CT-03

Questions:

Marks

01. (a) What is dial-up modem technology? List some of the common modem standards discussed in this chapter and give their data rates. 3

(b) List the seven steps to successful Analog-to-digital signal conversion. 6

(c) Define private Branch Exchange or PBX. List the parts of a PBX. 5

02. (a) Define blocking in a switched network. What is TSI and its role in a time division switching? 4

02. (b) A path in a digital circuit-switched network has a data rate of 1 Mbps. The exchange of 1000 bits is required for the setup and teardown phases. The distance between two parties is 5000 km. Answer the following questions if the propagation speed is 2×10^8 m. — 10

i. What is the total delay if 1000 bits of data are exchanged during the data transfer phase?

ii. What is the total delay if 100,000 bits of data are exchanged during the data transfer phase?

iii. What is the total delay if 1,000,000 bits of data are exchanged during the data transfer phase?

iv. Find the delay per 1000 bits of data for each of the above cases and compare them. What can you infer?

CT-03

03. (a) List five types of topology in computer networks. Describe the pitfalls of mesh topology. → 5

(b) Differentiate between terrestial microwave and satellite microwave transmission system. → 5

(c) What do you mean by Geostationary satellite system? → 4

04. (a) What are the differences between circuit switching and packet switching? → 5

(b) List four types of connections in a telecommunication network. → 4

(c) What is direct contro switching system? and describe benefits of automatic switching system. → 5

05. (a) Define Electromechanical crosspoint Technology. What are the challenges for the crosspoint technology? → 5

(b) Define circuit switching. What are the benefits of circuit switching? → 5

(c) What are the features of crossbar switches? → 4

CT-03

06. (a) Define Satellite Microwave transmission system. Describe the demerits satellite communication. 5

(b) Write down advantages and disadvantages of Star topology. 5

(c) Define public switched telephone network (PSTN). List major systems of any telecommunication network. 4

07. (a) What do you mean by IT support skills or Network engineering? 4

(b) What is Hybrid topology? Describe the advantages and disadvantages of hybrid topology. 5

(c) List the advantages and disadvantages of ISDN. 5

08. (a) Distinguish between cable modem (CM) and cable modem transmission system (CMTS). → 2

(b) Write short notes: (any four)

i. Out-band Signaling
ii. Ring topology
iii. Bus topology
iv. Electronic mail (E-mail)
v. LAN

01.(a) What is dial-up modem technology? List some of the common modem standards discussed in this chapter and give their data rates.

Ans. to the Questions no-01(a)

Dial-up modem technology:

Dial-up modems use part of the bandwidth of the local loop to transfer data.

Common modem standards:

The latest dial-up modems use the V-series standards such as V.32 and V.32 bis (9600 bps), V.34 bis (28,800 or 33,600 bps), V.90 (56 kbps for downloading and 33.6 kbps for uploading), and V.92. (56 kbps for downloading and 48 kbps for uploading).

01.(b) List the seven steps to successful Analog-to-digital signal conversion.

Ans. to the Questions no-01(b)

Follow these seven steps when designing an analog front end:

1. Describe the electrical output of the sensor or section preceding the gain block.
2. Calculate the ADC's requirements.
3. Find the optimal ADC+ voltage reference for the signal conversion.
4. Find the maximum gain and define search criteria for the op amp.
5. Find the optimal amplifier and design the gain block.
6. Check the total solution noise against the design target.
7. Run simulation and validate.

01. (c) Define Private Branch Exchange or PBX. List the parts of a PBX.

Ans. to the Questions no-01(c)

PBX: Private Branch Exchange is a telephone system within a local area that switches calls between ~~rose~~ those users on local lines while allowing all users to share a certain number of external phone lines.

The parts of a PBX include:

- A telephone trunk that contains many phone lines, which are terminated at PBX.
- A computer that handles the incoming and outgoing calls, of PBX along with switching between different calls within the local loop.
- The network of lines within the PBX.
- A human operator console, which is optional

02. (a) Define blocking in a switched network. What is TSI and its role in a time-division switching?

Ans. to the Questions no-02(a)

Blocking: In multistage switching, blocking refers to times when one input cannot be connected to an output because there is no path available between them-all the possible intermediate switches are occupied. One solution to blocking is to increase the number of intermediate switches.

~~TSI is the most popular~~

TSI and its role in time-division switching:

TSI (Time-Slot Interchanges) is the most popular technology in a time-division switch. It used random access memory (RAM) with several memory locations. The RAM fills up with incoming data from time slots in the order received. Slots are then sent out in an order based on the decisions of a control unit.

02. (b) A path in a digital circuit-switched network has a data rate of 1 Mbps. The exchange of 1000 bits is required for the setup and teardown phases. The distance between two parties is 5000 km. Answer the following questions if the propagation speed is 2×10^8 m. — 10

i. What is the total delay if 1000 bits of data are exchanged during the data transfer phase?

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iii. What is the total delay if 1,000,000 bits of data are exchanged during the data transfer phase?

iv. Find the delay per 1000 bits of data for each of the above cases and compare them. What can you infer?

Ans. to the Questions no-02(b)

Solution:

We assume that the setup phase is a two-way communication and the teardown phase is a one-way communication. These two phases are common for all three cases. The delay for these two phases can be calculated as three propagation delays and three transmission delays or

$$3[(5000\,km)/(2\times10^8\,m/s)] + 3[(1000\,bits/1\,Mbps)]$$

$$= 75ms + 3ms = 78ms$$

We assume that the data transfer is in one direction; the total delay is then:

delay for setup and teardown + propagation delay + transmission delay

i. $78 + 25 + 1 = 104\ ms$

ii. $78 + 25 + 100 = 203\ ms$

iii. $78 + 25 + 1000 = 1103$ ms

iv. In case a, we have 104 ms.

In case b, we have $203/100 = 2.03$ ms.

In case c, we have $1103/1000 = 1.103$ ms.

The ratio for case c is the smallest because we use one setup and teardown phase to send more data.

03.(a) List five types of topology in computer networks. Describe the pitfalls of Mesh topology.

Ans. to the questions no-03(a)

There are five types of topology in computer networks:

1. Mesh Topology
2. Star Topology
3. Bus Topology
4. Ring Topology
5. Hybrid Topology

Pitfalls of Mesh Topology:

1. Amount of wires required to connected each system is tedious and headache.
2. Since each device needs to be connected with other devices, number of I/O ports required must be huge.
3. Scalability issues because a device cannot be connected with large number of device with a dedicated point to point link.

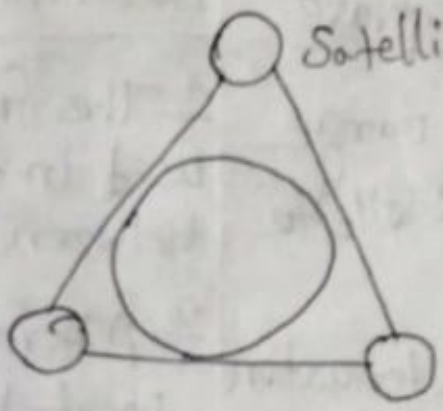
03. (b) Differentiate between Terrestial Microwave and satellite Microwave Transmission System.

Ans. to the Questions no-03(b)

Terrestial Microwave	Satellite Microwave
1. The frequency range needed is from 4 GHz to 6 GHz.	1. The frequenay range used in this system is between 11 GHz to 14 GHz
2. In this system, attenuation mainly depends on frequency and signal strength.	2. Attenuation is generally affected by the frequency and power.
3. It requires focused signals and line of sight as physical path.	3. It requires the proper allignment of earth station atternas.
4. In these systems, short distance systems can be inexpensive but long distance systems are almost costly.	4. These systems are very expensive as cost of building and launching is very high.
5. Relay towers are used to extend the signals.	5. Satellites are used for the expansion of signals.

03.(c) What do you mean by Geostationary Satellite System?

Ans. to the Questions no-03(c)



Geostationary Satellite System

Geostationary satellite:

The satellites were placed in low earth orbit. as a result the satellite at a such high speed that it visible to the ground only for a short time at each day, the satellite appeared below the horizon and dies appear below the opposite horizon, the ground station was cut-off at long time in a day, to maintain the communication link another station had to be activated.

04.(a) What are the differences between circuit switching and packet switching?

Ans. to the questions no- 04(a)

Feature	Circuit switching	Packet switching
Dedicated path	Yes	No
Path Formation	Path dedicated for one conversion.	Route is established on a per packet basis of the conversion using datagram.
Delay	Call setup delay	Packet transmission delay.
Bandwidth type	Fixed bandwidth	Dynamic bandwidth
Overload effects	Stops call establishment.	Increases packet delay.

04.(b) List four types of connections in a telecommunication network.

Ans. to the Questions no-04(b)

There are four types of connections that can be established in a telecommunication network. The connections are as follows:

- Local call connection between 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

04. (c) What is direct control switching system? and describe benefits of automatic switching system.

Ans. to the Questions no-04(c)

Direct control switching system:

The switching systems where the control sub systems from an integral 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 and release of calls is done.

→ 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.

05. (a) Define Electromechanical crosspoint Technology. What are the challenges for the crosspoint technology?

Ans. to the Questions no-05(a)

Electromechanical crosspoint Technology:

The electromechanical crosspoint switches which are capable of making and breaking contacts in 1-10 ms of time duration for several million times without any wear and tear.

In this section, we will discuss the challenges associated with the crosspoint technology. 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
iv. Electromechanical
v. Electronic

05. (b) Define circuit switching. What are the benefits of circuit switching?

Ans. to the Questions no- 05(b)

Circuit switching: This method of switching establishes a dedicated communication path between the sender and receiver.

Benefits of circuit switching:

i. It uses a fixed bandwidth.

ii. A dedicated communication channel increases the quality of communication.

iii. Data is transmitted with a fixed data rate.

iv. No wating time at switches.

v. Suitable for long continuous communication.

05.(c) What are the features of crossbare switches?

Ans. to the Questions no-05(c)

Features of crossbare switches:

- While processing a call, the common control system helps in the sharing of resources.
- The specific route functions of call processing are hardwired because of the wire logic computers.
- The flexible system design helps in the appropriate ratio selection is allowed for a specific switch.
- Fewere moving parcts ease the maintenance of crossbare switching system.

06. (a) Define Satellite Microwave Transmission System. Describe the demercits satellite communication.

Ans. to the Questions no-06(a)

Satellite Microwave Transmission System uses satellites for broadcasting and receiving of signals. These systems need satellites which are in the geostationary orbit which is 36000 km above the earth.

Demercits of satellite communication:

1. The transmitter and receiver used in satellite communication requires high power, most sensetive transmitters and large diameter antena's.
2. Satellite communication is disturbed by solar activities and cyclones in the space.
3. Due to ageing effect the efficiency of satellite components decreases.
4. The longer propagation times (Appox. 300ms) is one of a disadvantage of satellite communication.
5. The cost for initial design and launching of the satellite in the orbit results in extremely high.

06. (b) Write down advantages and disadvantages of star topology.

Ans. to the questions no-06(b)

Advantages of Star Topology:

1. Less expensive because each device only need one I/O port and needs to be connected with hub with one link.
2. Easier to install
3. Less amount of cables required because each device needs to be connected with the hub only.
4. Robust, if one link falls, others links will work just fine.
5. Easy fault detection because the link can be easily identified.

Disadvantages of Star topology:

1. If hub goes down everything goes down, none of the devices can work without hub.
2. Hub requires more resources and regular maintenance because it is the central system of star topology.

06. (c) Define public switched telephone network (PSTN). list major systems of any telecommunication network.

Ans. to the questions no-06(c)

PSTN: public switched telephone network is perhaps the most stupendous telecommunication network in existence today. The length of telephone wire-pairs buried underground exceeds a bilion kilometres.

Any telecommunication network may be viewed as consisting of the following major systems;

1. Subscribers and instruments or equipments
2. Subscriber loop systems
3. Switching systems
4. Transmission systems
5. Signaling systems

02. (a) What do you mean by IT support skills or Network Engineering?

Ans. to the Questions no-02(a)

Network engineering involves different types of processes which are required to maintain, support, troubleshoot and implement communication networks. This could either be within a single organization or between multiple organizations. Skilled network support engineers are expected to be able to create a network infrastructure which is fool proof. The infrastructure should be ~~abaikab~~ available to a variety of stakeholders which include customers, employees, supply side staff and clients. They are also expected to have relevant knowledge regarding different types of networks such as WAN, LAN, MAN and WLAN.

07. (b) What is Hybrid topology? Describe the advantages and disadvantages of hybrid topology.

Ans. to the Questions no- 07(b)

Hybrid topology: A combination of two or more topology is known as hybrid topology.

Advantages of hybrid topology:

1. We can choose the topology based on the requirement for example, scalability is our concern then we can use star topology instead of bus technology.
2. Scalable as we can further connect other computer networks with the existing networks with different topologies.

Disadvantages of Hybrid topology:

1. Fault detection is difficult.
2. Installation is difficult.
3. Design is complex so maintenance is high thus expensive.

07. (c) List the advantages and disadvantages of ISDN.

Ans. to the questions no-07 (c)

Advantages of ISDN:

- As the services are digital, there is less chance for errors.
- The connection is faster.
- The bandwidth is higher.
- Voice, data and video – all of these can be sent over a single ISDN line.

Disadvantages of ISDN:

The disadvantages of ISDN is that it requires specialized digital services and is costlier. However, the advent of ISDN has brought great advancement in communications. Multiple transmissions with greater speed are being achieved with higher levels of accuracy.

08. (a) Distinguish between cable modem (CM) and cable modem transmission system (CMTS).

Ans. to the Questions no-08(a)

CM versus CMTS:

a) The CM is installed on the subscriber premises. The CMTS is installed inside the distribution hub by the cable company.

b) The CM receives data from the Internet and passes them to the combiner, which sends them to the subscriber. The CMTS also receives data from the subscriber and passes them to the Internet.

08. (b) Write short notes: (any four)

i. Out-band signaling
ii. Ring topology
iii. Bus topology
iv. Electronic mail (E-mail)
v. LAN

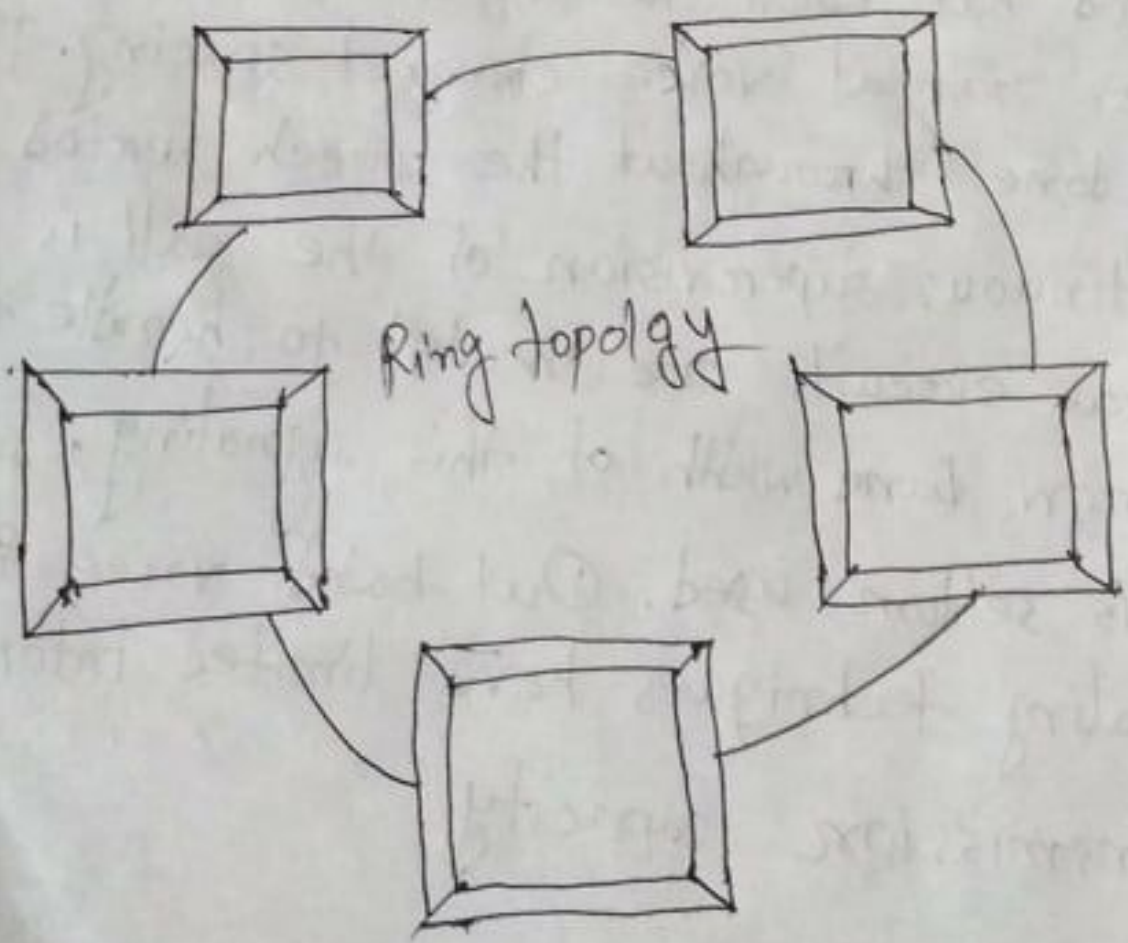
Ans. to the Questions no-08(b)

i. Out-band signaling: The out-band signaling uses frequencies which are above the voice band but below the upper limit of 4000 Hz of the nomial voice channel spacing. The signaling is done throughout the speech period and thus continuous supervision of the call is allowed. Extra circuits are needed to handle the extremly narrow band width of this signaling, due to which it is seldom used. Out-band voice frequency signaling techniques have limited information transmission capacity.

ii. Ring topology:

In ring topology each device is connected with the two devices on either side of it. There are two dedicated point to point links a device has with the devices on the either side of it. This structure forms a ring thus it is known as ring topology.

Structure of Ring topology:

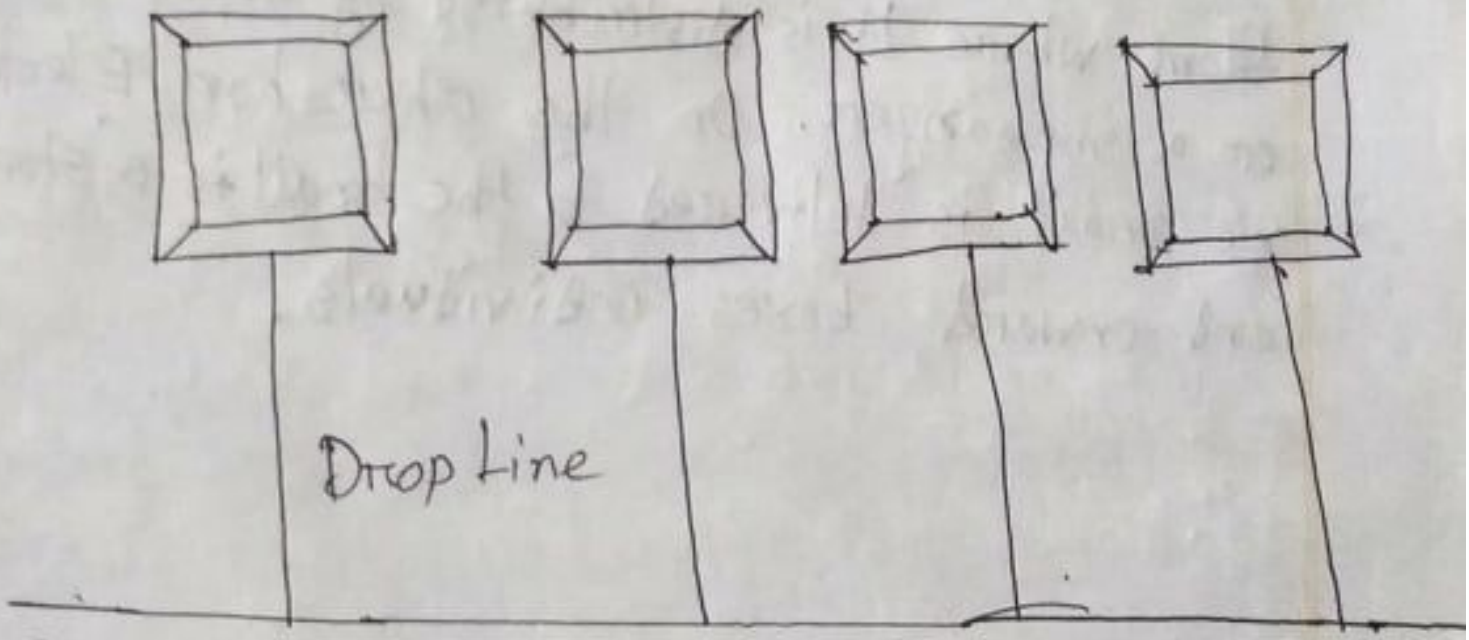


- Computer

iii. Bus topology:

In bus topology there is a main cable and all the devices are connected to this main cable through drop lines. There is a device called tap that connects the drop line to the main cable. Since all the data transmitted over the main cable, there is a limit of drop lines and the distance a main cable can have.

Structure of Bus topology:



Bus topology

▭ – Computer

iv. Electronic mail (E-mail): Electronic mail. popularly known as email, may be defined as the communication of textual messages via electronic means. Even the telex communication is electronic nature. While telex communication is terminal to terminal. electronic mail communication is user-to-user. In telex, messages destined to a number of users are sent to the same terminal from where it is distributed by an operator or a messanger. On the other han. Electronic mail is delivered to the mail ~~is a store and onward~~ boxes individuals.