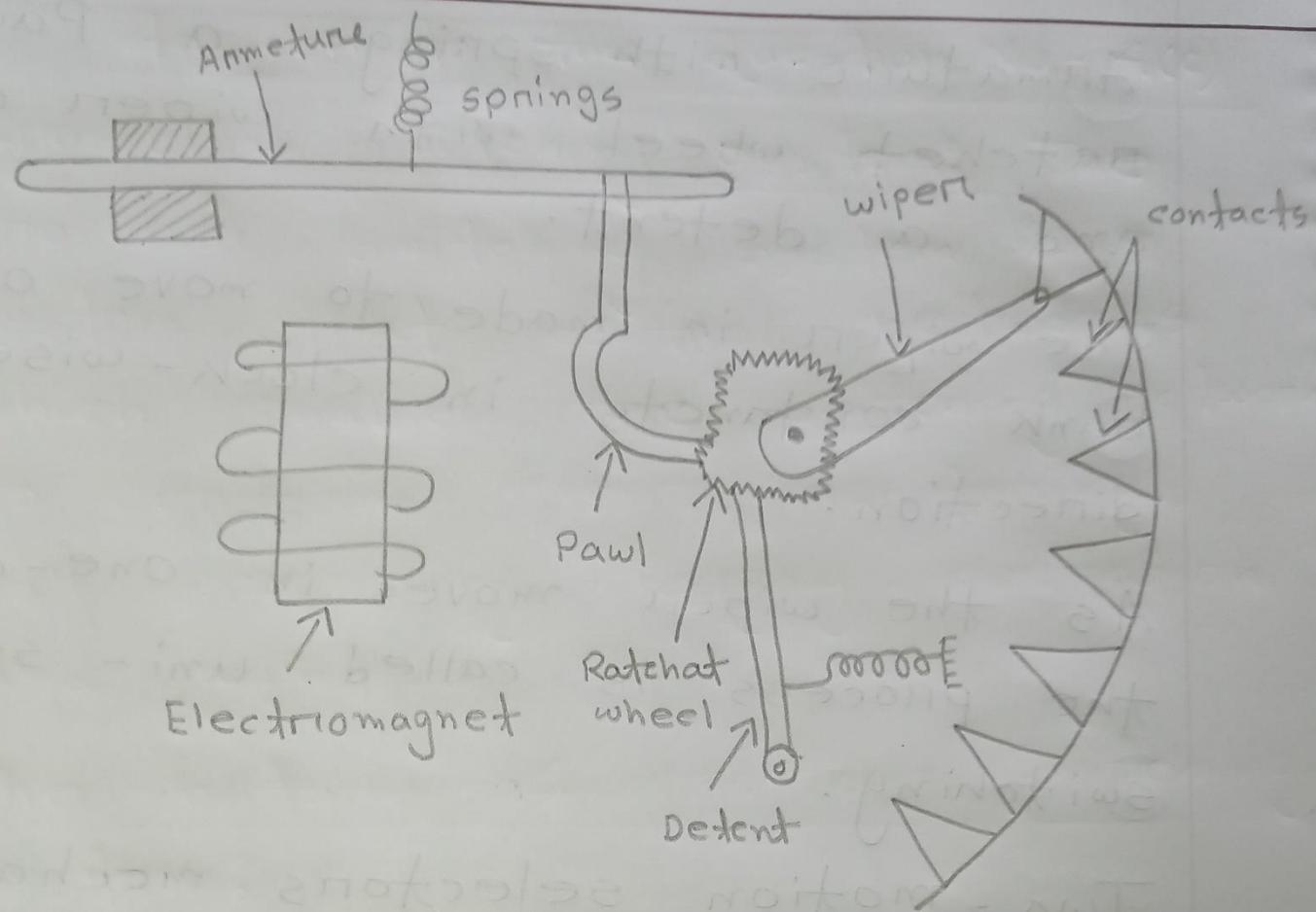
### Two-motion selectors mechanism:

The two-motion selector's mechanism consists of two ways. These are:

i) Vertical

ii) Horizontal

An upward movement is made in vertical and horizontal directions there is no contacts made in the vertical movement.



### Answer to the Question No - 4(b)

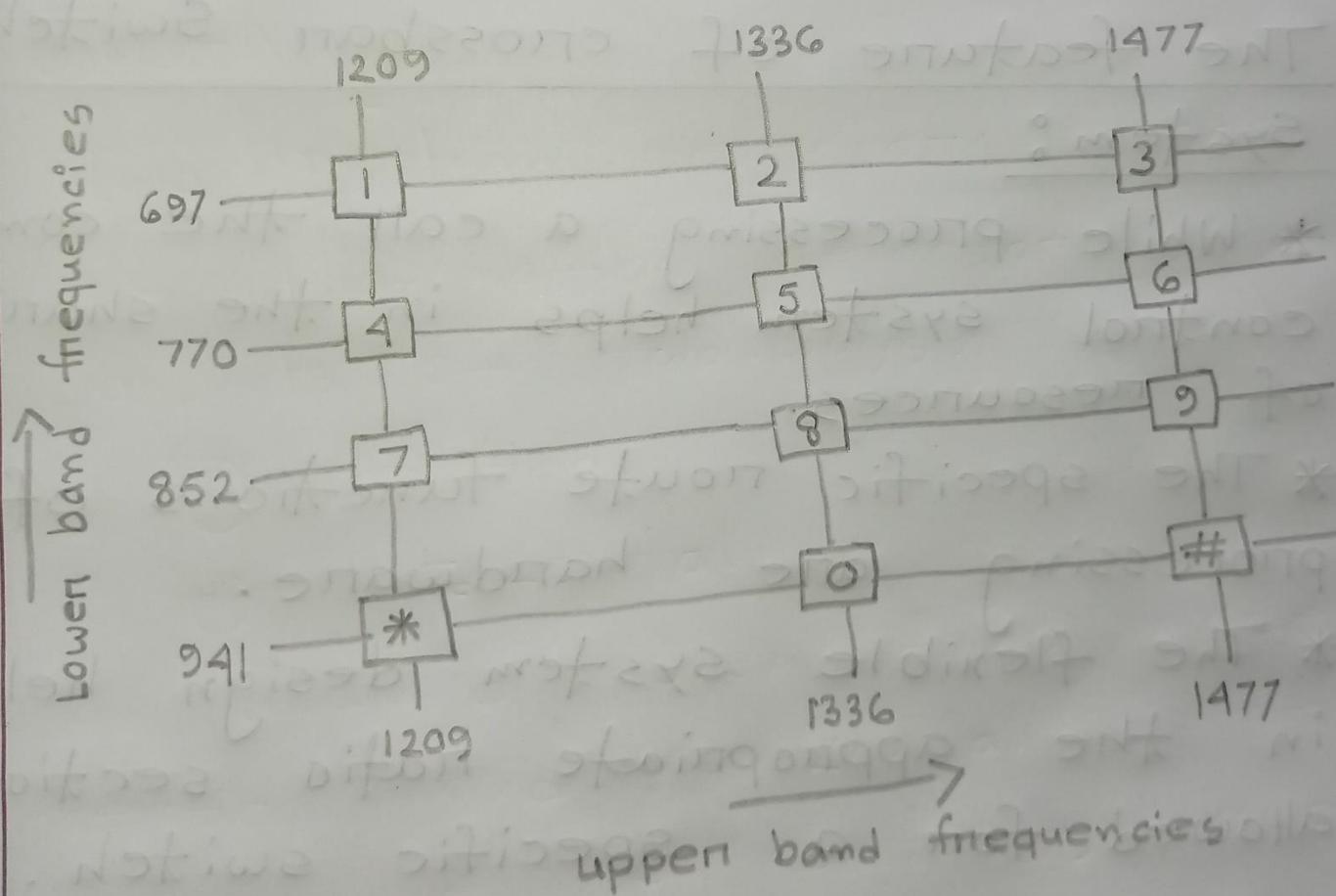
#### Operation of the Touch - tone

Dial - Telephone Operation: The process of button on the touch-tone dial of telephone indicates the number dialed using certain frequencies.

→ Touching.  
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On light pressing of a number generates a  $\rightarrow$  Tone which is a combination of two frequencies one from lower band and the other from upper band.

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



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## Answer to the Question No - 4(c)

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

The feature of crossbar switching system:

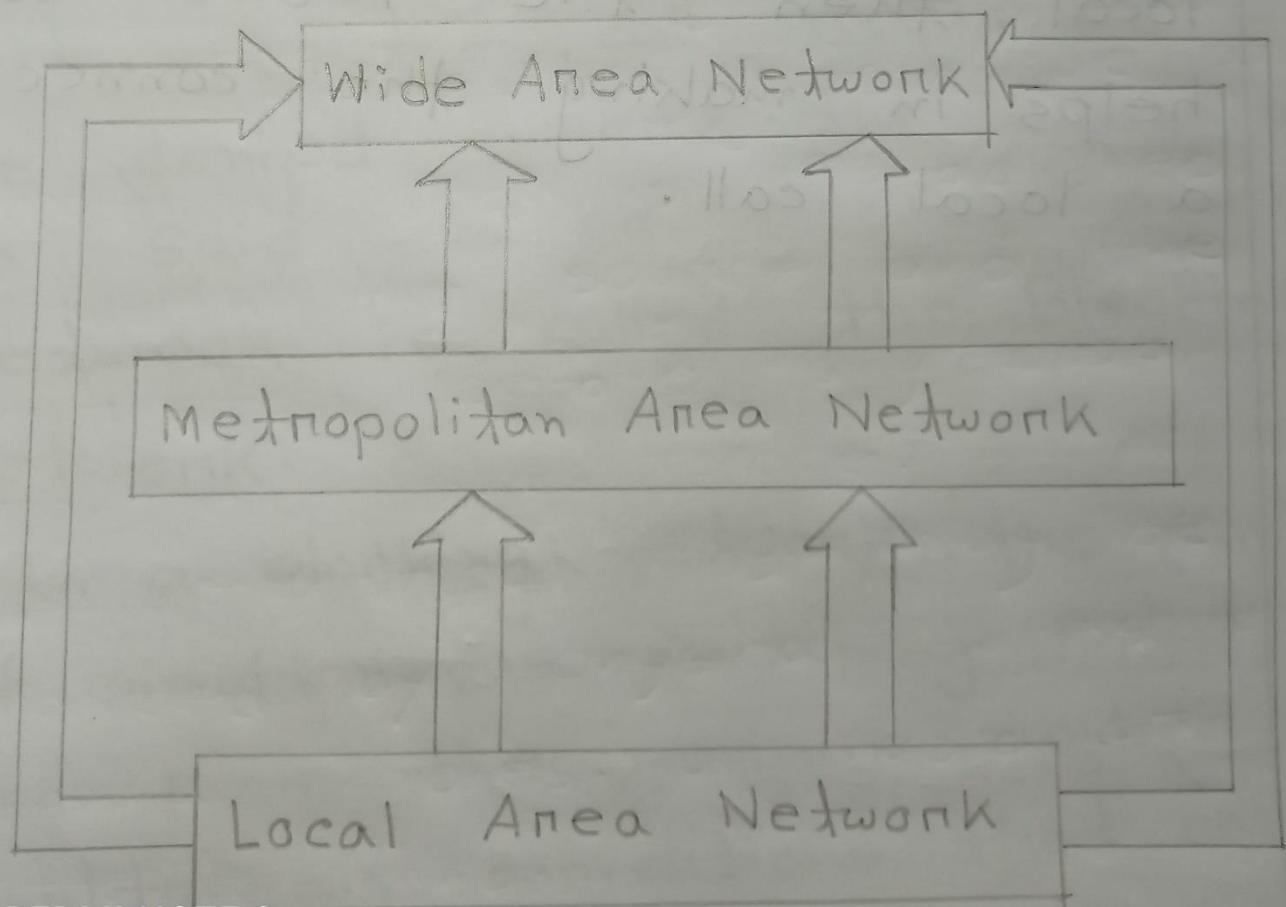
- \* While processing a call the common control system helps in the sharing of resources.
- \* The specific route functions of call processing are hardware.
- \* The flexible system design helps in the appropriate ratio section is allowed for a specific switch.
- \* Fewer moving parts are the main advantage of crossbar switching



## Answer to the Question No-5(a)

Data Network: A data network is a system that transfers data between network access points through data switching system control and interconnection transmission lines.

## Data Network hierarchy:



## Types of Data Network:

- i) Wide Area Network (WAN)
- ii) Metropolitan Area Network (MAN)
- iii) Local Area Network (LAN)
- iv) Personal Area Network (PAN)
- v) Wireless Local Area Network (WLAN)
- vi) Campus Area Network (CAN)
- vii) Storage Area Network (SAN)
- viii) System Area Network
- ix) Virtual Private Network (VPN)
- x) Enterprise Private Network (EPN)
- xi) Passive Optical Local Area Network (POLAN)



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## Answer to the Question No- 5(b)

Switching techniques for data transmission: The switching techniques for data transmission can be classified into two categories. They are given below:

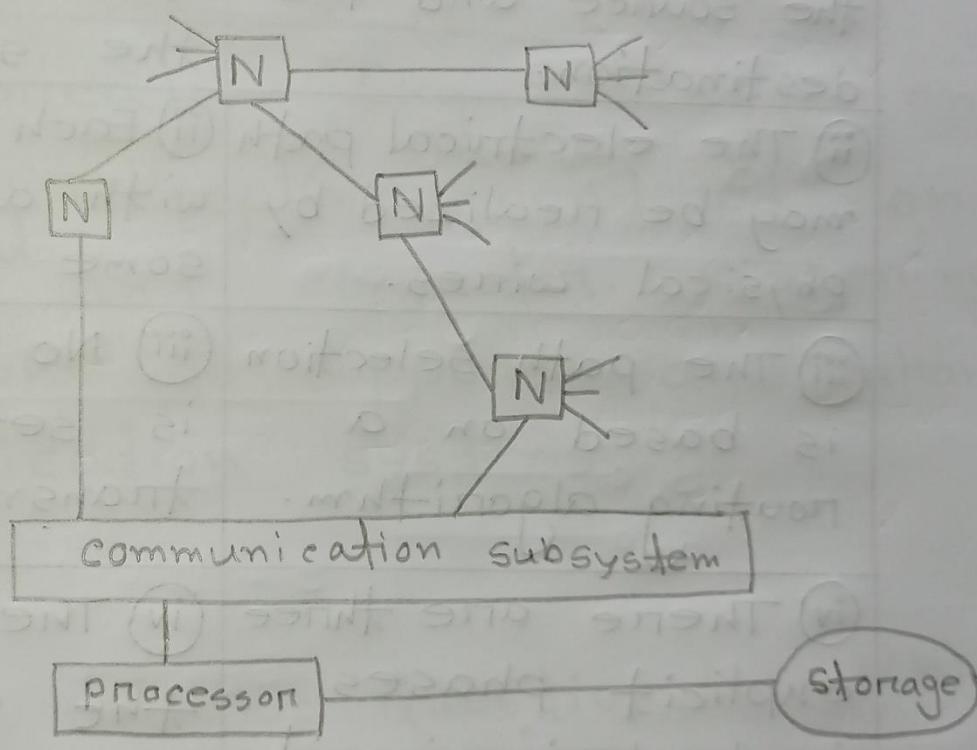
- i) circuit switching Technique
- ii) Store and Forward Technique

### i) Circuit Switching Technique:

In circuit switching technique, 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 co-axial cables, or radio or links.

ii) Store and Forward Switching:  
In store and forward switching network, the switching nodes have the ability to store user messages and forward the same towards the destination as and when the links become available.



## Answer to the Question No - 5(c)

Difference between store and forward switching vs circuit switching:

### Circuit Switching

i) An electrical path is established between the source and the destination.

ii) The electrical path may be realized by physical wires.

iii) The path selection is based on a routing algorithm.

iv) There are three explicit phases involved in circuit switched transfer.

### store and forward switching

i) The switching node have the ability to store user messages and forward the same toward.

ii) Each node is equipped with a processor and some buffer storage.

iii) No end-to-end link is setup prior to data transmission.

iv) The network moves the user information from node to node.

### Answer to the Question No - 6(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 - 6(b)

Difference between Layer and Entity:

Layer	Entity
i) A layer is composed of subsystems of the same rank of all the interconnection systems.	i) The functions in a layer are performed by hardware subsystems or software packages.
ii) The layers are numbered starting at the bottom level.	ii) Entities communicate with peer entities in the adjacent system.

Layer	Entity
iii) Layering is a natural choice for communication architecture.	iii) There is no communication with entities in the intermediate systems.
iv) A layer obtains services from its intermediate lower layer.	iv) Entity obtains services from its intermediate higher layer.

### Answer to the Question No- 6(c)

The layering principles are given below:

- \* Create layers to handle functions which are manifestly different in the process performed.
- \* Collect similar functions into the same layer and create a boundary at point where the number of interactions across the boundary minimized.

\* Create a layer of easily localized functions so that the layer could be totally redesigned and its protocols change.

### Answer to the Question No-6(d)

Describe various types of Layers:

According to OSI model, there are seven types of layers in network.

They are given below:

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



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- \* Physical Layer: This is the most lowest layer of the OSI model. It permits the usage 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 organizes different sessions between cooperating entities and perform related functions.

\* Presentation Layer: The presentation layer represent information to the communication 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-7(a)

ANS: A LAN stands for Local Area Network, which typifies a distributed environment and finds applications in a number of area.

Some examples are:

- \* Office automation
- \* Factory automation
- \* Distributed automation
- \* Fire and security systems
- \* Process control
- \* Document Distribution

Answer to the Question No-7(b)

Advantage and disadvantage of LAN:

Advantages:

- ① Offers a good back up capability in the event of one or two systems.
- ② Provides a resource sharing environment.
- ③ Permits multivendor systems.
- ④ In LAN, the systems are generally so chosen as to meet most of the user.
- ⑤ Operation time is small.

Disadvantages:

- ① High setup cost
- ② Privacy violations
- ③ Data security threat
- ④ LAN maintenance Job
- ⑤ Covers Limited area

## Answer to the Question No-7(c)

### Difference between LAN and MAN:

LAN	MAN
i) LAN stands for Local Area Network.	i) MAN stands for Metropolitan Area Network.
ii) LAN is a group of computers and not work devices connected together.	ii) MAN is a larger network that usually spans several buildings in the same city.
iii) It has short propagation delay than MAN.	iii) It has high propagation delay than LAN.
iv) It covers the smallest area.	iv) It covers the largest area.
v) LAN's ownership is private.	v) MAN's ownership can be public or private.
vi) Easy design and maintenance.	vi) Complex design and maintenance than LAN.
vii) LAN's cost is less than MAN.	vii) MAN's cost is higher than LAN.

## Answer to the Question No - 7(d)

\* Fibre optic: Fibre optic 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 fibre-optic 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-8

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.

80) 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 was designed for voice applications.
  - Example: Telephone

Folded Network: A network where the outlets are connected to the inlets, is called the Folded Network.

\* In a folded network, the number of inlets then the connections are established by  $N/2$ .

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.

⑨ Junctions: The Junctions 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.