08. Computer Network

1. **What is a Computer Network?**
   Computer Network is a group of computers and other computing hardware devices connected to each other electronically through communication medium.

2. **What is the use of computer networks**?
   By networking individual computers,
   1. **Data communication is possible** . Computer network helps user to communicate with any other user of the network through its services like e-mail chatting etc..
   2. **Resource Sharing**: The sharing of available hardware and software resources (like programs, printers , hard disk etc..)in a computer network is called resource sharing.
   3. **Reliability**: A file can have copies in different computers . So breaking down of one system does not cause data loss.
   4. **Scalability**: Computing and storage capacity can be increased or decreased easily by adding/removing computer or storage devises to the network..
   5. **Price –Performance ratio**: Sharing of hardware and software instead of purchasing saves a lot of money.

3. **What is mean by bandwidth, noise and node**?
   a). **Bandwidth**: it is the amount of data transfer through a communication medium in a unit time.
   b). **Noise**: It is the unwanted electrical or electromagnetic energy that lowers the quality of the data signals.
   c). **Node**: Any device that is directly connected to a computer network is called a node.

4. What is mean by data communication?
Data communication is the exchange of digital data between any two devices through a transmission medium.

5. What are the basic elements of a data communication system?
a). Message : It is the information to be communicated like text, picture etc.
b). Sender (transmitter or source) : The device used for sending data
c). Receiver : The device that receives the message
d). Medium :It is the path through which message travels from sender to receive.
e) Protocol : The rules under which transmission takes place between sender and receiver.

6. What are different communication media?
The path through which message travels from sender to receiver is known as communication media.
There are two types of communication media

a. Guided Media: Here data is transmitted through some physical media such as metal wire or optical cable.

1. **Twisted Pair cables:** There are two types of twisted pair cables

a). Unshielded twisted pair(UTP): It is commonly used It is cheap and flexible. It consists of two insulated conductors twisted together to avoid noise.

Characteristics: Low cost, thin and flexible, ease of installation and carries data up to a length of 100m.

b). Shielded Twisted pair(STP): Here the twisted pair itself is shielded again.

Characteristics: protection from electromagnetic noise, difficult to install and expensive.

2. **Coaxial cables**: It has an inner central metallic core surrounded by an insulating sheath. It is then surrounded with a conducting outer cover and is again covered with a protecting insulation .

Characteristics: Expensive high band width, less flexible, difficult to install and carries data up to a length of 500m.

3. **Optical Fiber** : Optical fiber use light instead of electrical signals. They are made of glass fibers covered by a cladding both are in perfect thickness and in different refractive indices. Then it is covered by a plastic jacket.

LED or Laser Diode is used to convert electrical signal in to light signal(modulation). Laser is expensive but can used for long distance transmission.

Characteristics: High bandwidth, carries data over a long distance, expensive but effective and difficult to install.

b. Unguided media: Here data transmission takes place through space or air. Electromagnetic waves are used for it.

1. **Radio Waves**:

Its frequency range from 3 KHz to 3 GHz. It can used for short distance and long distance communication. These waves can easy to generate and can penetrate through most of the objects. So it can be used in indoors and outdoors.

Characteristics of Radio Waves transmission

a). Not a line of sight transmission
b). Inexpensive than wired media
c). Can penetrate through most objects
d). It can affected by electrical equipments like motor

Different types of radio transmissions are,

I). Bluetooth: Its frequency range from 2.402 GHz to 2.480 GHz. It is a short distance communication (approx 10m). It is uses in cell phones, wireless keyboard etc..

Characteristics:

i). Not a line of sight communication
ii). Can connect up to 8 devices
iii). Slow transfer rate(up to 1Mbps)

II). Wi-Fi: Its frequency range from 2.4 GHz to 5 GHz.

Characteristics:

i) . Not a line of sight communication.

ii). Data transfer speed is up to 54Mbps

iii). Can connect more devices at a time.

Iv). Range up to 114m

III). Wi-Max: Worldwide interoperability for Microwave Access

It combines the benefits of wireless and broadband. Its frequency range from 2 GHz to 11 GHz.

Characteristics:

i). Hundreds of users can connect at a time

ii). Range up to 45 Km

iii). Transmission speed up to 70Mbps

iv). High cost of installation and power consumption.

IV). Satellite Link: These are like repeaters but can cover a large foot area due to its position 36000KM above earth. Geostationary satellites are used for this. Its transponders receive the sending signal from earth(**uplink**) (frequency 1.6 GHz-30GHz), strengthen them and slightly change its frequency to avoid mixing with the up linking signal and retransmit it to earth(**downlink**) (frequency 1.5 GHz-20GHz),. The ground station can receive or even the end user can receive it.

Characteristics of satellite transmission

i). satellite cover a large are of the earth.

ii). Requires permission and license

iii). Expensive

2. **Microwaves**: It use in line of sight method of propagation. These waves can't travel along the surface of earth. So taller antennas and transceivers uses to receive the wave and strengthen and retransmit..

Eg. Mobile communication.

Characteristics:

1. Inexpensive than wired media
2. Transmission is in straight line
3. Easy communication over difficult areas

3. **Infrared Waves:**

Its frequency range from 300 GHz to 400 THz. It is a short distance communication (approx 5m)

Eg. remote control device

Characteristics:

1. A line of sight transmission.
2. Only two device can communicate
3. Short distance communication

7. ..... Is the jacket used in UTP cables.

Rj 45

8. **What are data communication devices?**

Data communication devices act as interface between computer and the communication channel. They are used to transmit, receive , amplify and route the signals across the communication media.

a). Network Interface Card(NIC): It enables a computer to connect a network and communicate. It can breaks up data into small units, translate the protocols , send and receive data. It may be wired(Ethernet) or wireless(Wi-Fi).

b). Hub: Hub is used in wired network to connect devices of the same network. It transmit data to all the devises connected to it. Only the device to which data is assigned is responds to it. Large network traffic due to this reduces its bandwidth.

c). Switch: Switch can be considered as an intelligent hub. It store addresses of all the device connected to it. Switch read the destination address of the data from the packet and send data to the particular destination device only. So network traffic can be reduced.

d). Repeater: They are used to receive the incoming signal , amplify it to their original strength and retransmit it.

e). Bridge: It is used to interconnect different segments of an existing network. Only those packet addressed to a node on a particular segment allowed to pass the bridge and transmitted to all the nodes in the segment.

f). Router: It can interconnect two networks of the same type using the same protocol. It can find the best path for data packets to travel and can reduce the amount of traffic in the network.

g). Gateway: It can interconnect two different networks using the different protocols. It can translate one protocols to other and can understand the address structure used in different networks.

Data Terminal Equipments: These are the devices that controls data flowing to or from a computer. These are connected at the end of the communication link.

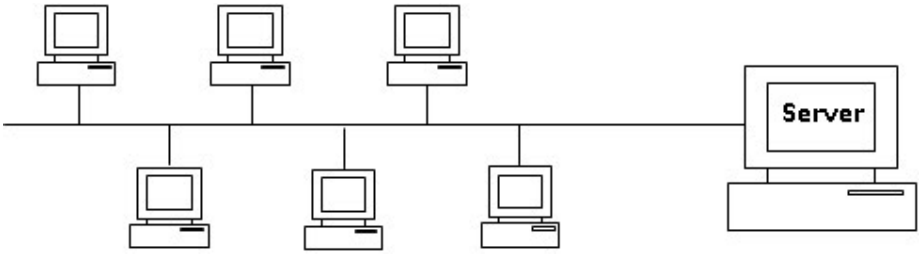
a). Modem: It is used for communication between computers through telephone lines. It convert digital signals received from a computer in to analog signals (Modulation) and analog signals received from telephone lines in to digital signals (Demodulation). Its speed (which is denoted as bits per second-bps) determines the speed of the data communication.

b). Multiplexer/Demultiplexer: It divided the transmission medium into several logical frequency channels through which we can send many different signals at a time. At the destination, a demultiplexer separates the different signals.

9. **What is topology? What are different types of topologies**?

Topology is the way in which computers are physically interconnected to form a network. Common types of topologies are,

a). **Bus Topology**: There is a main cable called bus from the server to which every node computers are connected by short drop cables. A small device called terminator is attached at the end of the bus. When a data signal reaches the terminator at the end, it is absorbed and the bus is free to carry new signal.



Advantages:

i). Easy to install

ii). Less cable is needed. So less expensive

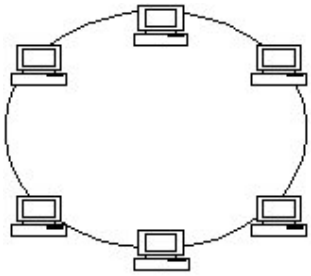
iii). Failure of node does not affect the network.

Disadvantages:

i). Fault detection is difficult.

ii). Failure of cable, server or terminator will affect entire network.

b). **Ring Topology**: All node computers are connected to a circular cable. All data is passing through this cable.



Advantages:

i). No signal amplification required because each node do this.

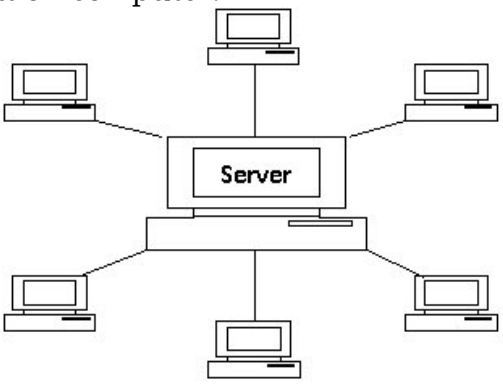
ii). Requires less cable, so cost effective

Disadvantages:

i). If a node fails, entire network will fail.

ii). Addition of nodes is difficult.

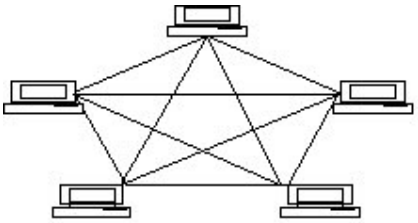
c). **Star Topology**: In star topology there is server at its centre and all other work stations are connected to it through separate connections. All messages are passed through the server. When a message goes from one computer to another , it is first send to the server , which then retransmit the message to the destination computer.



Advantages: **i).** If one workstation fails, it does not affect the whole network.
ii). Easy to install
iii). It easy to expand
iv). Easy to find faults and remove workstations.

Disadvantages:
i). Requires more cables than Bus topology
ii). If the central device fails it affect entire net work

d).**Mesh Topology**: In this Topology each node is connected to other nodes. So there is more than one path between two nodes. So failure of one node may not affect the data communication.



Advantages: **i).** If one workstation or a path fails, it does not affect the whole network.

Disadvantages:
i). Requires more cables so very expensive.
ii). Very complex and difficult to manage.

10. What are different types of computer networks?

a). Personal Area Network(PAN): Network of communication devices in the proximity of an individual.
Eg. Bluetooth communication.

b) Local Area Network(LAN): Networking of communication devices within a limited area like a building , room or a campus. It can setup using wired media(UTP/STP cable) or wireless media(infrared, radio waves etc) and can cover up to a few kilometers.

c) Metropolitan Area Network(MAN): It is a networking of communication devices within a city. Its coverage may up to a few hundred kilometers. It can interconnects a number of LANs and computers.

d) **Wide area Network(WAN):** It can span a geographically wide area like 1000 or more kilometers and may include many small networks. It may use transmission media like microwave.
The largest WAN in the world is internet.

11. Explain the logical classification of networks?
This classification based on the role of computers in a network. They are two types,

a). Peer to Peer: Here there is no dedicated server system. Any computer in the network can act as Server or Client at any instance.

b). client Server: Here a high end computer **(Server)** provides specific services to the clients upon clients request.

12. What are different types of servers?

a). File Server: Computers stores and manages files for the users in the network

b). Print Server: Redirect print jobs from client to specific printers

c). Web server: Dedicated to responds the requests for web pages.

d). Data Base Server: Allows authorized clients to view , modify and/ or delete data in a common database.

13. What is internet?

A collection of interconnected networks is called Internet. It is a network of networks which is capable of communicating with computers on other networks and sending data, files and other information.

14. What are the Hardware and Software needed to get internet in computer?

A Computer with facility to connect a modem.
A telephone connection
A Modem
A TCP/IP Account with a Service Provider.
Software such as browser.

15. Explain Internet, Extranet and Intranet?

Internet is a very large network of computers that interconnect many different networks in different parts of the world. It is a global network or network of networks. So it is a public networks and it is accessible for everyone.

Intranet is a private network owned by an organization. It used to connect various offices in that organization.

Extranet is like intranet but it can communicate with some external systems.

16. What is protocol?

It is the special set of rules to be followed in a network when devices in the network communicates. Each protocol specifies rules for formatting data, compressing data, error checking, making connections and making sure that the data packets reach its destination.

a). TCP/IP: Transfer Control Protocol/Internet Protocol used to interconnect network devices on local network and internet. When data is send from one device to another, the data is broken in to small packets by TCP and send through transmission medium. Delivery of each of these packets to the right destination is done by IP. When the packets are received by the receiving computer, TCP checks packets for error and assemble in to original message.

b). HTTP: Hyper Text Transfer Protocol is a standard protocol for transferring request from client side to receive response from the server side. The HTTP client (Browser) sends a request to the HTTP server (Web server) and server responds with HTTP responds.
HTTP is medium independent and stateless(Server and client are aware each other only during a request or response).

c). FTP: File transfer Protocol is the easiest way to transfer files between computers via internet. TCP/IP is used to perform uploading and downloading . A FTP client program (Filezilla, Cute FTP etc..) installed in the computer helps in the easy uploading and down loading.

17. What is DNS?

Domain Name Sytem return the IP address of the domain name, we type in our web browser's address bar. DNS has a data base to store domain names and IP address of all web sites on Internet.

18. What is MAC address? What is its importance?

Media access control Address is universal, unique and permanent address (12 digit hexadecimal number) assigned to each NIC by its manufacturer. Its first half contains the ID of the manufacturer and second half is the serial number of the particular adapter.
MM:MM:MM:SS:SS:SS

19. What is IP address?

It is a unique 4 part numeric address assigned to each node on a network for unique identification of them. . It is normally expressed in "dotted decimal Number"
Eg. 192.165.1.1
There are two types of IP addresses
IPV4: A 32 bit address which can identify only 4 billion devices in the net.
IPV6: A 128 bit address which can identify 4x4x4 billion devices in the net.

20. How can identify a device uniquely in internet?

A device in internet can uniquely identify by its MAC and IP address.

21. What is ISDN?

Integrated service digital network (ISDN) is used to transfer voice, video and text between individual computers simultaneously.

22. What is URL ? What are the components of a URL?

Every network resources in the internet has a unique address known as **Uniform Resource Locator** (URL). It is the Address of the website. It consists of letters , numbers and punctuations. Eg.
http://www/dhsekerala.gov.in/model question.html
A URL is divided in to 3 parts
a). Network protocol(scheme) like *'http'*. It enables the browser to know what protocol is used to access the information specified in the domain.
b). Domain Name: (Host name/ address) like *'dhsekerala.gov.in'*. It is the name assigned to a server through the DNS to identify a particular web server. It may contain

country specific domain name like .in, .us, .au etc..
generic domain name like .com,.edu etc..
File name – It is the file to be opened like *'model question.html'*

Previous Questions:

1. A device that regenerates the incoming signals and retransmit them to their destination is called .... (1)

2. In communication system the term source refers to .... (1)

3. If all devices are connected to a central switch/hub, the topology is known as... ... .. (1)

4. "Client-server architecture is an example of centralized software management." Justify. (1)

5. 14. Which among the following communication technologies is the slowest?
   a) Bluetooth b) Wi-Fi c) Wi-MAX d) Satellite link (1)

6. Choose a data terminal equipment (DTE) from the following options.
   a) Bridge b) Modem c) Router d) Gateway (1)

7. A ... ... is a computer peripheral that allow you to connect and communicate with other computer via telephone lines. (1)

8. Find the odd one from the following.
   a). DOS b). DSL c). ISDL d). FTTH (1)

9. What is the importance of TCP / IP protocol in computer networks? (2)

10. Write any two advantages of Network. (2)

11. What are the advantages of Wi-Fi network? (2)

12. List any four advantages of forming computer networks. (2)

13. Differentiate between HUB and SWITCH. (2)

14. Explain the following terms in computer networking
    a). Node b). Bandwidth c). Noise (3)

14. Match the following. (2)

A	B
Unguided Media	org
Generic Domain Name	Coaxial cable
Guided Media	microwave
Protocol	http

15. Compare ring topology and mesh topology. (3)

16. How is a WAN differ from a LAN? (3)

17 . Explain the following terms in computer networking. (3)

18. Identify the name given to the physical arrangement of computers in a network?

Explain two types with block diagrams. (3)

19. Communication media is generally divided into two – wired and wireless media.
    a) Give an example for wireless medium. (1)
    b) Compare the characteristics of three types of wired media. (3)

20. Consider that your teacher is planning to connect the computers in the computer lab of your school to form network.
    a) He has a switch and a hub to connect these computers. Which one would you prefer? Why? (2)
    b) Name a topology that you will suggest for this network. Give reasons for your suggestion. (3)

21. Computer network has an important in the modern communication.
    a). What is data communication? (1)
    b). Explain any two guided media? (2)
    c). List any four data communication devices. (2)