

Telecommunication Engineering

CT-01

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IT-17015

2+3

1. a) What do you mean by Telecommunication Engineering ? write down the applications of telecommunication Engineering ? 2+3
- b) what are the difficulties we face in the Telecommunication network? 3
- c) what is switching system ? Describe the switching system . 2+4
2. a) classify the switching system . 5
- b) Draw the block diagram of switching system . 6
- c) Explain briefly about signaling. 3
3. a) With simple circuit describe Telecommunication network. 5
- b) write down the connections type that can be established in a Telephone network. 4
- c) what is dialing ? Explain pl pulse dialing . 5
4. a) write down the features of common control switching system. 3
- b) Draw the block diagram of common control switching system. 5
- c) what is the Quality of service (QoS) ? what are the Q parameters ? Explain in details . 6

1+5

5. a) what do you mean by switching ? describe the switching techniques.

10-15

Networks & BM

b) Differentiate between circuit switching , packet switching and message switching .

5

c) Briefly describe the operation of a basic time division switching .

3

6. a) Explain the technique used for crosspoint design .

6

b) Describe touch tone dial Telephony with associated figure

5

c) what are the main design considerations for touch tone signaling systems .

3

7. a) Classified Data networks according to the geographical areas .

3

b) Describe ISO-OSI Reference model with figure .

6

c) what do you mean by congestion ? Define store and forward switching .

2+3

8. a) what are the techniques used for congestion control ?

2

b) Describe LAN, MAN and Fiber optics

6

c) write down the different types of error control mechanism .

3

d) classify the routing algorithm .

3

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(a) Ans to the Question no-1(a)

Q) What do you mean by Telecommunication Engineering? What are the applications of Telecommunication Engineering.

Ans:

Telecommunication Engineering: Telecommunication engineering is a discipline founded around the exchange of information across channels via wired or wireless means. It brings together all of the elements of electrical engineering, including computer engineering and system engineering to create and improve telecommunications systems.

Applications:

Telecommunication engineering is an important area of applications for electronic circuits. Telecommunication handle different types of technology that helps us to communicate. They research, design, develop and manage satellite and cable systems, mobile phones, radio waves, the internet and email.

Ans to the Question no-1(b)

b) What are the difficulties we face in telecommunication engineering?

Ans:

- ↳ Need to keep up with technology.
- ↳ Need to be updated regularly.
- ↳ Security threats
- ↳ Lack of skilled person.
- ↳ Lack of training equipment tools and resources.

Ans to the question 1(c)

c) What is switching system? Describe the switching system.

Ans:

switching systems: The network connection can't be simply made with telephone sets and bunch of wires, but a good system is required to make or break connection. This system is known as 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.

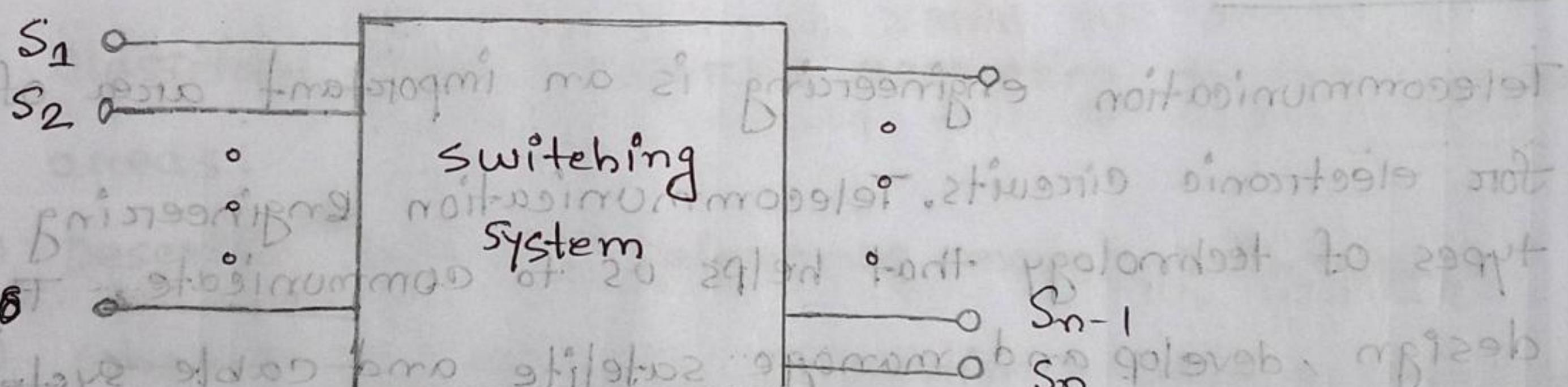


Fig: switching systems

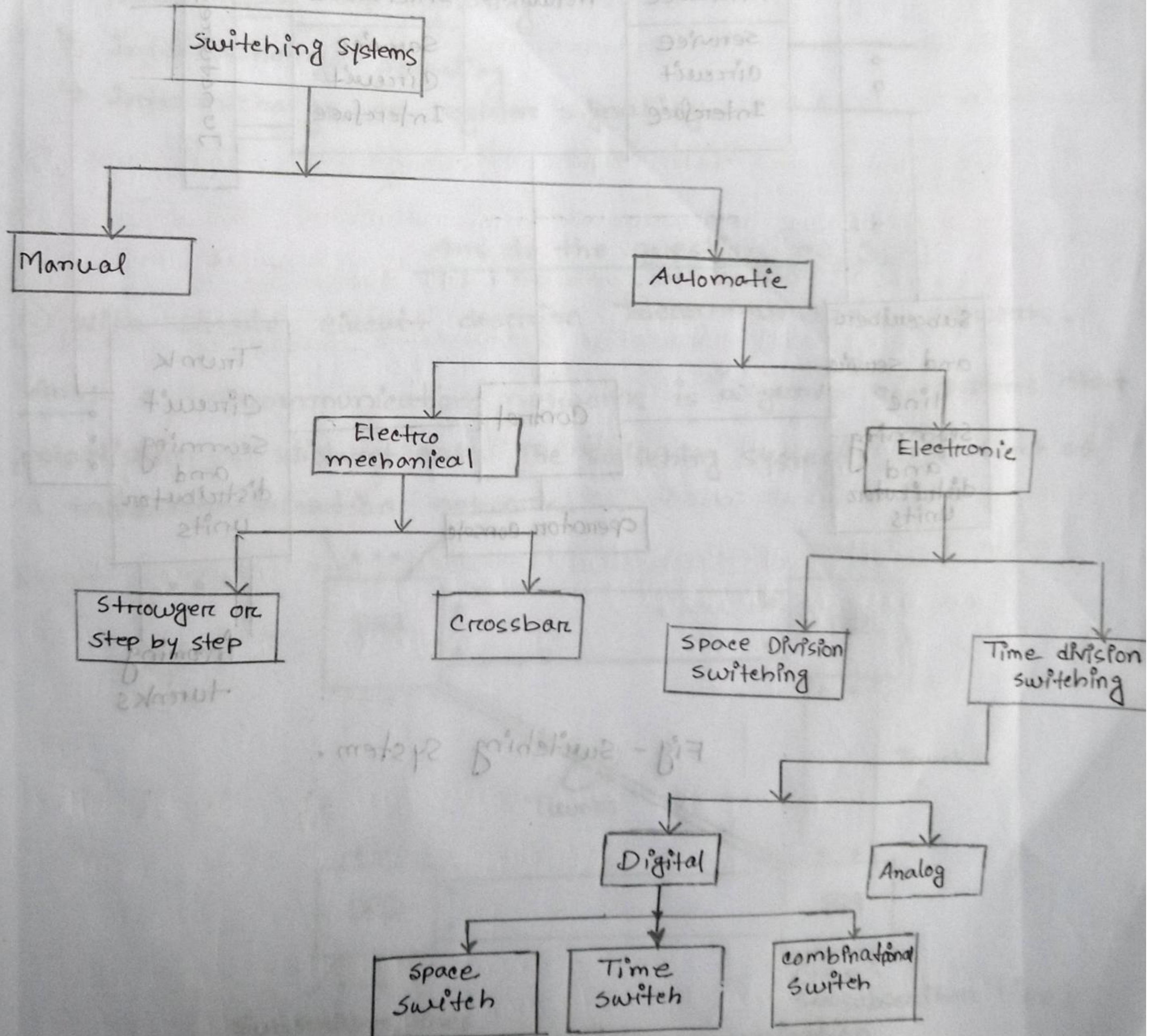
With the introduction of switching systems, the need for traditional connections between the subscribers reduced. All the subscribers need to have a connection with the switching systems, which makes more or breaks any connection, requested by the calling subscriber. The switching systems, which is also called the Telephone exchange, takes care of establishing the calls. Hence the total number of such link is equal to the number of subscribers connected to the system.

Ans to the Question no 2(a)

Q) classify the switching systems

Ans:

Classification of switching Systems: The following flowchart shows how the switching systems were classified.



Ans to the question no-2 (b)

b) Draw the block diagram of switching system.

Ans:

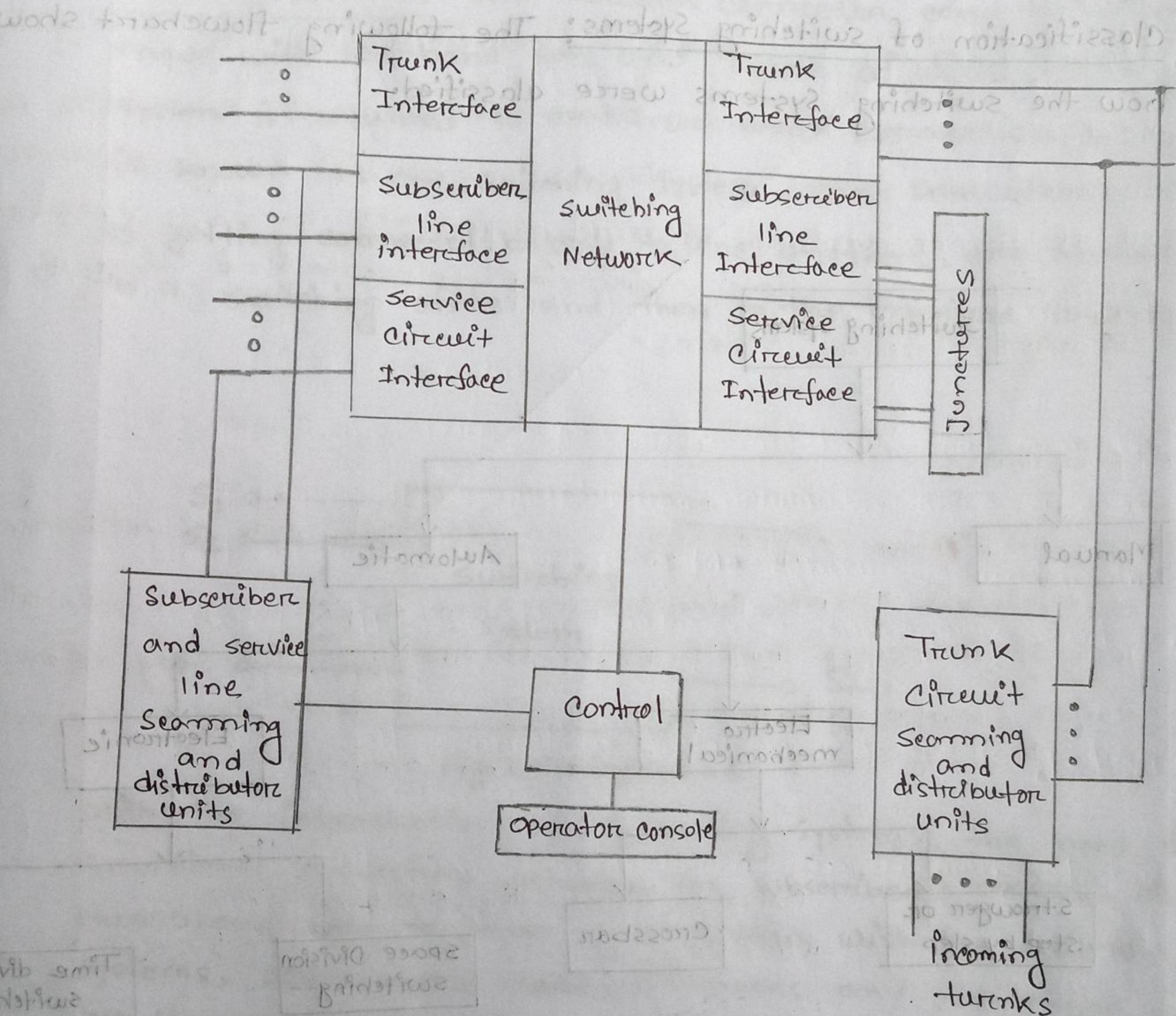


Fig - switching system.

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Ans to the question no-2(c)

c) Explain briefly about signaling.

Ans:

signaling: The signaling formats and requirements for the subscribers, the trunks and the sub-systems differ significantly. According to a switching system provides for three different forms of signaling:

- ↳ Subscriber loop signaling
- ↳ Interexchange signaling
- ↳ Intraexchange or register signaling.

Ans to the question no-3(a)

a) With simple circuit describe telecommunication network.

Ans: A telecommunication network is a group of systems that establishes a distant call. The switching systems are part of a telecommunication network.

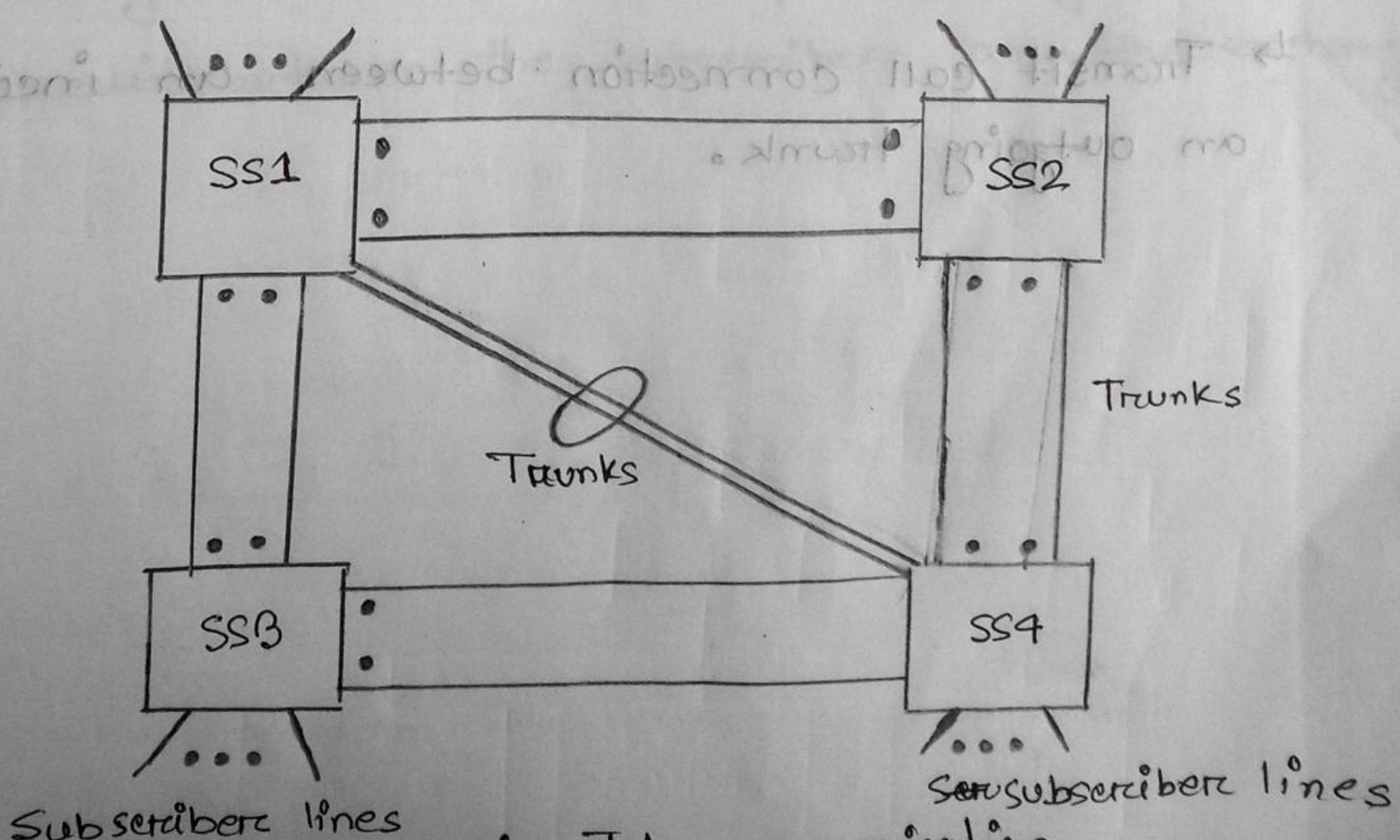


Fig - Telecommunication

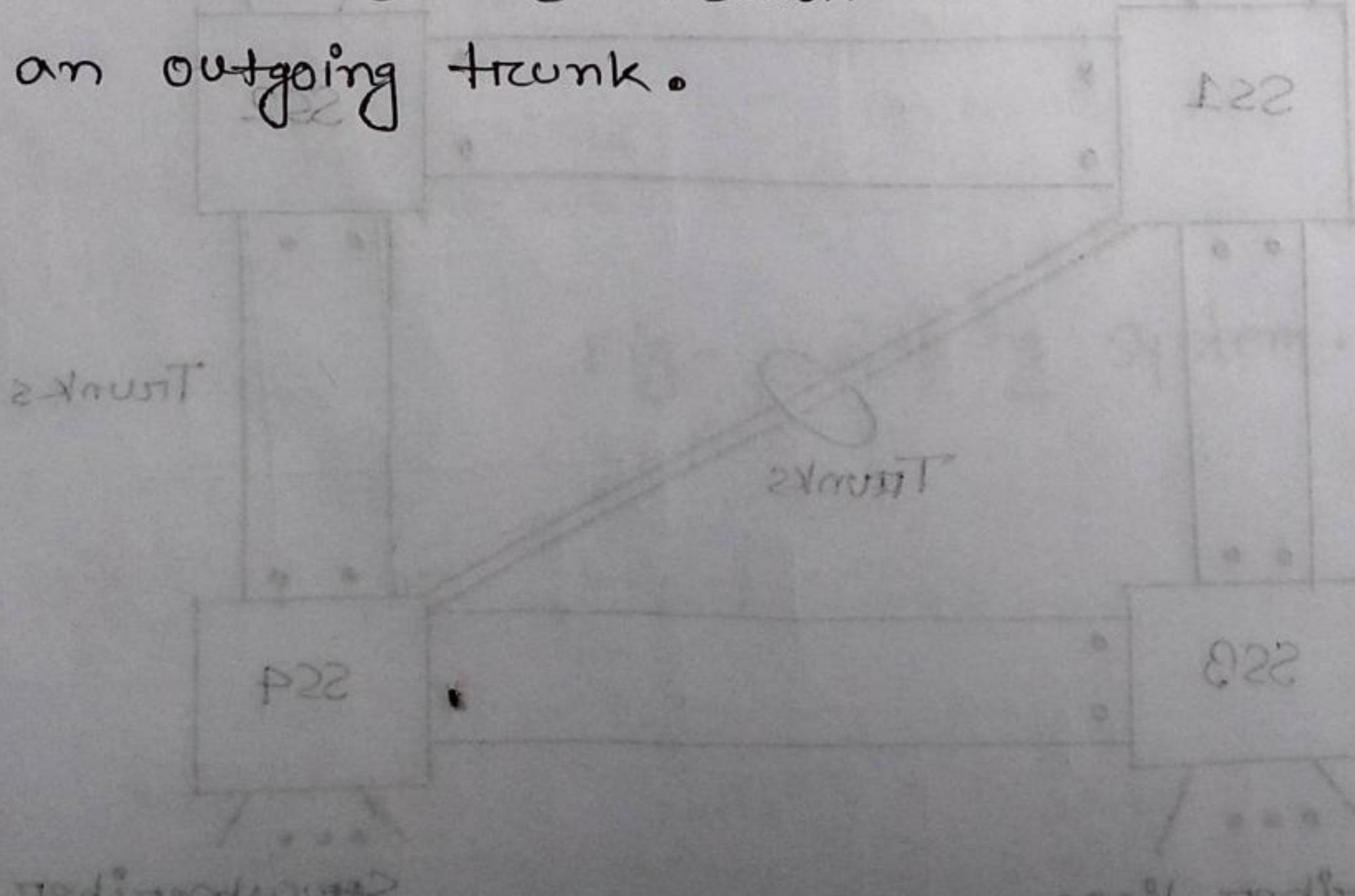
From the early to the later stages of the 20th century (1900-80) when a person needed to make a distant call, the call was first routed to the operator at the nearest switching center and then the number and location of the called subscriber was noted down. Hence, the job of the operator was to establish a call to the remote switching center and then calling subscriber to establish the connection.

Ans to the question no - 3(b)

b) Write down the connections type that can be established in a telephone network.

Ans: There are four types of connections that can be established in a telephone telecommunication network. These are as follows:-

- ↳ Local call connection between two subscribers and in the systems.
- ↳ 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.



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Ans to the question no-3(c)

c) What is dialing? Explain pulse dialing.

Ans:

Dialing: Dialing is the action of initiating a telephone call by operating the rotary dial or the telephone keypad of a telephone.

Pulse dialing: As the name implies, the digits that are used to identify the subscribers are represented by a train of pulses. The number of pulses in a train is equal to the digit value it represents excepts in case of zero, which is represented by 10 pulses. Successive digits in a number are represented by a series of pulse trains. These pulses have equal number of time intervals and are the number of pulses produced will be the according to the number dialed.

Two successive trains are distinguished from one another by a pause in between them known as the Inter-digit gap. The pulses are generated by alternately breaking and making the loop circuit between the subscriber and the exchange.

Ans to the question no-4(a)

a) Write down the features of common control switch system.

Ans:

Common Control Subsystem:

↳ Exchange Identifier + subscriber link identifier.

↳ Event monitoring

↳ Call processing

↳ Charging

↳ Operation and maintenance

↳ Map in memory

↳ Map in network

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Ans to the question no-4(b)

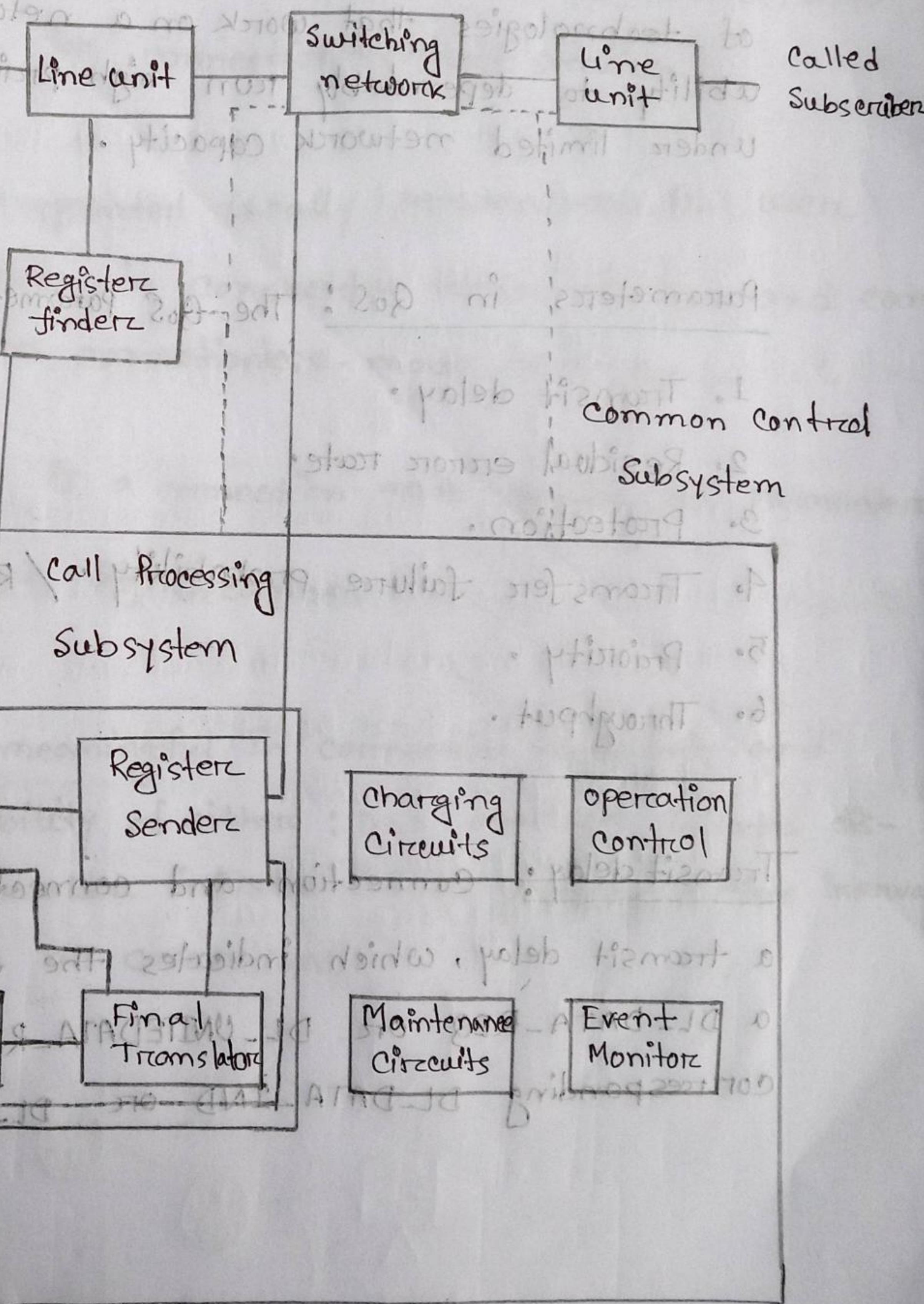
b) Draw the block diagram of common control sub-system.

Ans:

The below block diagram is a simple indication of the common control switching system.

calling

Subscribers



Ans to the question no-4 (c)

Q) what is the Quality of Service (QoS) ? what are the QoS parameters ? Explain in details.

Ans:

Quality of Service (QoS): Quality of Service (QoS) is a set of technologies that work on a network to guarantee its ability to dependably run high priority applications and traffic under limited network capacity.

Parameters in QoS: The QoS parameters are given below-

1. Transit delay.
2. Residual error rate.
3. Protection.
4. Transfer failure probability / Resilience.
5. Priority.
6. Throughput.

Transit delay: Connection and connectionless modes can specify a transit delay, which indicates the elapsed time between the a DL-DATA-REQ or DL-UNITEDATA-REQ primitive and the corresponding DL-DATA-IND or DL-UNITEDATA-IND primitive.

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Residual Error rate: is the ratio of total incorrect, lost and duplicate DLSDUs to the total DLSDUs transferred between DLS users during a period of time.

Protection: Protection is negotiated locally between each DLS user and the DLS provider in connection mode service, and can also be specified for connectionless mode service.

Priority: Priority is negotiated locally between each DLS user and the DLS provider in connection mode service, and can also be specified for connectionless-mode service.

Throughput: Throughput is a connection mode service QoS parameter that has end to end significance.

Resilience: Ret-R is meaningful in connection mode only, and represents the probability of either: DLS provider initiated disconnectors or DLS provider initiated resets during a time interval of 10,000 seconds on a connection.

Ans to the question - 5(a)

a) what do you mean by switching? Describe the switching techniques.

Ans:

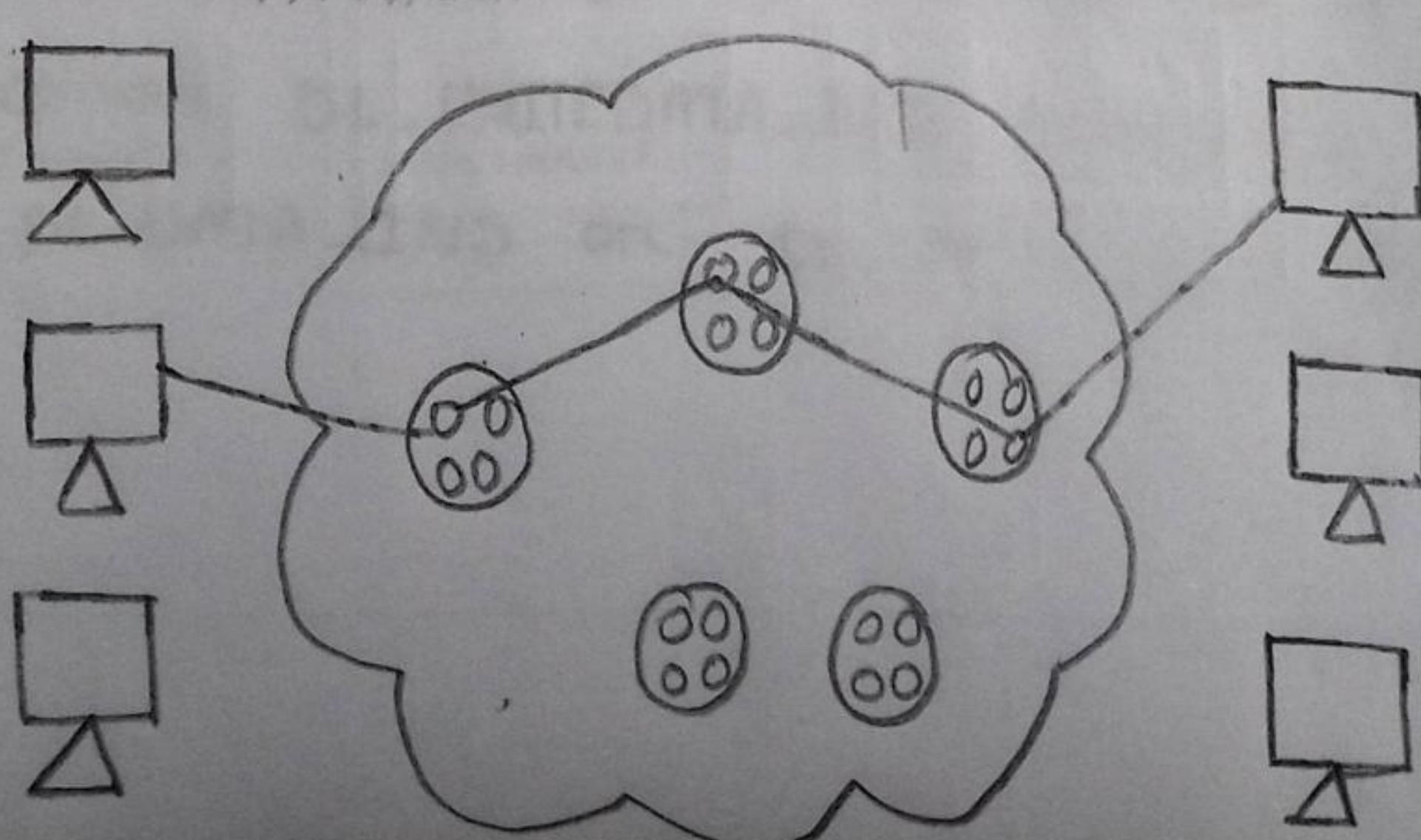
Switching: In large networks, there may be more than one path for transmitting data from the sender to the receiver. Selecting a path that data must take out of the available options can be understood as switching.

Switching technique: There are typically three typical switching techniques available for digital traffic. They are :-

- ↳ Circuit switching
- ↳ Message switching
- ↳ Packet switching

Circuit Switching: Two nodes communicates with each other over a dedicated communication path. In this, a circuit is established to transfer the data. These are:-

- ↳ Establishing a circuit
- ↳ Transferring the data
- ↳ Disconnecting the circuit



Application of circuit switching:

↳ Was designed for voice applications.

↳ Telephone is the best suitable example.

Message switching:

In message switching, the whole message is treated as a data unit. The data is transferred in its entire circuitry. A switch working on a message switching, first receives the whole message and buffers it until there are resources available to transfer it to the next hop. If the next hop is not having enough resources to accommodate large size message, the message is stored switch waits.

Packet switching:

The packet switching technique is derived from message switching whence the message is broken down into smaller chunks called packets. The header of each packet contains the switching information which is then transmitted independently. The header contains details such as source, destination and intermediate node address information. The intermediate networking devices can store small size packets and don't take many resources either on the carrier path or in the internal memory of switches.

Application:

↳ Used in both voice and data transfer.

Ans to the question no - 5(b)

b) Differentiate between circuit switching and packet switching.

Ans:

Circuit switching

Packet switching

- | Circuit switching | Packet switching |
|--|--|
| 1. Connection oriented. | 1. Connection less. |
| 2. It's more reliable. | 2. Less reliable. |
| 3. Transmission of data is done by the source. | 3. Not only by the source but also by the intermediate routers |
| 4. Call set up is not required. | 4. Call setup is ^{not} required. |
| 5. It is store and forward technique. | 5. It is store and forward technique. |
| 6. All packets use same path. | 6. Packets travel independently. |
| 7. wastage of resources are more. | 7. Less wastage of resources. |
| 8. Initially designed for voice communication. | 8. Initially designed for data transmission. |

Ans to the question no - 5(e)

c) Briefly described the operation of a basic time division switching.

Ans: The switching scheme used by the electronic switching systems may be either space Division switching or Time Division switching. Time division switching comes under digital switching techniques, where the pulse code modulated signals are mostly present at the input and output ports.

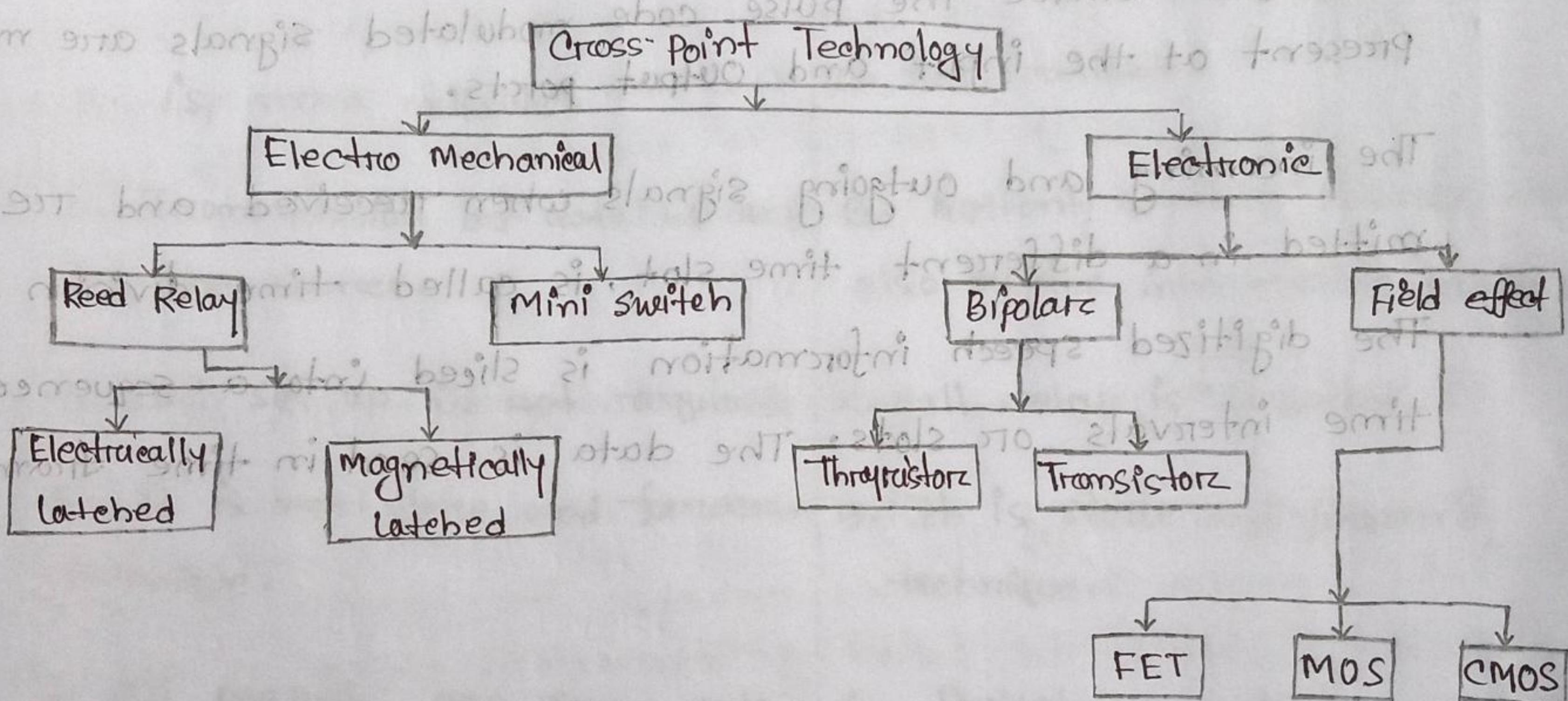
The incoming and outgoing signals when received and re-transmitted in a different time slot, is called time division switching. The digitized speech information is sliced into a sequence of time intervals or slots. The data is sent in time frames.

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Ans to the question no - 6(a)

a) Explain the technique used for crosspoint design.

Ans: The flowchart given below shows the different categories of the Crosspoint Technology:



In the process of finding the solutions to the existing challenges, the crosspoint technology evolved. Crosspoint technology is an amalgamation of two related technologies. The technologies are:

- ↳ Electromechanical
- ↳ Electronic

Electromechanical crosspoint switches which are capable of making and breaking contacts in 1-10ms of time duration for several millions times without any wear and tear are being

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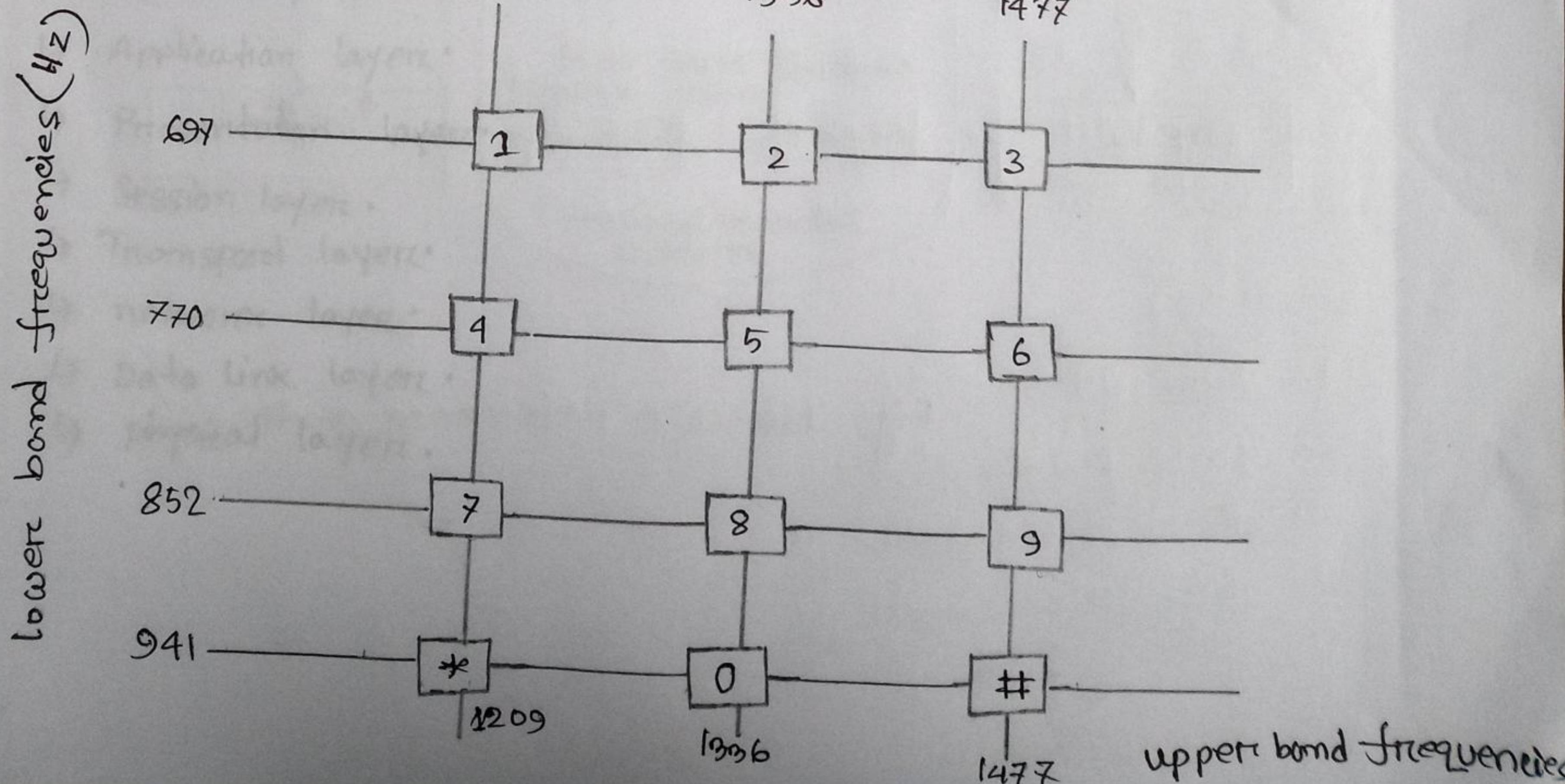
extensively used even today. The two types of switches widely used are mini switches and Reed relay.

Ans to the question no - 6(b)

b) Describe touch tone dial telephony with associated figure.

Ans: The press 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 from upper band.

For example, by pressing the button 9, two frequencies such as 852 Hz the lower frequency and 1477 Hz the upper frequency are produced. The design of touch-tone dialing producing two frequencies is as shown below:



Ans to the question no - 7(a)

- a) Ans: Classified data networks according to the geographical areas.

Ans: Data networks are classified according to their geographical coverage. These are :-

- ↳ Wide area network (WAN)
- ↳ Metropolitan area network (MAN)
- ↳ Local area networks (LANs)

Ans to the question no - 7(b)

- b) Describe ISO-OSI Reference model.

Ans: The ISO-OSI model is a seven layer architecture. It defines seven layers or levels in a complete communication system. They are :

- ↳ Application layer.
- ↳ Presentation layer.
- ↳ Session layer.
- ↳ Transport layer.
- ↳ network layer.
- ↳ Data link layer.
- ↳ physical layer.

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The below figure is the representation of the OSI model, showcasing all the layers and how they communicate with each other.

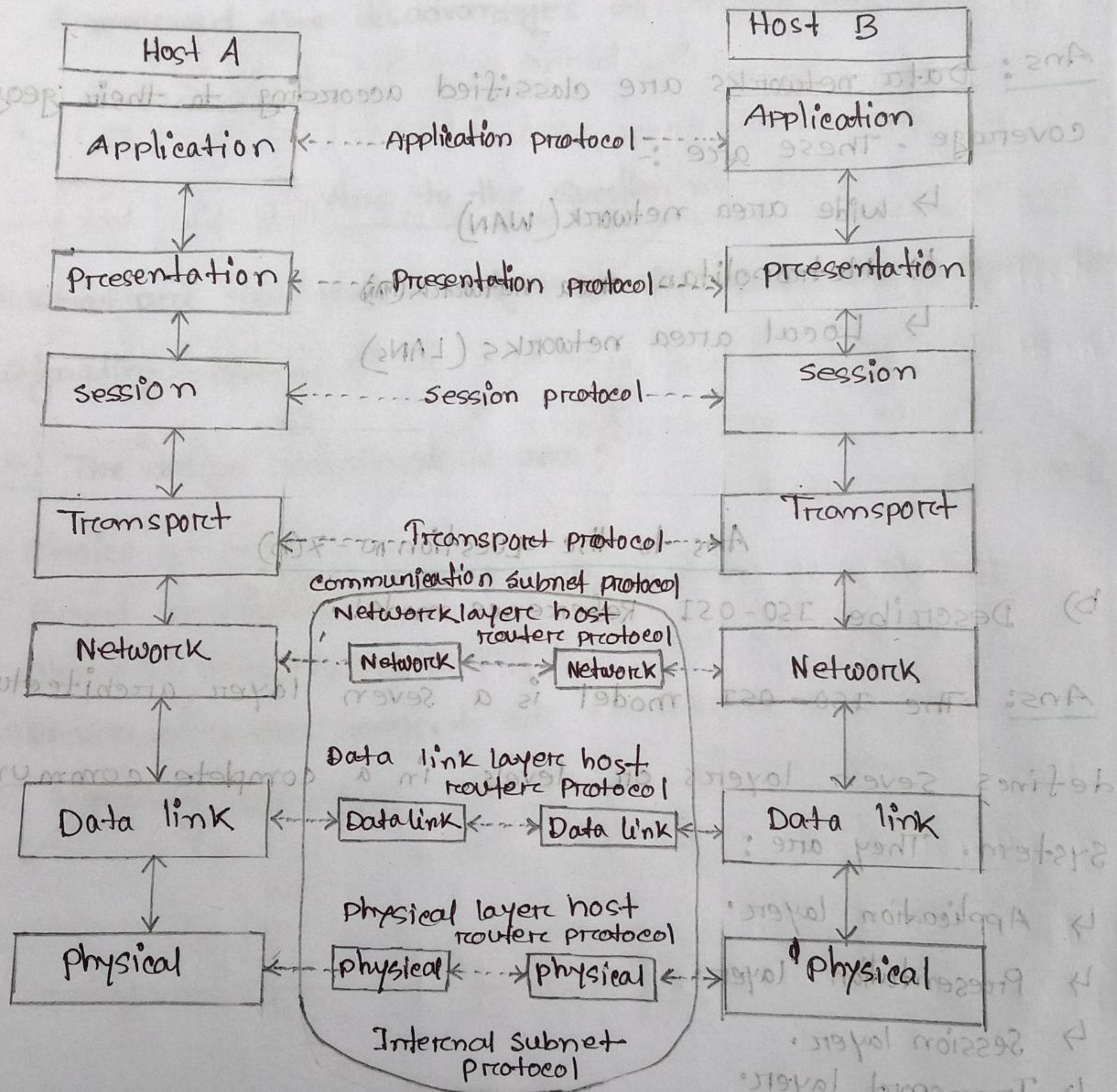


Fig- ISO-OSI reference model.

(Q) Ans to the conges question no-7(c)

Q) What do you mean by congestion? Define store and forward switching.

Ans:

Congestion: When too many packets arrive at the port in a packet switched network, then the performance degraded and such a situation is called congestion.

Store and Forward switching: Store and forward is a

telecommunication techniques in which information is sent to an intermediate station where it is kept and sent at a later time to the final destination or to another intermediate station.

Example:

- ATM
- Frame relay
- ISDN
- FDDI

Ans to the question no-8(a)

a) what are the techniques used for congestion control?

Ans: The techniques used for congestion control are of two types:- These are :-

1. Open Loop Congestion control - which produces protocols to avoid congestion.
2. Closed loop congestion control - which produces protocols that allow the system to enter the congested state and then detect and remove the congestion.

Ans to the question no-8(b)

b) Describe LAN, MAN and fiber optics.

Ans:

LAN : LAN stands for local area network, is usually privately owned and links the device in a single office, building or campus. LAN are designed to allow resources to shared between personal computers or workstations.

Examples:

1. Office automation.
2. Factory automation.
3. Process control.
4. Distributed computing.

Advantages:

- ↳ It offers good backup capability in the event of two systems failing in the network.
- ↳ Provides resource sharing environment.

Metropolitan area network (MAN): A metropolitan area network

(MAN) usually covers a geographical area spanning a distance of 5 - 50 Km.

- ↳ MAN support services that require guaranteed bandwidth and bounded delay performances.
- ↳ MAN operates at speeds of 1 Mbps.
- ↳ Network structures to MAN are similar to the ones used in LANS.

Advantages:

- ↳ High speed than WAN
- ↳ High security
- ↳ Sharing of the internet
- ↳ Less expensive

Fiber optics: Fiber optics network are characterised by -

1. High speed operation (typically 100 Mbps or more)
2. Ability to span large distance. (100 - 200 km)
3. Ability to support a moderate number of stations.

These characteristics make the fiber optics network suitable for high speed LANs and MANs with a limited number of stations.

Ans. to the question no-8(c)

(c) Write down the different types of error control mechanism.

Ans: There are three error control mechanism that are commonly used :

1. Echo checking

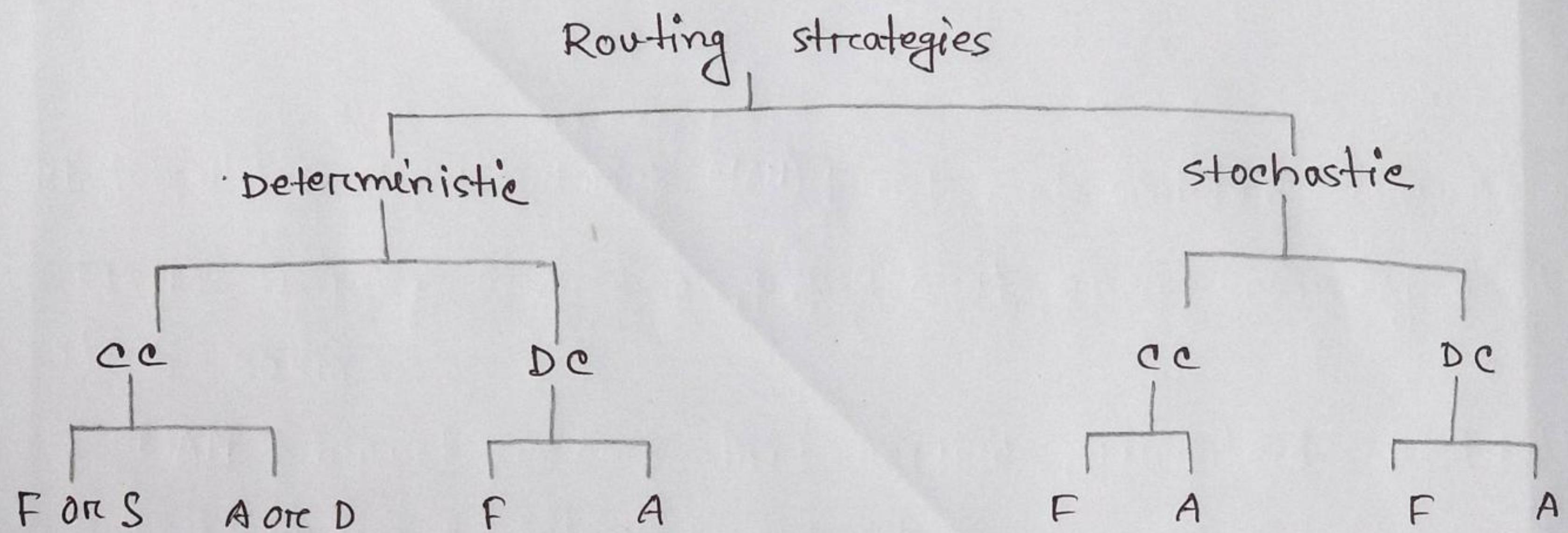
2. Forward correction error (FEC)

3. Automatic repeat request (ARQ)

Ans to the Question no - 8 (d)

d) classify routing algorithm

Ans:



CC = Centralised control

DC = Distributed control

F = fixed , A = Adaptive

S = state D = dynamic

fig- classification of routing algorithm