Summer-15

1. **Define the term 'Topology'. List the names of any two network topologies.**
   (Definition- 1 Mark, Listing – 1 Mark)

Answer: Topology: A topology is a usually "Schematic description of the arrangement of a network including its nodes and connecting lines (links). OR The way in which computers are connected *in a network* is called as topology. OR It is physical interconnection between various elements on computer network such as links & nodes.

Types: 1. Bus 2. Ring 3. Star 4. Mesh 5. Tree 6. Hybrid

2. **State whether the bus is active or passive network. Justify your answer. (2 Marks)**
Answer: Bus is a passive network.
The bus topology is usually used when a network installation is small, simple or temporary. In bus network, the cable is just one or more wires, with no active electronics to amplify the signal or pass it along from computer to computer. This makes the bus a passive network.

<div align="center">or</div>

In the bus topology the major component is the backbone cable. The communication takes place through it and this backbone does not do any amplification or correction of signals passed through that's why bus can be called as passive network.

3. **Describe Tree Topology with neat diagram. State its advantages. (any two)**
   (Diagram- *1.5* Marks, Explanation -*1.5* Marks, two advantages- *1* Mark)
Tree Topology: A tree topology is variation of star. As in a star, nodes in a tree are linked to a central hub head end that controls the traffic to a network. However, not every computer plugs into the central hub, majority of them are connected to a secondary hub which in turn is connected to the central hub as shown in fig.

Digram - Tree Topology

The central hub in the tree is active hub which contains repeater. The repeater amplifies the signal & increase the distance a signal can travel. The secondary hubs may be active or passive. A passive hub provides a simple physical connection between the attached devices.

Advantages:
1. Supported by several hardware and software venders.
2. It allows more devices to be attached to a single central hub and can therefore increases the distance a signal can travel between devices.
3. It allows the network to isolate and prioritize communication from different computers i.e. the computers attached to one secondary hub can be given priority over the computers attached to another secondary hub.

4. **You are asked to established a small network with minimum cost at least sight computers. Also it is necessary to use centralized database. Which type of network topology you will use? Justify your answer.**
(Type of network- 1 Marks, Type of topology -1 Mark, Justification -2 Marks)

Answer: Due to necessity of centralized data base, we have to use the **Client-Server network.** As the network is small & low cost, we can use **the bus topology**.

The bus topology has the following advantages:

1. Low cost
2. Easy control.
3. It is easy to set-up and extend bus network.
4. Cable length required for this topology is the least compared to other networks.
5. Linear Bus network is mostly used in small networks. Good for LAN.

5. Enlist essential components required to design computer network. Describe any one in brief. (1 mark for list, 1 mark for diagram, 2 marks for description, any other component can be considered)
The components of computer network are:

- Hub
- Router
- Modem
- Bridge
- Switches

- Network Interface Card
- Cables and connectors
- Crimping tool
- LAN tester
- Computers Gateway

Explanation:

1) **HUB:**
   - Hub is a connecting device; it is also known as multiport repeater.
   - It is normally used for connecting stations in a physical star topology.
   - All networks require a central location to bring media segments together.
   - These central locations are called hubs. A hub organizes the cables and relays signals to the other media segments.

There are three main types of hubs:

1) Passive 2) Active 3) Intelligent

Passive Hubs: A passive hubs simply combines the signals of a network segments. There is no signal processing or regeneration. A passive hub reduces the cabling distance by half because it does not boost the signals and in fact absorbs some of the signal. With the passive hub each computer receives the signal sent from all the other computers connected to the hub.

Active hubs: They are like passive hubs but have electronic components for regeneration and amplification of signals. by using active hubs the distance between devices can be increased. The main drawback of active hubs is that the amplify noise along with the signals. They are also much expensive than passive hubs.

Intelligent hubs: in addition to signal regeneration, intelligent hubs perform some network management and intelligent path selection. One advantage to this is that all transmission media segment can be connected permanently because each segment will be used only when a signal is sent to a device using that segment.
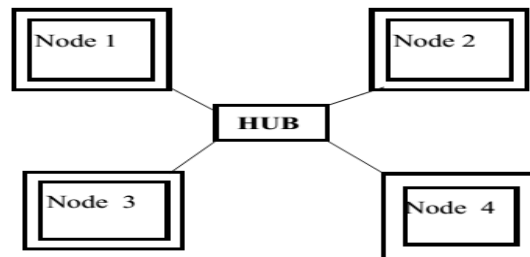
2. ROUTER:

Router is a device that connects 2 or more networks. It consist of hardware and software .hardware includes the physical interfaces to the various networks in the internetwork. Software in a router is OS and routing protocols management software.

1) Router use logical and physical addressing to connect two or more logically separate networks.
2) They accomplish this connection by organizing the large network into logical network called subnets.
3) Each of the subnet is given a logical address. This allows the network to be separate but still access to each other and exchange data.
4) Data is grouped into packets. Each packet has physical device address and logical network address.
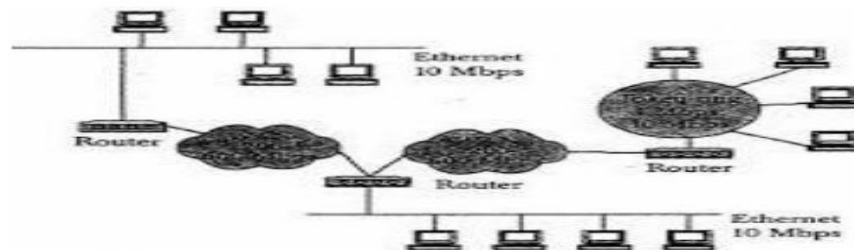

3. Switch: A switch is a small hardware device that joins multiple computers together within one Local Area Network (LAN). Network switches operate at Data Link Layer of the OSI model. A switch is device that provides a central connection point for cables from workstations, servers and peripherals.

4. Bridge: It is a device which connects two or more segment of a network. Use in DLL. If only forwards the packet which are for other.

5. Gateway: It is a device which connects two different dissimilar networks which has similar function of communication. It is also called as protocol convertor. It works in all layers of OSI model.

6. MODEM:

Modem works as modulator as well as demodulator. Modem converts analog signal to digital signal and vice versa. In case of networking data has to be transferred from one location to another location. At present to transfer such data whatever the infrastructure (PSTN) is available .it is of analog technology but computer sends digital data to transfer this data to another location it is needed to convert into analog format so that it can be transferred by using currently available infrastructure.
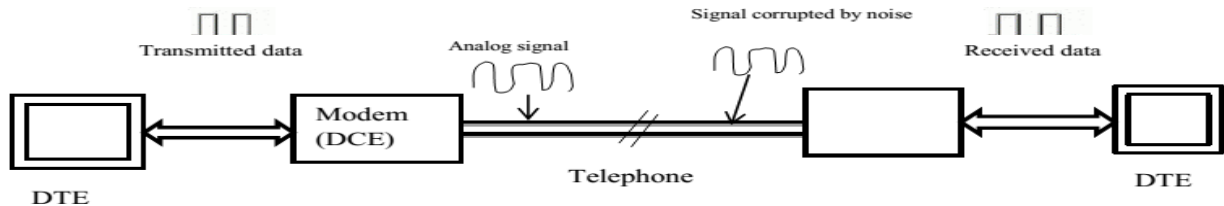
6. State any two advantages of ring topology, define token. State whether ring topology is broadcast or point to point network. (Advantages 2 marks, definition of token 1 mark; ring topology is broadcast or point to point 1 mark)

Answer: Advantages of Ring Topology:

1) Here, since the system provides point to point flow of data i.e. the data is moving in one direction from one computer to another i.e. active topology, hence no collision occurs in the system.
2) Cable faults are easily identified.
3) Dual loop rings can be easily effective.
4) Packet or data delivery is guaranteed.
5) Every computer is having equal priority.

Token: Token is a special three byte frame that travels around the ring network. It can flow clockwise or anticlockwise.

Ring topology is a **point to point** network.

7. What is token passing? List any four protocols associated with application layer of OSI model. (Token passing definition 1 mark, any 4 protocols of application layer 1 mark each)

Answer: Token passing is a method of passing the token in the ring network either clockwise or anticlockwise.

Protocols associated **with** application layer of OSI model are as follows:

1. TELNET
2. File Transfer Protocol (FTP)
3. Simple Mail Transfer Protocol (SMTP)
4. Domain Name System (DNS)
5. Hypertext Transfer Protocol (HTTP)

8. What is NIC? State functions of NIC.
(Definition- 1M; Any three functions – 1M each)

NIC: NIC is a Network Interface Card which is a small card inserted or plugged on the motherboard of the host. It has a small CPU, memory and a limited instruction set required for the network related functions. Each NIC has a unique hardware address or physical address to identify the host uniquely, which ensures that its unique all over world.

The functions include:
- It accepts instructions from host to transfer data to/ from cable.
- It checks the status of the bus with the help of the transceiver and waits till the bus is busy.
- It sends the data bit by bit once the bus is idle.
- It inserts the CRC in the header of the frame while transmitting.
- While accepting the data, NIC compares the destination address in the frame with its own hardware address; If matches then only it is accepted otherwise rejected.
- Validating the input frame by checking its CRC to ensure that the data is error free.

9. In which situation MODEM are useful in network.
(Any two situations: 2 M each)

1. Modems are used when digital signal is sent over analog medium.
2. When the data transmission is over an analog medium such as telephone lines, Modem is used for converting analog signal to digital signal.
3. When a home user need to connect to ISP a modem is used to connect to telephone lines. Or when user wants to connect internet by telephone line.

Winter-14

1. **Enlist the components of computer network. Describe any one in brief.**
   (1 mark for list, 3 marks for description, any other component can be considered)

Answer: Same as Question No- 5 above.

2. **Write in brief any two roles of network control devices in computer network.**
   (1 role – 1 mark, any 2 two roles)

Two roles of network control devices in computer:
Role of repeater:
- Generates the original signal.
- Operates in the physical layer.

Role of Bridges:
- Bridges utilize the address protocol.
- They can exercise the traffic management.
- They are most active in the data link layer.

Role of routers:

- Routers provide connections between two separate but compatible networks.
- It works in the network layer.

Role of Gateways:
- Gateways provide translation services between incompatible networks and
- Works in all layers.

3. List any two disadvantages of bus topology.
   (1 disadvantage- 1mark, any two disadvantages)

Disadvantages of bus topology.
1. Heavy network traffic slows down the bus speed.
2. In bus topology only one computer can transmit & other have to wait till their turn comes & there is no co-ordination between computers for reservation of transmitting time slot.
3. The BNC connector used for expansion of the bus attenuates the signal considerably.
4. A cable break or loose BNC connectors will cause reflections & bring down the whole network causing all network activity to stop.

4. Discuss hybrid topology with suitable diagram. (Explanation -2 marks, Diagram- 2 marks)

Answer: Hybrid topology is one that uses two or more basic topologies together. Fig. depicts this. In this case, the bus, star & ring topologies are used to create this hybrid topology. There are multiple ways in which this can be created. The hybrid topology which is to be used for a particular application depends on the requirements of that application. In practice, many networks are quite complex but they can be reduced to some form of hybrid topology.
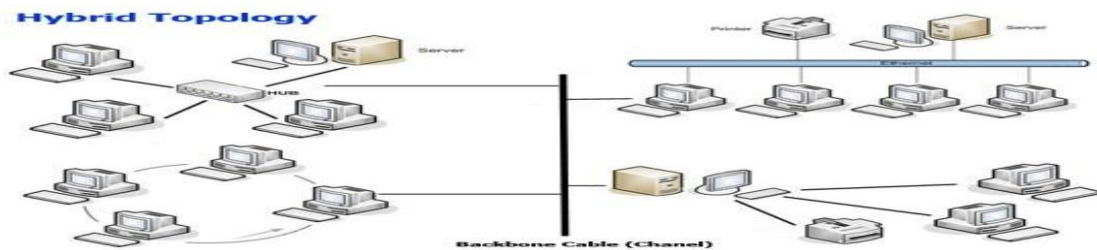
5. Give any four selection criteria for selecting network topology.
(1- mark for each criteria, any four criteria)

Answer: Selection criteria for selecting network topology.
1. Size of the network & number of devices or nodes being connected.
2. Ease of configuration & installing.
3. The ease of adding new device in an existing network.
4. The ease of fault indication & reflection.
5. Number of physical links required to be used for connecting the devices.
6. Need of network connecting devices such as repeaters, switches, hubs etc.
7. Costs involved.
8. Need of security.
9. Need of network administration.

6. Discuss the role of the HUB. Differentiate between Active Hub and Passive Hub.
(Role-2 marks, difference any 2 points -1 mark each)

HUB: Hub is a connecting device; it is also known as multiport repeater. It is normally used for connecting stations in a physical star topology All networks require a central location to bring media segments together. These central locations are called hubs. A hub organizes the cables and relays signals to the other media segments. There are three main types of hubs: **1) Passive 2) Active 3) Intelligent**

Active Hub	Passive Hub
1. They are like passive hubs but have electronic components for regeneration and amplification of signals.	1. A passive hub simply combines the signals of a network segments.
2. by using active hubs the distance between devices can be increased.	2. A passive hub reduces the cabling distance by half because it does not boost the signals.
3. The main drawback of active hubs is that they amplify noise along with the signals.	3. Passive hubs do not amplify noise.
4. They are much expensive than passive hubs.	4. They are not much expensive.

7. State the situations under which gateways are necessary in the network.
(Necessary2Marks. example2Marks)

Answer: Gateway operates at all 7 layers of the OSI model. It is a device, which connects two different dissimilar n/w which have same function of communication.

Situation where gateways are necessary: for different n/w like Ethernet, Token Ring, and FDDI etc. It can communicate if they are using same protocol for communication like TCP/IP, Apple talk if they are using different protocol from a gateway forward packet across different n/w s that may also use different protocol. Eg: if n/w A is a Token Ring network using TCP/IP & network B is a Novell Network, a gateway can relay frames between two. In certain situations the only changes required are to the frame header. In other cases, the gateway must take case of different frame sizes, data rates, format, acknowledgement schemes, and priority schemes etc.

8. Explain following:
I. Telnet II. FTP   (2 Marks for each)
1. **Telnet:** TELNET is abbreviation for Terminal Network. It is standard TCP/IP protocol for virtual terminal services proposed by ISO. TELNET enables establishment of connection to a remote system in such a way that a local terminal appears to be terminal at remote system. TELNET is general purpose client server application program.
2. **FTP.** FTP is a stranded mechanism provided by the Internet for copying a file from one host to the other.

Some of the problem in transferring files from one system to the other are as follows:
➢ Two systems may use different file name conventions.

➢ Two systems may represent text data in different types.
➢ The directory structure of the two systems may be different.

FTP provides a simple solution to all these problems. FTP established two connections between the client and server. One is for data transfer and the other is for the control information. The fact that FTP separates control and data makes it very efficient. The control connection uses simple rules of communication. Only one line of command or a line of response is transferred at a time. But the data connection uses more complex rules due to the variety of data types being transferred. FTP uses port 21 for the control connection and port 20 for the data connection.

Summer-14

1. **Give two advantages of mesh topology.** *(Any 2 advantages - 1 Mark each)*
   Ans:

Advantages of Mesh topology:

- **Dedicated Links:** Dedicated links guarantees that each connection can carry its own data load, thus eliminating the traffic problems that can occur when links must be shared by multiple devices
- **It is robust.** If one link becomes unusable, it does not incapacitate the entire system
- **It is Secure.** When every message travels along a dedicated line, only the intended recipient sees it. Physical boundaries prevent other users from gaining access to messages.
- **Point to Point Connection:** Point-to-point links make fault identification and fault isolation easy

2. **Compare Bus topology and Ring topology (four points).**
   *(Any 4 points – 1 Mark each)*
   Ans:

Factors	BUS	RING
Configuration	Moderate	Difficult
Type	It is passive Topology	It is Active Topology
Troubleshooting	Difficult	More Difficult
Media Failure	Entire N/W collapse	Entire network collapse
Failure of Node	Partially affected	Entire N/W Collapse
Addition of a node	Bit difficult as entire N/W has to shut down and then a node can be added	Very difficult as entire N/W has to shut down and then node can be added and entire N/W has to reconfigure
Cables and connectors used	T- Connector, BNC Connector, Terminator, Co-axial cable	T-Connector, BNC connector, Co-axial Cable **OR** Fiber optic connector and fiber optic cable
LAN Card used	Ethernet	Ethernet OR Fiber Optic Card
Reliability	Lower	Moderate

3. **Suppose you are going to implement a computer network in a small business mall. Which topology will you use? Why?**
   (Determining the topology -2 Marks, Justification - 2 Marks)

Ans: I will Use Star Topology.
STAR Topology
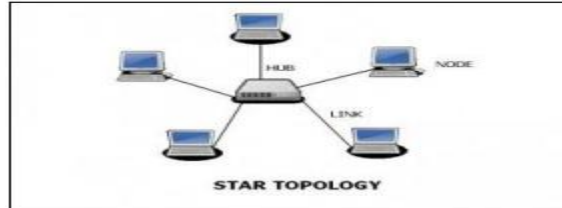
- In star topology, each computer or node is connected to a central hub.
- This is more reliable than a classical ring topology because a node failing will not bring down entire network.
- A bus topology arguably is more reliable but it has poor performance.

Advantages:

1. Highly reliable
2. Adding new node is very easy
3. Failure of any node does not affect the network
4. Troubleshooting is very easy

4. **Give the names of various N/W connecting devices (Any two).**
   (Listing of any 2 control devices -1 Mark each)
   Ans:

N/W connecting device:

- Repeater
- Hub
- Switch
- Bridge
- Router
- Gateway
- Modem

5. **What are the various components of computer network? Describe any one.**
   (Listing of Components - 2 Marks, Explanation (any one) - 2 Marks)

Ans:

Components of Computer networks:

1. Computers (two or more)
2. Network Operating System software.
3. Network Interface card (on each Computer)
4. Cables to connects computers to each other (coaxial cable, Fiber optic cable or twisted pair cable)
5. Network devices such as routers, gateways, switch, hub, bridges, connectors.

Description:

1. **Computers:** Set of Computers with latest configuration. Example: Intel Processor core i3/i5/i7 or latest with motherboard cheapest 41/61 with 4 USB, 1 Serial port, 4GB RAM DDR III, 500 GB Hard disk.
2. **Network Operating System:** refers to software that implements an operating system of some kind that is oriented to computer networking. For example, one that runs on a server and enables the server to manage data, users, groups, security, applications, and other networking functions. Example: Windows Server 2003/08/12, UNIX SERVER.
3. **NIC (Network interface card / network adapter):** It physically makes the connection, works as interface between computer and network cable.

Functions of NIC:

- Provide physical link or connectivity between computer and the network physical medium.
- Prepare data from computer for network cable.
- Send data to another node in network.
- Control flow of data between computer and physical medium.

4. **Cables:**
1. **Co-axial Cab**le: It is made of two conductors that share a common axis. The center of the cable is stiff solid copper wire or stranded wire encased in insulating plastic foam. The foam is surrounded by the second conductor, a wire mesh tube which serves as a shield from EMI. A tough insulating plastic tube forms the cover of cable.
2. **Twisted Pair Cable:** They are formed by twisting of two insulated copper wires. One or more twisted pairs are combined within a common jacket. Twisting the copper wires reduces Crosstalk. **Types:** i) Unshielded Twisted Pair Cable (UTP) ii) Shielded Twisted Pair Cable (STP)
3. **Fiber optic cable:** It is made of a light-conducting glass or plastic core surrounded by more glass called cladding, and tough outer sheath. The center core provides the light path or wave guide, while the cladding is composed of varying layers of reflective glass.

5. **Network Connecting Devices:**

1. **Repeaters:** A repeater works at the physical layer of the OSI Reference Model to regenerate the network's signals and resend them out on other segments.

2. **Router:** It is a device that attaches two or more network & forward packets according to information found in routing table

3. **Hub:** It is a device used in Star Topology that connects the computers in a LAN. Hubs are Passive, Active or Hybrid. It is a Multicast device

6. **Connectors:** To connect cables between two computers Example: RJ-45, BNC.

6. Describe with neat sketch "Hybrid topology" Give its applications. *(Hybrid topology explanation-2 Marks, Diagram -1 Mark, Use - 1 Mark)*

Ans: A combination of two or more different topologies makes for a hybrid topology. When different topologies are connected to one another, they do not display characteristics of any one specific topology.
WORKING OF Hybrid Topology
The Hybrid topology scheme combines multiple topologies into one large topology. The hybrid network is common in large wide area networks. Because each topology has its own strengths and weaknesses, several different types can be combined for maximum effectiveness.
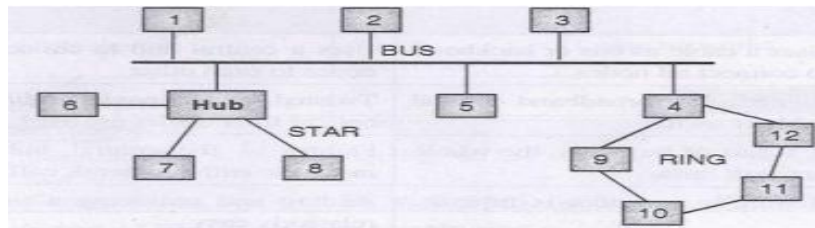
ADVANTAGES of Hybrid Topology

1) **Reliable:** Unlike other networks, fault detection and troubleshooting is easy in this type of topology. The part in which fault is detected can be isolated from the rest of network and required corrective measures can be taken, without affecting the functioning of rest of the network.

2) **Scalable:** Its easy to increase the size of network by adding new components, without disturbing existing architecture.

3) Flexible: Hybrid Network can be designed according to the requirements of the organization and by optimizing the available resources. Special care can be given to nodes where traffic is high as well as where chances of fault are high.

4) **Effective:** Hybrid topology is the combination of two or more topologies, so we can design it in such a way that strengths of constituent topologies are maximized while there weaknesses are neutralized.

DISADVANTAGES of Hybrid Topology

1) **Complexity of Design:** One of the biggest drawback of hybrid topology is its design. Its not easy to design this type of architecture and its a tough job for designers. Configuration and installation process needs to be very efficient.

2) **Costly Hub:** The hubs used to connect two distinct networks, are very expensive. These hubs are different from usual hubs as they need to be intelligent enough to work with different architectures and should be function even if a part of network is down.

3) **Costly Infrastructure:** As hybrid architectures are usually larger in scale, they require a lot of cables, cooling systems, sophisticate network devices, etc.
Applications: widely used in WAN.

7. In which circumstances star topology is preferred mostly. Name the centralized device used in star topology. Give its two advantages over Hub.
(List of circumstances - 1 Mark, Name of device - 1 Mark, Any Two advantages- 2 Marks)
Ans: star topology is preferred under following circumstances

1. When centralized management of nodes is required
2. There are more chances of adding or removing nodes in the network.
3. When there is a need of robust network. If one link fail only that node is affected.

Switch is the centralized device used in star topology.
Switch has following advantages over HUB

1. Switch is point to point networking device because it send data to only destination node
2. Switch is intelligent device because it understands MAC address.
3. Switch works at Data link layer of OSI model, whereas Hub works at Physical Layer of OSI model.
4. Switch gives full speed to all connected node, whereas Hub Distributes the speed to the all connected nodes.

8. Describe the role of following network device used in computer network
i) Gateway ii) Router iii) Hub iv) Switch *(Each -1 Mark)*
Ans:

1) Gateway:

- Gateway is protocol converter.
- Gateway enables communication between different network architecture and environments.
- Gateway connects two systems that do not use the same protocol, data format, language and architecture.
- It works at all layers of OSI model.
- Convert commonly used protocols (e.g. TCP/IP) to a specialized protocol (for example, an SNA: System Network Architecture).
- Convert message formats from one format to another. Translate different addressing schemes.
2) **Router:**
   - Router chooses the best path for packet forwarding. Router read complex network address in packet. It works at Network Layer of OSI model
   - Efficiently direct packets from one network to another, reducing excessive traffic.
   - Join neighboring or distant network Connect dissimilar networks.
   - Prevent network bottlenecks by isolating portions of a network.
3) **Hub:**
   - Hub connects all nodes in star topology.
   - Hub is broadcasting device.
   - It sends packets to all nodes in the network.
   - It works at Physical Layer of OSI mode.

4) **Switch:**
   - Switch connects all nodes in star topology.
   - Switch is point to point networking device.
   - Switch sends packets only to destination node.
   - It works at Data link layer of OSI model

Winter-15

1. **List types of network topology. Name one device used in star topology.**
   (Network Topology- 1 Mark, Device Used- 1 Mark)

Ans: Network Topology refers to layout of a network. How different nodes in a network are connected to each other and how they communicate is determined by the network's topology.
Types of Network Topology

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

Device used in STAR Topology: Switch, Hub

2. **What is hub? Give types of hub.** *(Definition of hub -1Mark, types of hubs- 1Mark).*

Ans:
HUB: Hub is amplifying & splitting device. Hub contains multiple ports & is a common connection point for connecting all segments of a LAN. When a packet arrives on a port, it is forwarded to rest of ports so that it can be sent to all other nodes in the network.
Types of Hub:- 1. Active Hub 2. Passive Hub 3. Intelligent hub

3. **Draw with neat labelled sketch of star networks having three computers in two stars and two computers in one star.** *(Correct Diagram - 4 Marks)*
   Ans:
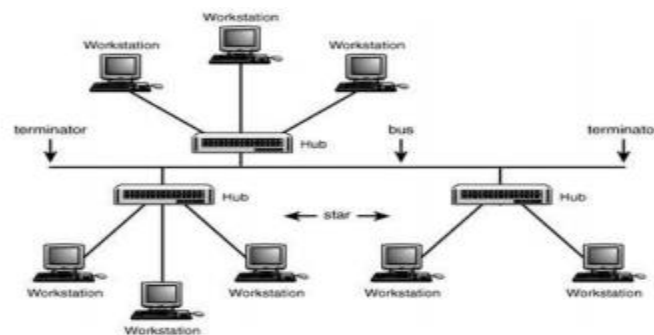
Fig: Star Bus Topology

13

4. **You are said to establish a small network with minimum cost at least ten computer and also necessary to use the centralized database. Which type of network and topology you will prefer in this situation? Justify your answer.** *(Identification of type of network – 1 Mark, its justification – 1 Mark, Identification of Topology – 1Mark, its justification -1 Mark)*

Ans:

Type of Network- Client-Server Network.

Justification- For the mention situation client Server network is preferred because centralized database can be maintained at server.

Type of Topology- **Bus Topology**.

Justification -For the mention situation Bus Topology is preferred because cost is less due to short cable length, no need of HUB, simple wiring layout. Bus topology can support 10 computers and additional nodes can be easily added to existing bus network.

5. **State two advantages of ring topology. Describe token. State whether ring topology is broadcast or point to point network.** *(Any two Advantages - 2 Marks, definition of token - 1 Mark; ring topology is broadcast or point to point - 1 Mark).*

Ans*:*
Advantages of Ring Topology:

1. The adding or removing of network nodes is easy, as the process requires changing only two connections.
2. The data being transmitted between two nodes passes through all the intermediate nodes. A central server is not required for the management of this topology
3. Here, since the system provides point to point flow of data i.e. the data is moving in one direction from one computer to another i.e. active topology, hence no collision occurs in the system.
4. Cable faults are easily identified.
5. Dual loop rings can be easily effective.
6. Packet or data delivery is guaranteed.
7. Every computer is having equal priority.

Token: Token is a special three byte frame that travels around the ring network. It can flow clockwise or anticlockwise.

Ring topology is a point to point network.

6. **State any two advantages of bus topology .Explain whether adding more computers in bus topology affects performance of network.** (*Any Two Advantage – 2 Marks Explanations – 2 Marks)*

**Ans:** The bus topology has the following advantages:

1. Low cost

2. Easy control.
3. It is easy to set-up and extend bus network.
4. Cable length required for this topology is the least compared to other networks.
5. Linear Bus network is mostly used in small networks. Good for LAN.

- In bus topologies, all computers are connected to a single cable or "trunk or backbone", by a transceiver either directly or by using a short drop cable.
- All ends of the cable must be terminated, that is plugged into a device such as a computer or terminator. Most bus topologies use coax cables.
- The number of computers on a bus network will affect network performance, since only one computer at a time can send data, the more computers you have on the network the more computers there will be waiting send data.

7. Describe gateways. State the situations under which gateways are necessary in the network. *(Explanations – 2 Marks, Diagram – 2 Marks, situation explanation - 4 Marks)*

Ans:

A gateway is a node in a computer network, a key stopping point for data on its way to or from other networks. Using gateways, we are able to communicate and send data back and forth. The Internet wouldn't be any use to us without gateways (as well as a lot of other hardware and software). In a workplace, the gateway is the computer that routes traffic from a workstation to the outside network that is serving up the Web pages. For basic Internet connections at home, the gateway is the Internet Service Provider that gives you access to the entire Internet.

Gateway operates at all 7 layers of the OSI model. It is a device, which connects two different dissimilar networks which have same function of communication. Situation where gateways are necessary for different network like Ethernet, Token Ring, and FDDI etc. It can communicate if they are using same protocol for communication like TCP/IP and if they are using different protocol from a gateway can also forward packet across different n/ws that may also use different protocol.
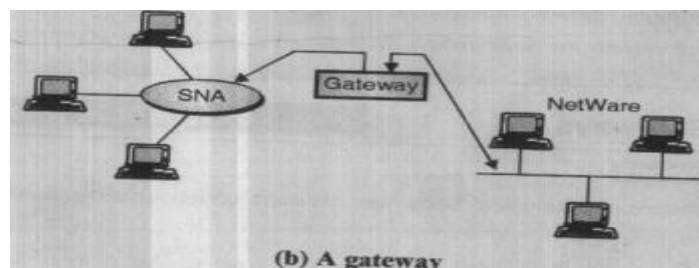
(b) A gateway

Eg: if n/w A is a Token Ring network using TCP/IP & network B is a Novell Network, a gateway can relay frames between two. This means that a gateway is not only used for similar protocol, but also used between different protocols. In certain situations the only changes required are to the frame header. In other cases, the gateway must take case of different frame sizes, data rates, format, acknowledgement schemes, and priority schemes etc.