

MAWLANA BHASHANI SCIENCE AND TECHNOLOGY UNIVERSITY



DEPARTMENT OF ICT

Assignment No : 01

Course Code : ICT-4101
Course Title : Telecommunication Engineering
Assignment name : Introduction of telecommunication and Data networks

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Assignment - 01

Questions:

- 1] (a) What is telecommunication engineering ?
What are the key challenges facing telecommunication engineering ?
- (b) Classify switching system.
- (c) Draw the block diagram of a switching system showing each of its elements.
- 2] (a) What are the fundamental features of a common control switching system ?

- (b) Draw the block diagram of a common control switching system ?

(c) categorize the control functions
in a switching system.

3 (a) In a 100 line folded network, how
many switching elements are required
for non-blocking operation?

(b) Write a list of functions that The
Initial Translator determines.

(c) What are the difficulties we
face in telecommunication engineering?

4 (a) Discuss the working principle of
routing dial telephone.

(b) Draw the pulse waveform for the number 32.

(c) With simple circuit, explain the networking principle of telephone network.

5] (a) Describe Touch Tone Dial Telephony with associated figure.

(b) What are the main design considerations for Touch Tone Signaling system?

(c) Explain the technologies used for crosspoint design.

6] (a) Difference between circuit switching, message switching and packet switching?

(b) In what ways stored program control is superior to hard-wire control?

(c) What are the challenges for the development and deployment of crosspoint technology?

7] (a) What is Network traffic and congestion? - 65

(b) Describe satellite based data networks?

(c) Draw a topology of a multi-exchange network.

8] (a) Why does blocking probability depend on the traffic characteristics?

(b) Define Erlang and CCS. Establish relation between them.

(c) Write a comparison between satellite communications and Terrestrial communications.

Answer to the Ques. No-1(a)

Telecommunication engineering: The exchange of information between two or many individuals is called communication. The word tele is a Greek word which means distance. Hence, Telecommunication means the exchange of information between two distant places.

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

The key challenges facing telecommunication engineering are:

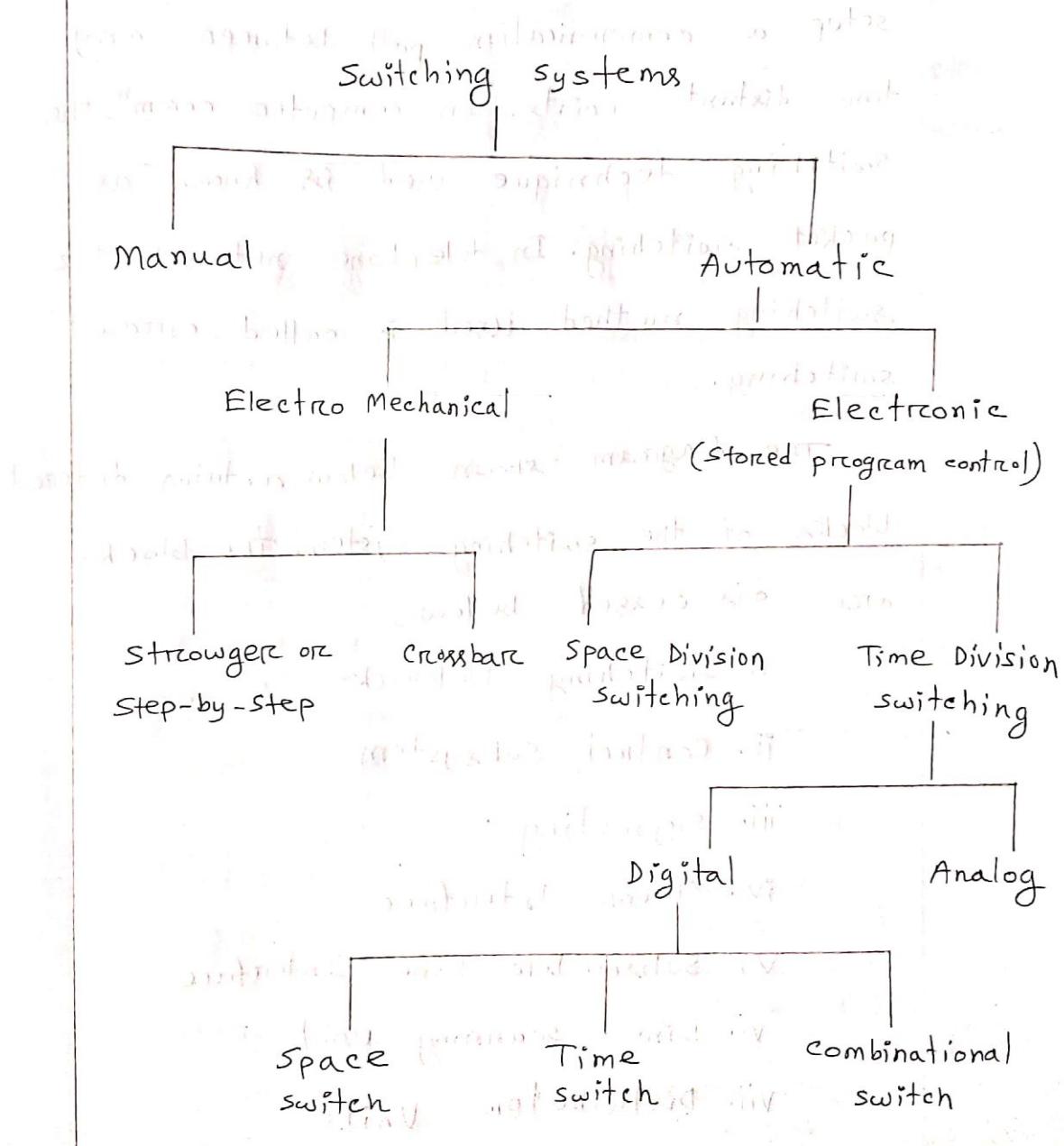
1. Telcos have to decentralize the purchasing and decision power, both internally and externally, because of the essential agile reconfiguration of the cloud.

ii. Telecommunication providers need to upgrade their IT and connectivity infrastructure and focus on providing data and voice services that are high quality, reliable and affordable.

iii. One more challenge waiting in the wings of telcos and ISPs is the impact of Internet of Things (IoT) that is leading to explosive growth in the connected devices.

Answers to the Ques. No - 1 (b)

The following flowchart shows how the switching systems were classified:



(Answer to the Ques. No - 1(c))

A switching system is a collection of switching elements arranged in a way to setup a communication path between any two distant points. In computer commⁿ, the switching technique used is known as packet switching. In telephone network, the switching method used is called circuit switching.

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

i. Switching Network

ii. Control subsystem

iii. Signaling

iv. Trunk Interface

v. Subscriber Line Interface

vi. Line Scanning unit

vii. Distributor Units

viii. Operator console

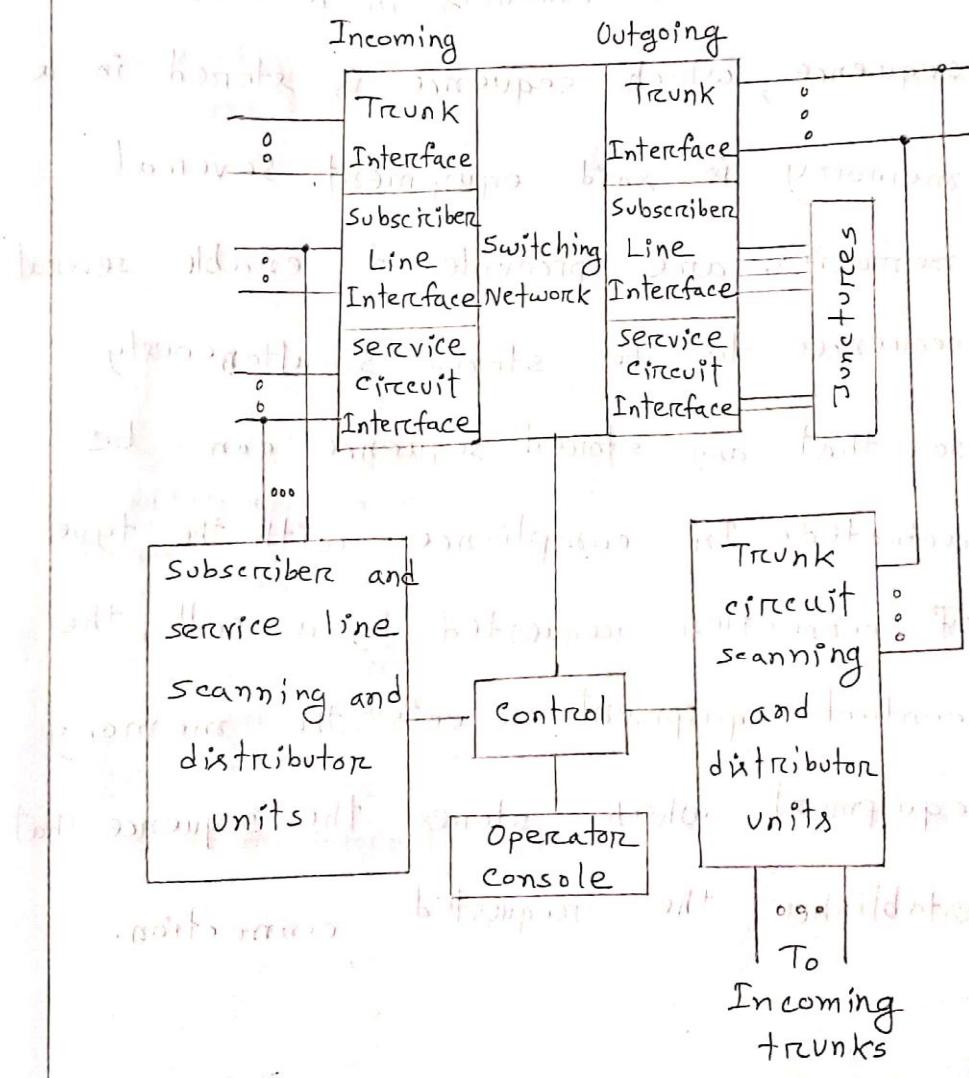
ix. Service circuit interface

x. Junctions

xi. Direct and Indirect

→ Direct control switching system

→ Indirect control switching system

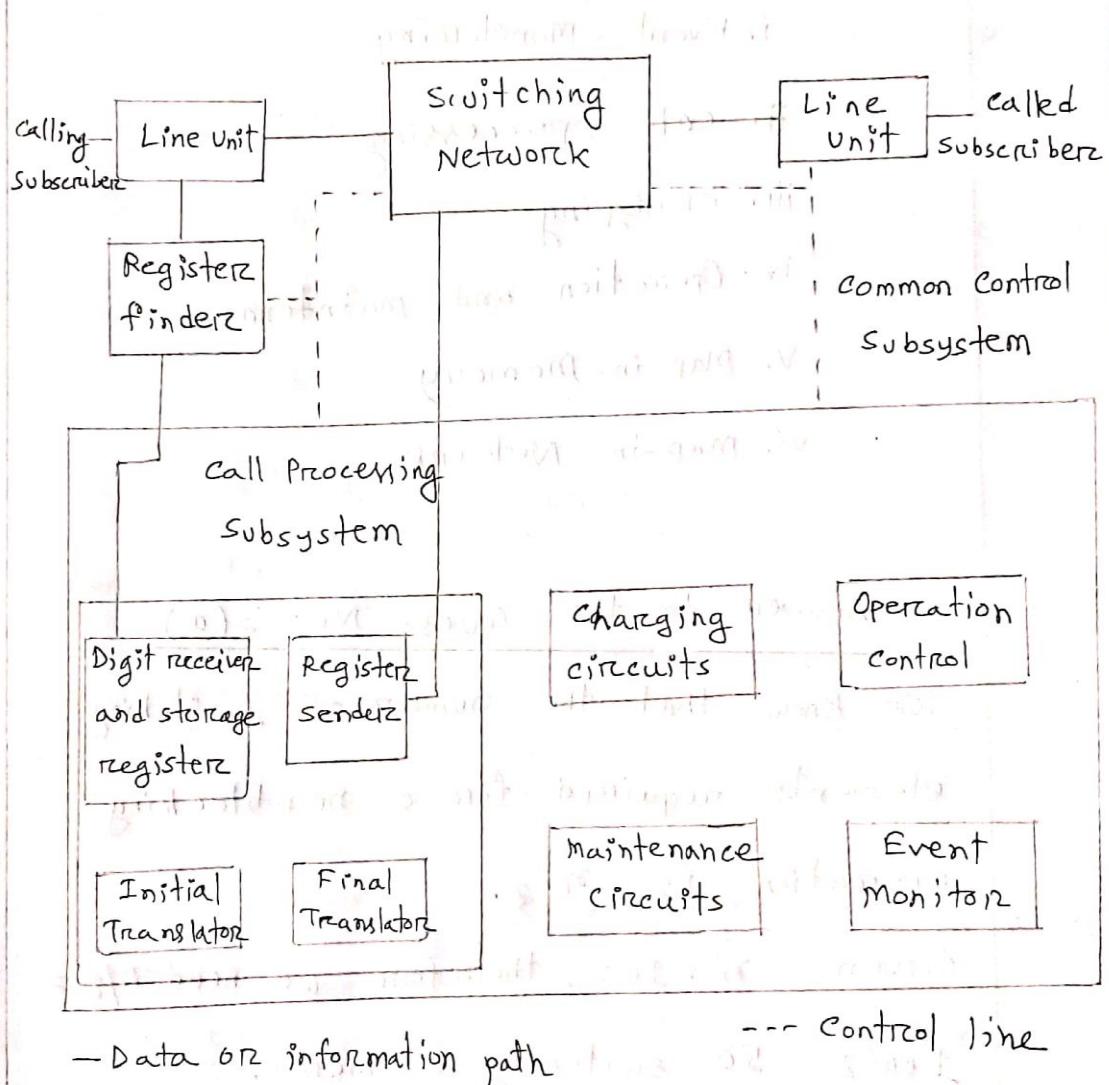


Answers to the Ques. No - 2 (a)

The common control equipment of a switching system including a plurality of functional block circuits is comprised of equipment for selectively actuating said functional block circuits in a desired sequence, which sequence is stored in a memory in said equipment. Several memories are provided to enable several sequences to be stored simultaneously so that any stored sequence can be actuated. In compliance with the type of connection requested by a call, the control equipment selects the memory equipment which stores the sequence that establishes the requested connection.

Answer to the Ques. No - 2 (b)

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



Answer to the Ques. No - 2 (c)

The control functions in a switching system can be categorized as the following :

i. Event monitoring

ii. call processing

iii. charging

iv. Operation and maintenance

v. Map-in-Memory

vi. Map-in-Network

Answer to the Ques. No - 3(a)

We know that the number of switching elements required for a non-blocking operation is $n/2$.

Given, $n = 100$, therefore we need $n/2 = 100/2 = 50$ switching elements.

Answer to the Ques. No - 3(b)

Initial translator determines —

↳ route for call through network.

↳ puts through call depending on class of service

↳ origin based routing

↳ Initial translator also called office code translator or decode marker.

Answer to the Ques. No - 3(c)

The difficulties we face in telecommunication engineering are :

i. High spectrum cost

ii. Unviable telecom towers in rural areas

iii. Lack of telecom infrastructure

iv. Security & breaches

v. Ever changing technology and peer competition.

OR The most challenging issues in the telecom sector are:

i. Telecom is cash intensive, it requires continuous investment. Network rollout is an ongoing process.

ii. Technology changes every six months and that causes changes in revenue models.

iii. OTT operators have killed a lot of revenue sources for the industry.

iv. cost of acquiring spectrum is too high in Bangladesh and is a source of drain for the industry which is in high debt.

Answer to the Ques. No - 4(a)

Call routing is a call management feature for business phone systems where each

incoming call is placed in a queue and is then routed to a specific person or group of people based on pre-established rules and criteria. For example,

- i. A customer telephones the company.
- ii. He/she hears an automatic welcoming message, a request to wait for the connection and then music.
- iii. Meanwhile his/her call is routed to appropriate persons and it is either answered immediately or placed in a queue until one of those persons is able to answer a given call.
- iv. If none of those persons answers the call within the specified time, the call is diverted to voice mail.

Answer to Ques. No - 4 (b)

The number of pulses in a train is equal to the digit value it represents except in the 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 numbers of time intervals, and the number of pulses produced will be 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. An example pulse train is shown in the following figure:

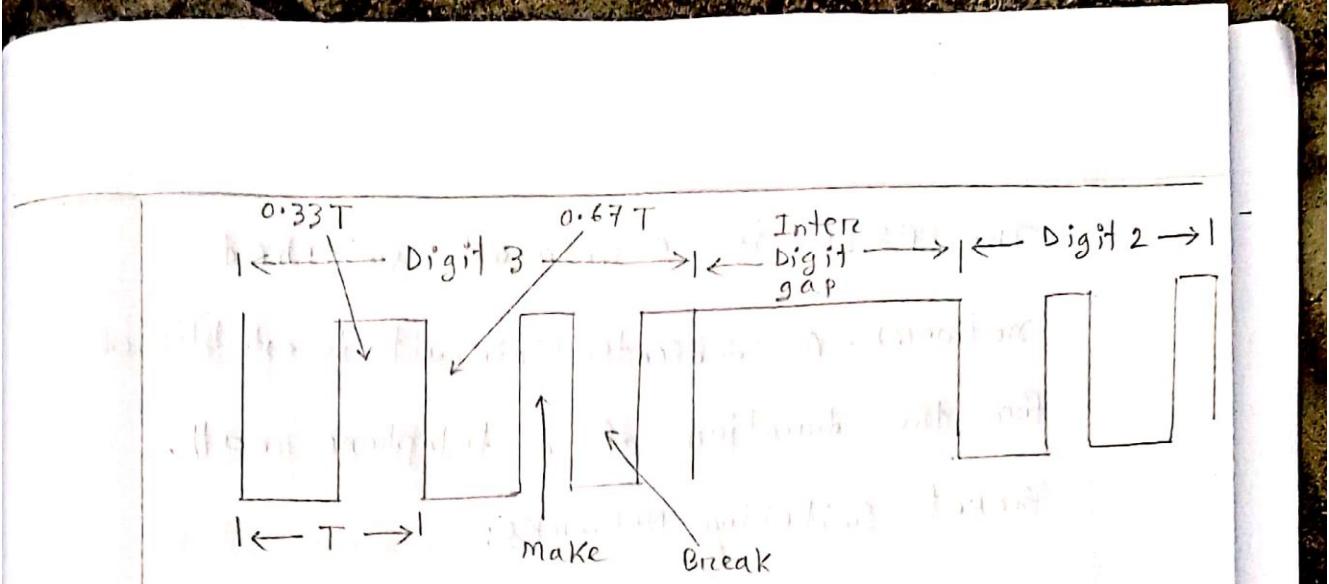
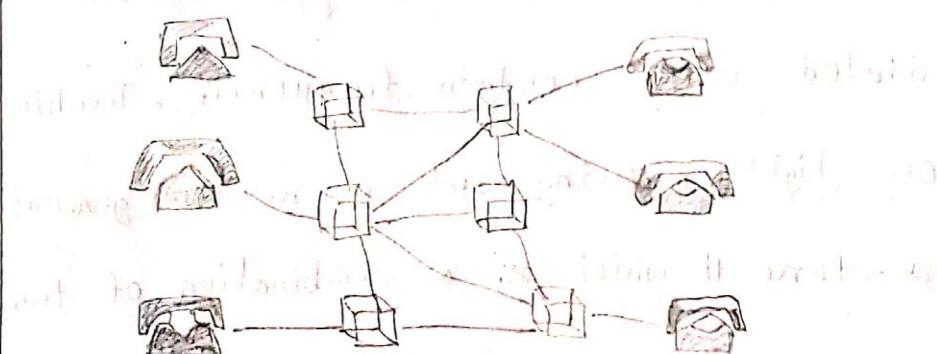


Fig: Dial 32

Answer to the Ques. No -4 (c)

PSTN (Public switched Telephone Network) is the worldwide collection of interconnected public telephone network that was designed primarily for analog telephone calls. PSTN is also referred to as the landlines/ Plain old Telephone Service (POTS).



circuit switching PSTN

The PSTN is a circuit-switched network. A dedicated circuit is established for the duration of a telephone call.

Packet switching Networks:

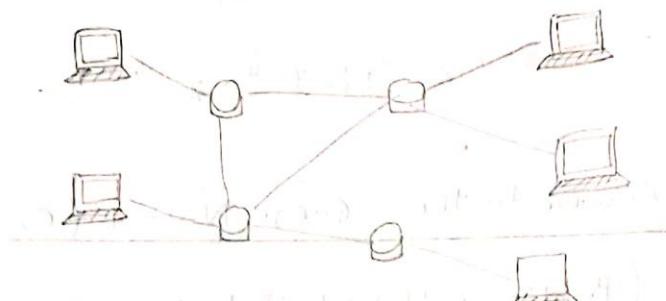


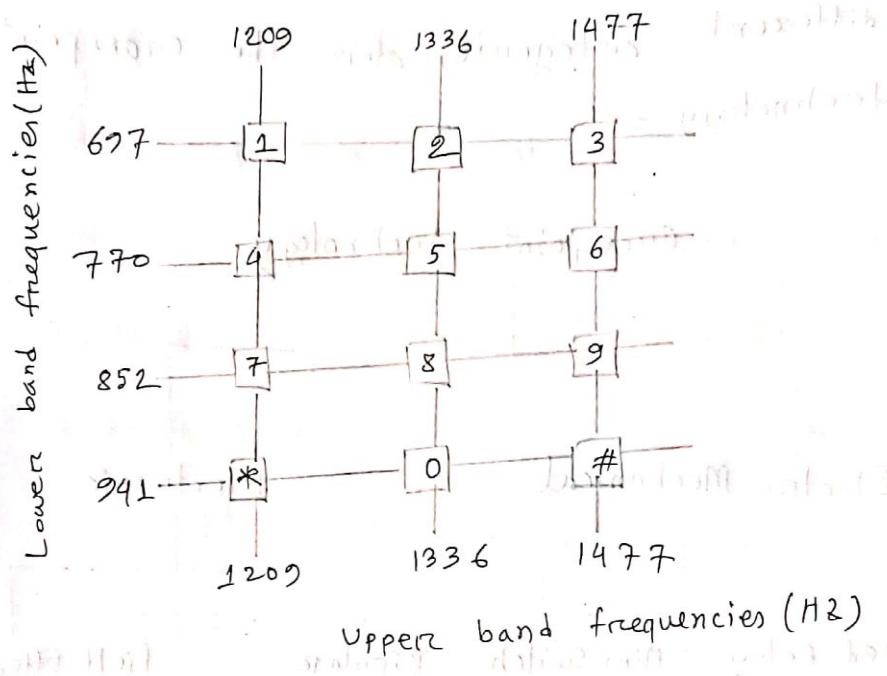
Fig: Packet switching Networks.

messages are divided into packets and each packet is sent individually.

Answer to the Ques. No - 5(a)

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 from upper band.



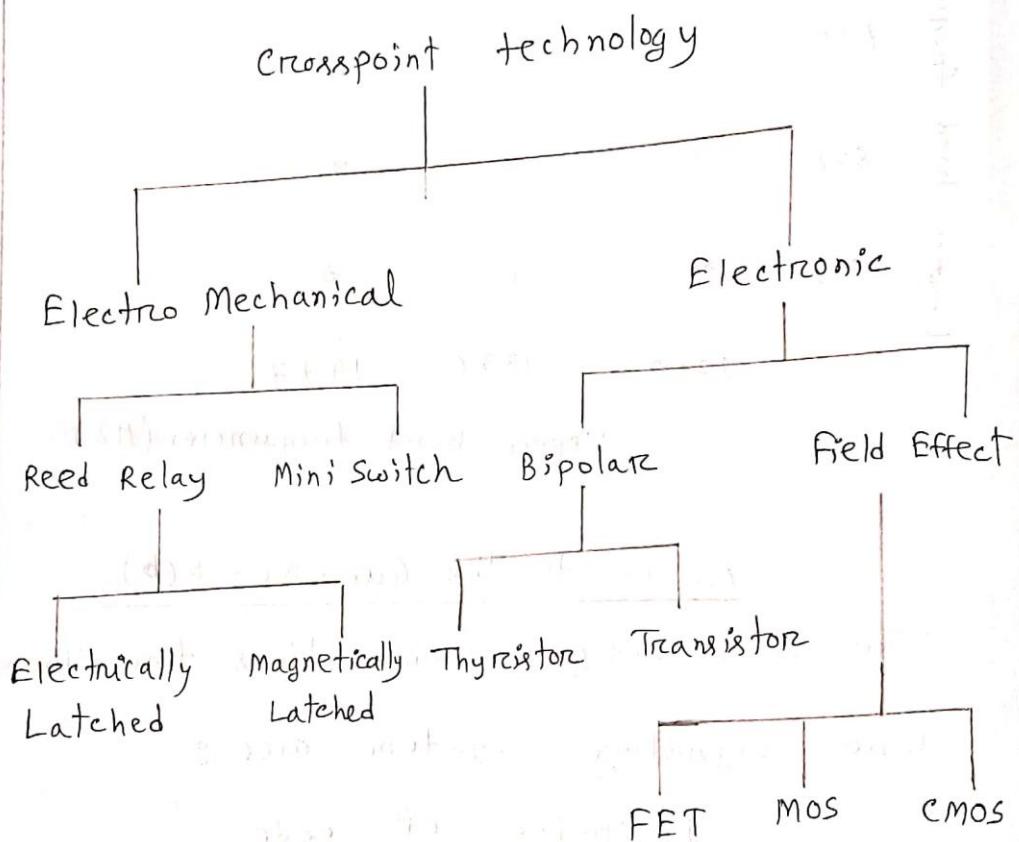
Answer to the Ques. No - 5(b)

The main design considerations for Touch Tone signaling system are:

- i. choice of code
- ii. Band separation
- iii. choice of frequencies
- iv. choice of power levels
- v. Signaling duration.

Answer to the Ques No - 5(c)

The flowchart given below shows the different categories of the crosspoint technology —



Answers to the Ques. No-6(a)

Difference between circuit switching, message switching and packet switching:

The main difference between circuit switching and message switching is that circuit switching is done by setting a physical path between two systems while message switching works on store and forward method. Packet switching is a method of grouping data that is transmitted over a digital network into packets. In circuit switching method, message is received in the same order, that is sent from the source, whereas, in the packet switching method, messages are received out of order, and are assembled at the destination.

In message switching, data is first stored, then forwarded to the next node.

Answer to the Ques. No - 6 (b)

The ways are:

i. New facilities can be added to SPC program by changing control parameters

but it is virtually impossible to modify the hard-wired subsystems to

provide new functionalities,

ii. Hard-wired subsystems have limited capacity, but SPC has higher capacity.

iii. In SPC control functions are performed by the computer or processor rather than hardware.

Answers to the Ques. No - 6(c)

The challenges are described below-

- i. Reduction in the size of a crosspoint.
- ii. Reduction in the cost of a crosspoint.
- iii. Improvisation of the switching time.

Answer to the Ques. No - 7(a)

Network traffic: Network traffic is simply the data that moves along the network in a given time.

Congestion: Congestion in a network is said to have occurred when load on the network is greater than the capacity of the network.

Answers to the Ques. No - 7 (b)

- There are some important aspects of

satellite communication:

↳ satellite network topology and configurations, modulation schemes and bandwidth utilisation; these are aspects related to the physical layer functions of the reference model.

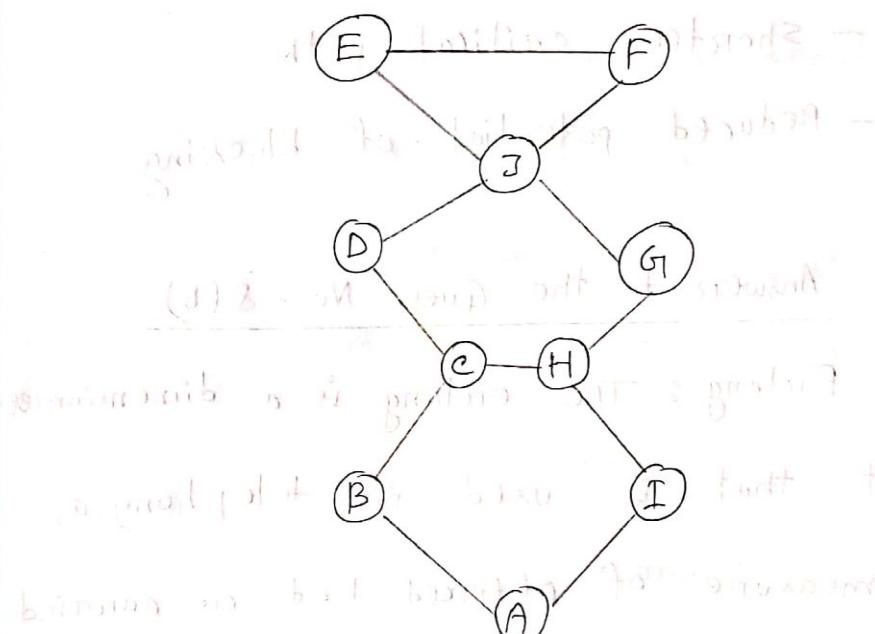
↳ Being a common communication resource accessible by all or a group of earth stations simultaneously, media access becomes a nontrivial function in the data link layer.

↳ Satellite communication being broadcast in nature, routing becomes a trivial

functions; however, organising point-to-point or point-to-multipoint connections in a broadcast.

Answer to the Ques No - 7(c)

The following figure is an example of the topology of a multi-exchange network:



Answer to the Ques. No - 8(a)

Reducing the probability of blocking, or equivalently, striving for independent recovery under as many circumstances as possible.

—fewer messages and (forced) log writers

—shorter critical path

—Reduced potential of blocking

Answer to the Ques. No - 8(b)

Erlang: The erlang is a dimensionless unit that is used in telephony as a measure of offered load or carried load on service-providing elements such as telephone circuits or telephone switching equipment.

CCS : In telecommunication, common-channel signaling (CCS), is the transmission of control information via a separate channel than that used for the messages.

Answer to the Ques. No - 8(c)

In a satellite link delay from earth to satellite to earth is about 240 ms while in terrestrial link it will be far less. But transmission cost in a satellite system is independent of the distance within the area of coverage of the satellite antenna, while in terrestrial system it varies based on the distance.

END