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BDA

BCS - Assignment 1

Date
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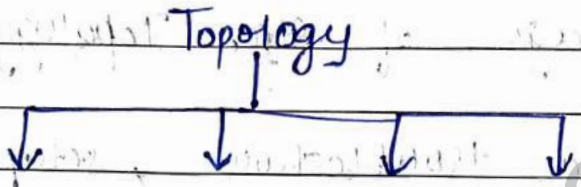
1. Categorize basic four topologies and explain each topology in brief with their advantages.

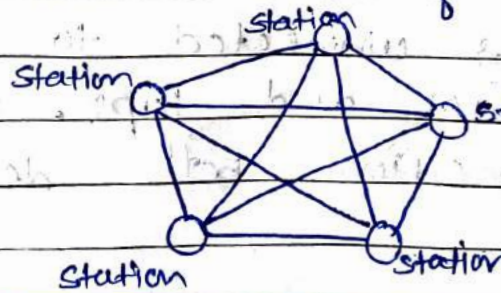
Ans Topologies are basically categoried in 4 topology.



(i) Mesh :- In mesh topology, every device has a dedicated point-to-point connection.

* Advantages of Mesh topology :-

↳ The network can be expanded without disrupting current users.
↳ Need extra capable compared with other LAN topologies.
↳ No traffic problem as nodes has dedicated links.
↳ Very less chance of network failure.



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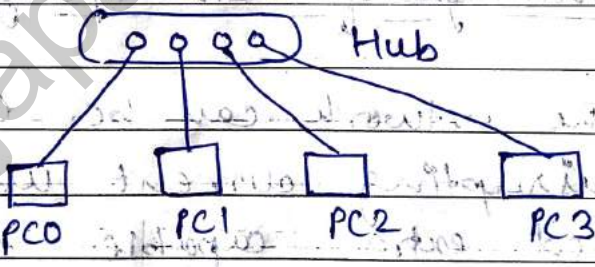
(ii) Star :- In star topology, each device has a dedicated point-to-point link only to a central controller, usually called a hub. Devices are not directly connected to each other.

* Advantages of Star Topology :-

↳ Easy to troubleshoot, setup and modify.
↳ Only those nodes are affected, that has failed. Other nodes still work.
↳ Fast performance with few nodes & very low network traffic.
↳ Addition, deletion and moving of device is easy.



(iii) Bus :- Bus topology is one of the topology with multipoint link. One long cable act as backbone to link all the devices in the network. Nodes are connected to bus cable by drop lines and taps. Drop line is a connection bet^n device & main cable.

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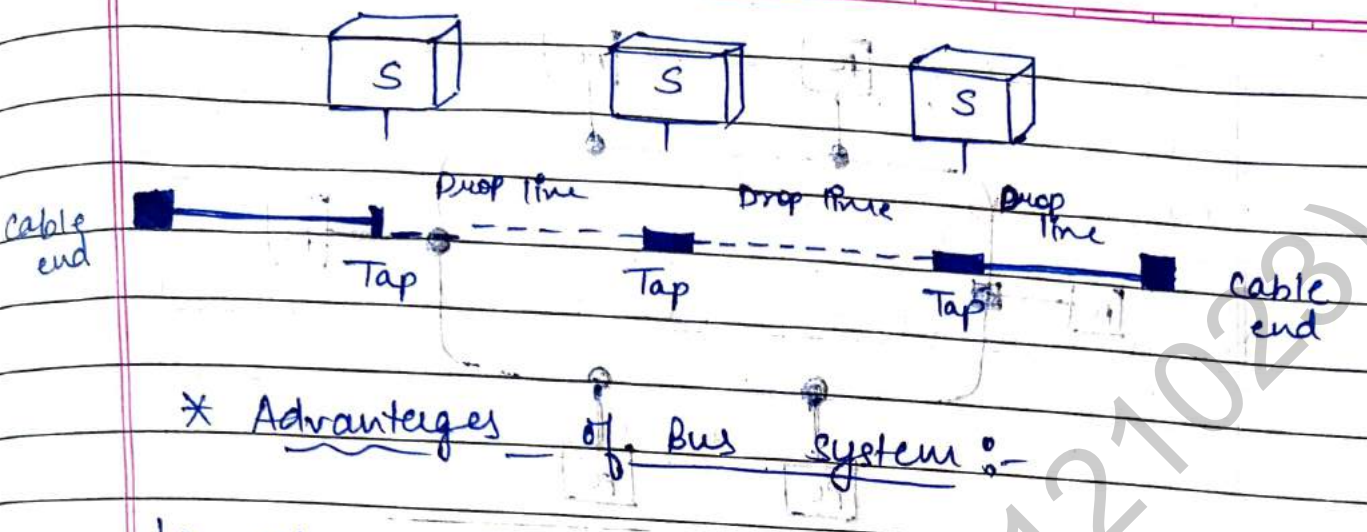

* Advantages of Bus system :-

↳ Mfg. cost of is low so it is widely used to make small networks
↳ Widely used for LAN as they are easy to install & cheap.
↳ Installation is small, simple and cheap
↳ It is passive topology. So computers in bus only listen for data being sent, that are not responsible for moving the data from one computer to other.

(iv) Ring :- In ring topology, every device has exactly two neighbouring devices for communication purpose. Here last node is connected to first one.
This topology uses token to pass information from one computer to another.
In this topology, all the messages travel through a ring in the same direction

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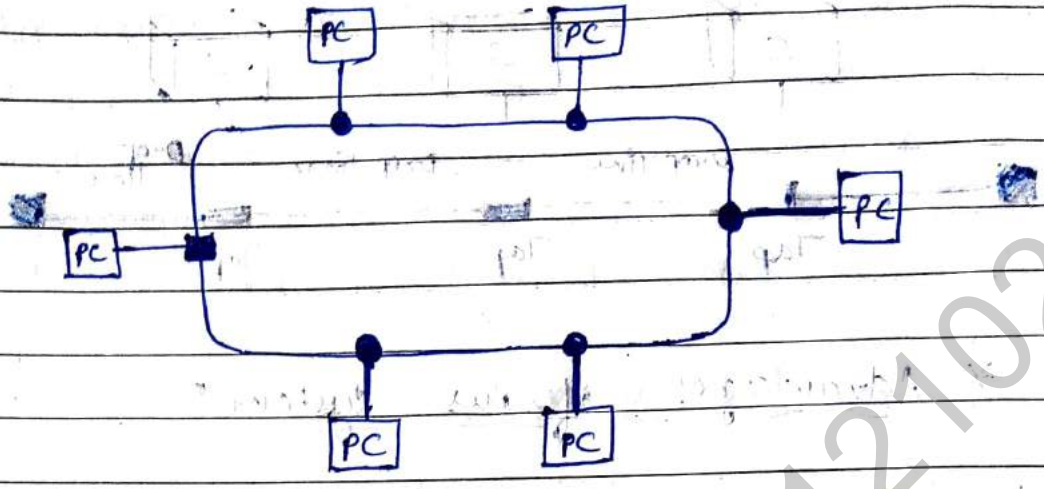

* Advanteiges of Ring Topology :-

↳ Easy to install and reconfigure
↳ Adding or deleting a devices needs you to move only two devices.
↳ Troubleshooting is difficult.
↳ Failure in one device can affect the network.
↳ Faster error checking.

2. Explain OSI refereince model and ~~bef~~ brief major responsibities of each layer.

Ans The seven layers of OSI model are :-
(i) Physical
(ii) Data link
(iii) Network
(iv) Transport
(v) Session
(vi) ~~Pres~~ Presentation

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(vii) Application.

(i) Physical Layer :-

- Line configuration :- It defines the way how two or more devices can be connected physically.
- Data Transmission :- It defines mode whether it is simplex, half duplex or full duplex mode between the two devices on network.
- Topology :- It defines the way how devices are arranged.
- Signals :- It determines the type of the signal used for transmitting information.

(ii) Data link Layer :-

- Framing :- It converts raw bit stream into frames. And adds header and trailer. Header contains info of hardware destination and source address.
- Physical Addressing :- The frame is sent to destination address which is present in header of frame.
- Flow control :- It controls the flow of incoming and out going data so none of data gets corrupted.
- Error control :- It is done by adding a calculated value CRC in trailer of

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frame. So that we can find corrupted frame

- Access control :- When two or more devices are connected to the same communication channel, then the data link layer protocols are used to determine which device has control over the link at a given time

(iii) Network Layer :-

- Internetworking :- This is main responsibility of network layer. It provides a logical connection between different devices.
- Addressing :- It adds source and destination address to header of frame to identify on internet.
- Routing :- It determines the best path from source to destination from multiple pathways.
- Packetizing :- A network layer receives packet from upper layer and converts them into packets. This process is known as packetizing. It is done by Internet protocol (IP).

(iv) Transport Layer :-

- service-point addressing :- It adds header that contains the address known as a service-point address or port address

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the responsibility of transport layer is to transmit the message to the correct process.

- Segmentation & reassembly :- Transport layer divides message into multiple segments and assign sequence numbers. When message is received at destination it reassembles the segments based on sequence number.
- Connection control :- Transport layer provides two services, connection-oriented service and connectionless services.
  - ↳ a connectionless service treats each segment as an individual part.
  - ↳ In connection-oriented services, all packets travel in single route.
- Flow control :- It is also responsible for flow control but it is performed end-to-end rather than across a single link.
- Error control :- The sender transport layer ensures that message reach to the destination without any error.

(v) Session Layer :-

- Dialog control :- It allows the communication between two process which can be either half duplex / full duplex.
- Synchronization :- This layer adds checkpoints when transmitting the data in a sequence to keep it synchronized.

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(vi) Presentation Layer :-

- Translation :- It converts the received data to common format.
- Encryption :- Encryption is needed for privacy. It is done on the message of sender.
- Compression :- Data compression is process of compressing the data, i.e it reduces the number of bits to be transmitted.

(vii) Application Layer :-

- File Transfer, Access & managment :- This allows users to access the file in a remote computer.
- Mail services :- It also provides the facility for email forwarding & storage
- Directory services :- It provides database sources & is used to provide that global info. about various objects.

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3. Give the difference between OSI model and TCP/IP model.

Ans.

OSI Model	TCP/IP Model
- Developed by ISO	Developed by ARPANET.
- OSI model provides clear distinction bet^n interfaces, services & protocols.	TCP/IP doesnot have proper distinguishing points.
- OSI refers to Open systems Inter connection	TCP refers to Transmission control protocol.
- OSI follows vertical approach	TCP/IP follows horizontal approach.
- It uses network layer to define routing standards & protocols.	TCP uses only the Internet layer.
- OSI has 7 layers.	TCP/IP has four layers.
- The transport layer is only connection-oriented.	The layer of TCP/IP is both connected oriented & connectionless.
- the Data-link & physical layers are separate layers.	In TCP/IP, physical & Data link are combined in Network layer.
- session & presentation layers are part of OSI model.	There is no session or presentation layer in TCP/IP.
- It is defined the advent of the Internet.	It is defined before the advent of Internet
- The minimum size of OSI header is 5bytes.	The min. header size is 20 bytes.

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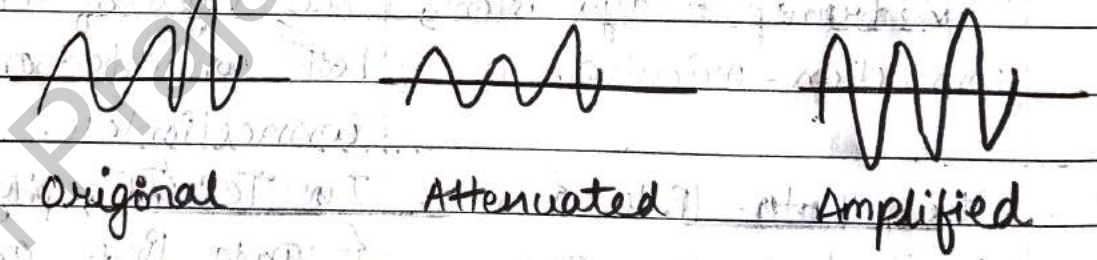
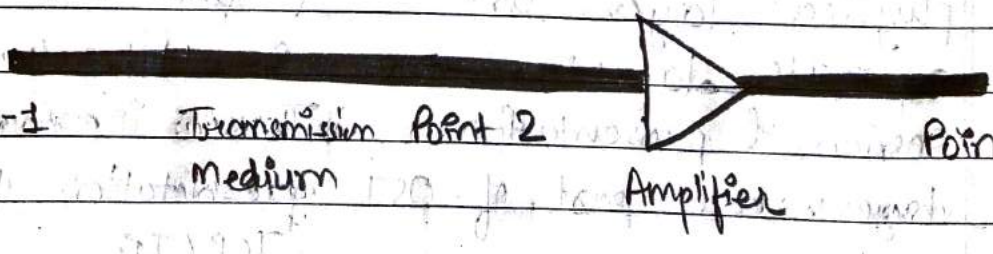
4. Explain three types of transmission impairment.

Ans There are three types of transmission impairments. They are attenuation, delay distortion, and noise.

(1) Attenuation :-

Attenuation means loss of energy. When a signal, simple or composite, travels through a medium, it losses some of its energy in overcoming the resistance of the medium. That is why a wire carrying electric signals gets warm. To compensate for this loss, we use amplifier.





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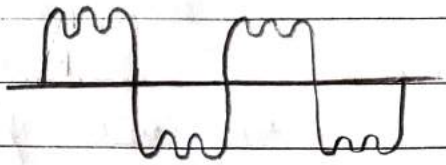
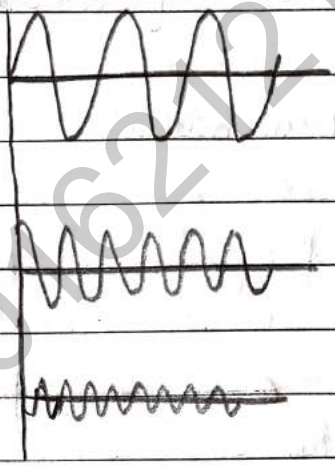
(ii) Distortion :-

Distortion means that the signal changes its form or shape. Distortion can occur in a composited signal made of different frequencies.

AT SENDER

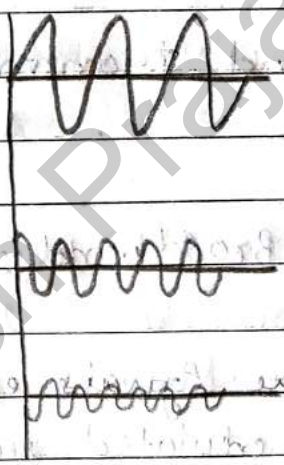


Composite signal sent

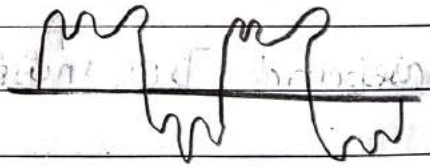


Components, in phase

AT RECEIVER



Components out of phase



Composite signal received

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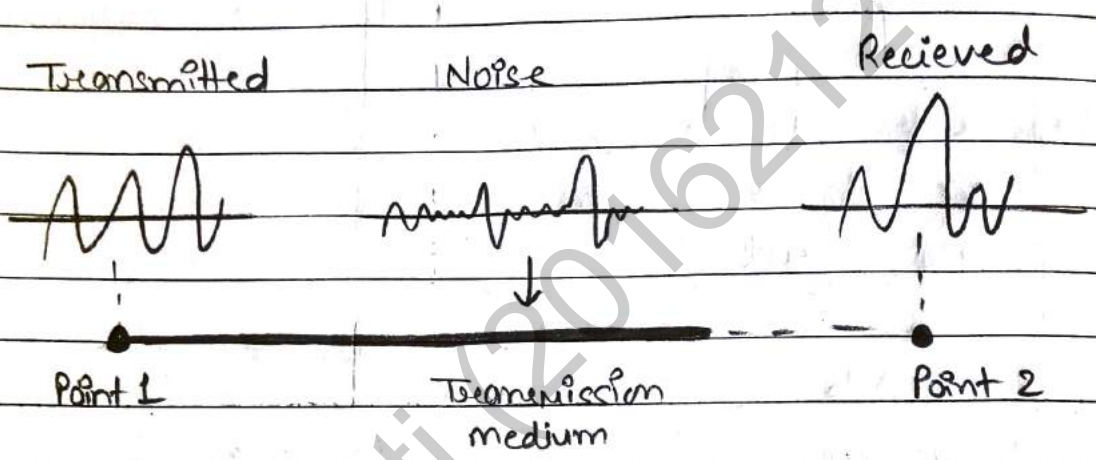
(iii) Noise :-

Noise is a another cause of impairment. There are several types of noise, such as thermal noise, Induced noise, cross talk, etc. Thermal noise is created by random motion of electrons in wire.



5. Distinguish between baseband transmission & broadband transmission.

Ans.

Baseband Transmission	Broadband Transmission
It refers to a communication channel in which info. is carried in digital form.	The signals are modulated radio frequencies analog waves that use different frequencies.
Communication is bi-directional which means	Communication is unidirectional which

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the same channel is used to transmit & receive signal.	means two diff. channels are required for communication.
– Every device on the base band system shares the same channel.	Multiple independent channel can carry analog or digital info. through FDM.
– Base band LAN are less expensive & easier to install & maintain	Broadband are generally more expensive because of the additional hardware involved.

6. Can we represent composite signal as a ~~comp~~ combination of simple sine wave with diff. frequencies, amplitudes & phases? Explain how.

Ans. ↳ Any composite signal is a combination of simple sine wave with different frequencies, amplitudes & phases.

↳ A composite signal can be periodic or non-periodic composite signal, and can be decomposed into series of simple sine wave with discrete frequency.

↳ A non-periodic composite signal can be

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decomposed into a combination of an infinite number of simple sine wave with continuous frequencies.

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7. Distinguish the performance of low pass channel compared to wide-band channel for baseband transmission.

Ans. Baseband transmission requires that we have a low pass channel, a channel with a bandwidth that starts from zero.

- This is case if we have a dedicated medium with a band width consisting of only one channel.
- ~~Low~~ Low pass channel with wide bandwidth.
- If we want to prevent the extra form of a non periodic digital signal with vertical segments horizontal we need to send the entire spectrum, the conti. range of freq. between 0 & ∞.
- Fortunately, the amp. of freq. at border of the bandwidth are so small that they can be ignored.

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- Baseband transmission of a digital signal that preserves the shape of the digital signal is only possible if we have a low pass channel with an infinite or very wide band width.

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8. Explain SNR & explain how channel capacity depends on SNR & how can we enhance channel capacity.

Ans: SNR or signal to noise ratio is ratio between the desired info. or power of a signal & the undesired signal or the power of background noise.

- For capacity,

  capacity = bandwidth * (1 + SNR)

- From above eqn, bandwidth is the bandwith channel, and SNR is the signal-to-noise ratio & capacity is the capacity of channel in bits per second (bps).

- Bandwidth is a fixed quantity so it can't be changed. Hence channel capacity is directly proportional to power of the signal.

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$$SNR = \frac{\text{power of signal}}{\text{power of noise}}$$

- MIMO technology is able to increase the capacity of given channel while obeying Shanon-Hartley's equation by increasing the number of transmit & receive antennas, a 2x2 MIMO system effectively doubles the maximum data rate of what can be ~~achie~~ achieved in a traditional signal RF channel.

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9. Explain Simple, Half-Duplex and Full-Duplex transmission mode.

Ans. (i) Simple :- In simple transmission mode, it is only unidirectional. The data / information can either be sent or received.

(ii) Half-Duplex :- In Half duplex, the transmission is unidirectional, ie, it can either sent or receive data only one at a time. It cannot do it simultaneously.

(iii) Full Duplex :- In full duplex, the data transmission is bi-directional, i.e we can send or receive data simultaneously.

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10. Explain different addressing modes : Physical address, Logical address, Port address.

Ans. (i) Physical address :- The physical address is also known as link address or lowest level address. , it is address of node as defined by LAN or WAN.

↳ It has authority over the network (LAN or WAN).

↳ The size & format of physical address is 6 bytes (48bit). That is printed on the network interface card (NIC).

(ii) Logical Address :- Logical address are necessary for universal communication That are independent of underlying physical network.

↳ A universal addressing system is required in which each host can be identified uniquely regardless of underlying physical address.

↳ A logical address in the internet is 32-bit address that can uniquely define a host connected to internet.

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(iii) Port addressing :- The IP address & physical address are necessary for the quantity of data to travel from source to the destination host.

↳ Computer are devices that can run multiple process at same time.

↳ The end objective of internet communication is a process completion with another process.

↳ For process to receive data, simultaneously. we need a method to label different processes so we can say that they need another type of address which is kn as port address.

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