Computer Network and Telecommunication

1. **Define Communication.**
   The process of sending and receiving data and information between two or more than two people is known as communication.

2. **What is Telecommunication? Give some examples of Telecommunication.**
   The transmission of data and information over significant distances through cables or through air using electronic signals or electromagnetic waves for the purpose of communication is known as telecommunication. The examples of telecommunication are mobile phone, internet phone, television, telephone, telegram, telex, radio, etc.

3. **What is data communication?**
   Data communication is the process of transferring digital data and information between computers and other electronic devices. Some examples of data communication are email, e-commerce, chat, e-banking etc.

4. **What is data transmission mode? List the different types of data transmission mode.**
   The direction of the flow of data between two communication devices connected on the network is known as data transmission mode.
   The different modes of data transmission are as follows:
   - **a** **Simplex :** The data transmission mode in which data is transmitted only in one direction. For example television, radio, newspaper, books etc. →
   - **b** **Duplex :** The data transmission mode in which data can be transmitted in both direction.
     - i. **Half Duplex :** The data transmission mode in which data travels in both directions but only one direction at a time. For examples Walkie-talkie ⇄
     - ii. **Full Duplex Transmission :** In full duplex transmission, data travels in both direction at the same time. Examples: telephone, computer, mobile etc. ↔

5. **What is computer network?**
   A computer network is an interconnection of two or more than two computers with cable or without cables, in order to share resources like hardware, data and software.

6. **Computer network reduces the cost. Give any two strong points to support this statement.**
   Computer network reduces the cost in the following ways:
   - **a** A network connected computer can easily and legally share the copies of software packages with the other computers.
   - **b** A network computer can access and share network connected peripherals like printers, hard disk etc.

7. **List any five services of computer network**
   Services of Network are as follows:
   - **a** File Services (includes sharing files, file transfer and storage, data migration)
   - **b** Print Services (includes a shared printer in a network)
   - **c** Message Services (includes sending and receiving messages)
   - **d** Application services (application programs can be shared)
   - **e** Database services (sharing of common database between multiple users)

8. **What are the advantages of computer network? OR List any four benefits that computer network offers.**

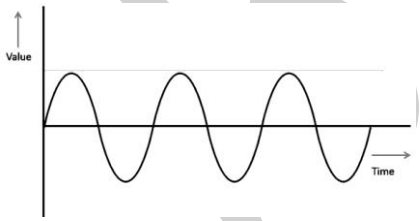
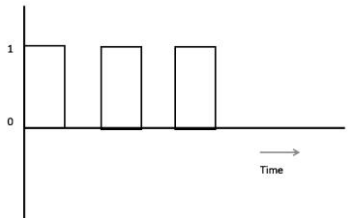
The advantages of network are as follows:

- **a** The computers, staff and information can be well managed.
- **b** The network computer can share network connected peripherals like hard disk, printers, scanners, DVD etc.
- **c** It provides the facility to share data and software among network computers.
- **d** It helps to access remote database and allows the electronic transfer of files.

9. **What are the disadvantages of computer network?**

- **a** Network failure may stop the whole organization activities.
- **b** It is very difficult to manage network and the efficiency of network depends on the skill of network administrator.
- **c** It is difficult make system secure from hackers, computer viruses etc.
- **d** Unauthorized access of data are likely possible.

10. **Difference between analog Signal and digital signal**

S. no	Analog Signal	Digital Signal
1	The analog signal is continuously varying electromagnetic waves called sine wave	The digital signal is a sequence of discrete voltage pulses called square wave.
3.	It is suitable for long distance data transmission	It is suitable for short distance data transmission
4.	Demodulator converts analog signal into digital signal	Digital signal is converted into analog signal through modulator
5.		

11. **What is network transmission media or communication channel? Define bound and unbound transmission media.**

Network transmission media is the path through which network data or information flow from one communicating device or computer to another. Transmission media may be bounded or unbounded. Physical Transmission media includes coaxial cable, twisted pair cable, optical fiber cable whereas wireless transmission media are microwave, infrared, radio wave etc.

<u>Types of communication channel</u>

- **a. Bound/Guided/Wired Transmission Media :** Transmission media that uses cable and guides the data signals along a specific path.
  - **i. <u>Twisted Pair Cable :</u>** It normally consists of two wire individually insulated in plastic then twisted each other and bound together in another layer of plastic insulation. It is most popular network cable. It uses one or more pair of insulated copper wires twisted

around each other to transmit signals. RJ-45 connectors are used to connect twisted pair cable. There are two types of Twisted Pair Cable

1. **UTP :** UTP cable consists of a number of twisted pairs with a simple plastic casing.
2. **STP:** A cable containing one or more twisted pairs of wires with additional shielding.

   Advantages : Suitable for analog & digital signal, inexpensive, easy to configure

   Disadvantages : High attenuation, low bandwidth, insecure

ii. **Coaxial Cable :** Coaxial Cable is commonly used for television transmission. It provides higher bandwidth and better reliability. It uses two wires, but one is a tube woven from very fine strands of metal. T-connectors, BNC-connectors are used to connect coaxial cable.. There are two types of coaxial cable : Thicknet and Thinnet

Advantages : Suitable for analog & digital signal, higher bandwidth, reliable.

Disadvantages : Signal loss in long distances, signal leakage , insecure

iii. **Fiber-Optic cable:** It is the most advanced media in communication, which uses light rather than electric signals to transmit information. It consists of fiber made of very pure glass or plastic that is used to transmit information in the form of pulses of laser light. It used for high speed communication and is not affected by EMI. SC and ST connectors are used to connect fiber optic cable.

Advantages : High Bandwidth, Good resistance to EMI, Fastest channel

Disadvantages : Expensive, Easily breakable, difficult to configure.

b. Unbound/Unguided/Wireless Transmission Media : The transmission media in which high wave frequencies are used to transfer data instead of cables.

i. **Microwave :** Microwave signals are used to transmit data through the space without the use of cable. Microwave transmission is line of sight transmission. The transmit station must be in visible contact with the receive station. Generally microwave signal are transmitted through repeater station.

ii. **Radio wave :** An electromagnetic wave whose frequency falls within the radio spectrum. It can penetrate an opaque medium and transmit the signal in long distances.

iii. **Infrared :** Infrared is an electromagnetic signal that are used for short distance communication. Its frequency is low, so it has low penetrating power. It cannot penetrate opaque medium. Remote control of devices uses Infrared.

iv. **Satellite :** The satellite accepts data and signal transmitted from an earth station and amplifies and then retransmits them to another station. The main advantage of this system is that it is visible from any point. The main disadvantages of satellite communication are the high cost of placing the satellite along the earth orbit.

12. Differentiate between bound and unbound transmission media.

Guided media/Bound/Wired	Unguided media/Unbound/Wireless
It is suitable for LAN	It is suitable for WAN
Often cables are used	High wave frequencies are used
Guided media are comparatively more secure and reliable but expensive	Unguided media are less secure, low reliability and inexpensive
Example: Optical fiber, coaxial cable, STP, UTP	Examples: Radio waves, Microwaves etc.

13. List the different types of computer network and explain them.

On the basis of geographical area three types of computer network. They are:

- **a Local Area Network (LAN) :** A group of computers and other devices dispersed over a relatively limited area and are connected by a communication link that enables any device to interact with any other on the network. This network may be in one room, one floor of a building or throughout one or more buildings. Example: Schools network , Organization network.
- **b Metropolitan Area Network (MAN):** A network that is limited within a city, village or metropolis and covers large geographical area than LAN is known as Metropolitan Area Network. Example : Cable Television Network
- **c Wide Area Network (WAN):** WAN is a large group of computers linked together through satellite communication in an unlimited area. This network may be across town, between cities, countries, or continents. Example: Internet.

14. Define Network Architecture?

Network architecture defines how the computer communicates and interacts with each other on network. The combined form of topologies and data transmission mode that defines how computer communicates and interacts with each other on network.

15. Explain Centralized Network.

The network architecture where all the nodes are directly connected to the server or host and workstation computers has no processing capabilities and is just used for input/output operations.

Advantages of Centralized Network

a. It saves cost of installation of network system.
b. It is highly secured network.
c. Host computer gives facilities like disk storage and software to workstation.

Disadvantages of Centralized Network

a. The malfunctioning of host computer affects other workstation.
b. It takes long time for data processing.
c. It is difficult to add more workstations.

16. What is peer-to-peer network architecture?

The technique of data transmission from node to node fashion in which each node behaves like as server or host temporarily is called peer to peer architecture.

Advantages of Peer to Peer network

- **a** Easy to install and configure
- **b** Individual machines do not depend on the presence of dedicated server.
- **c** Individual users control their own shared resources.
- **d** It's inexpensive to purchase and operate
- **e** No dedicated administrators are needed to run the network.

Disadvantages of Peer-to-Peer Network

- **a.** Network security applies only to a single resource at a time.
- **b.** Users may be forced to use as many passwords as there are shared resources.
- **c.** The expansion of network is limited.

17. What is Client-Server Network Architecture?

The client server architecture is type of broadcasting structure in which workstations or nodes are connected with main server or host. The packet of data sent by one computer, at first reaches to server,

and then passes to each local computer.

Advantages of Client –Server Network

a. Centralized user accounts and access controls.
b. More powerful equipment means more efficient access to network resources
c. A single password for network login delivers to all

Disadvantages of Client –Server network

a. At worst, server failure leads to whole network failure.
b. Complex, special purpose server software requires allocation of expert.
c. Expensive to setup dedicated server and other equipments.

18. Differentiate between peer-to-peer and client-server network architectures.

Peer to Peer	Client-Server
In peer to peer there is no dedicated server.	In client server there is a dedicated server.
Every computer acts as a server as well as client computer.	Server and client computers are different computers.
It is suitable for small sized network	It is suitable for large network.
Security level of network is poor	It is highly secured compared to peer to peer

19. What is Network Topology?

The physical layout or configuration of network computers and devices is known as network topology. A network topology describes the geographic orientation and arrangement of networking components. It is a map of physical network.

20. List the types of network topologies.

a Bus Topology: The topology in which all the computers are connected to each other through a common backbone cable (trunk). It also known as linear topology.

Advantages of Bus topology

i. It is simple and easy to configure.
ii. It requires less cable and reduces installation cost.
iii. Low traffic network

Disadvantages of Bus topology.

i. If problem occurs on the backbone cable, the entire network will go down.
ii. It tends to slow down under a heavy use.
iii. Troubleshooting could be difficult.

b Ring Topology : The topology in which, nodes are connected to each other in a closed loop by a single communication cable. Data transfers in one direction, from one node to another around the ring. It is also called loop network.

Advantages of Ring topology

i. One cable connection between the devices
ii. Short cable connection which cause an increase in network reliability.
iii. Each computer has equal access facility to the resource.

Disadvantages of Ring topology.

i. Any node failure causes network failure
ii. It is difficult to reconfigure.
iii. Difficult to diagnose faults.

c **Star Topology :** In star topology all the computers are connect to a central connecting device, hub. Data in this topology passes through the hub before continuing to its destination.

Advantages of star topology

i. Easy to add new nodes.
ii. Easy to detect faults.
iii. All the links stay active even if one link fails to work.

Disadvantages of star topology.

i. Long cable length, since each device is directly connect to the central hub
ii. The entire network fails if the central hub stops working.

21. Explain the following network devices.

a. **Bridge :** Bridge connects the networks using the same communications protocols. It is used to store and forward device used to connect different or similar networks. It is classified into two categories : Local Bridge and Remote Bridge
b. **Routers :** Routers are super intelligent bridge, which select the best path to route a message based on destination address and origin. It is highly intelligent, protocol sensitive linking device used to link similar or dissimilar LANs.
c. **Gateways :** It is used to link two dissimilar LANs. It also performs all functions of Bridge and Router. It is slower than Bridge and Router because it converts entire protocol of one network to other.
d. **Hub :** The device which makes communication between workstations and servers with multiple ports. It is used to receive incoming data, amplify and distribute. There are three types of hub, active hub, passive hub and hybrid hub.
e. **Repeaters :** A repeater is a network device that amplifies weak signals, regenerates them and send them back at their original strength. It is signal amplifier used to amplify weak signal and increase the length of LAN.
f. **MODEM :** A modem is a network device that allows computer to transmit information through telephone line. Modem is an electronic device used to convert digital signal into analog and vice versa. Modem has two parts a. Modulator and Demodulator. Modulator converts digital to analog signals and Demodulator converts Analog to Digital signals.
g. **Network Interface Card (NIC) :** A network interface card is a small circuit board or card that physically connects a computer with a network cable.
h. **Switch :** A device that connects computer, network devices and network segments.
i. **Connectors :** A connector us a device that is used to join cables or a cable to a device. Examples: RJ45, RJ11, T-Connector etc.
    i. **T- Connectors :** A Connector specially used with coaxial cables, often used by cable television broadcasting.
    ii. **RJ – 45 :** The jack used to connect network cables in Local Area Network (LAN).
    iii. **RJ- 11 :** The jack used to join telephone line to devices like modem.
    iv. **SC-Connector :**A fiber-optic cable connector that uses a push-pull latching mechanism similar to common audio and video cables.

22. Define Protocol. Write some examples of network protocols.

A formal description of message formats and the set of rules two computers must follow to exchange those messages. The term protocol refers to the set of rules and procedures that govern the

transmission of message over a physical networking medium. Some protocols are: TCP/IP, FTP, SMTP, HTTP, IPTV etc.

23. Explain about OSI/ISO model of networking.

OSI (Open System Interconnection) is the system adopted for data communication through internet because there are different sets of technology, protocols, devices and software used for transmitting data and there is a need of common language, which is understood by all the devices. OSI model consists of seven layers.

24. Terms related to Computer Network :

a **Server :** The main computer that controls access to the network , its shared resources and acts as the central authority on a network.

b **Bluetooth :** A proposed radio frequency (RF) specification that many portable devices will use for shot wireless communications is called Bluetooth. With Bluetooth devices such as laptop computers, handheld computers, cellular phones, printer can wirelessly communicate with each other.

c **Infrared (IR) :** Infrared is a type of electromagnetic wave of large wavelength and small frequencies than visible light. Its frequency is low, so it has small penetrating power. It cannot penetrate opaque medium. Remote control of devices uses Infrared.

d **Client/ Workstation :**A computer on the network besides server that uses the shared resources of the network.

e **Bandwidth :** The amount of data that can be transmitted through communication channels in a fixed time period. The bandwidth of a digital device is measured in bits per second and bandwidth of analog device is measured in hertz or cycles per second.

f **Network Operating System (NOS) :** An operating system that coordinates and manages the resources of the network and other devices attached to the network.

g **Network Administrator :** The person who is responsible for the control, configuration and monitors the computer network is known as network administrator.

h **Broadband :** A high speed bandwidth used for data, voice, and video transmission is known as broadband.

i **Terminals :** A specialized network device on a host-based network that transmits the data entered by the user to the host for processing and displays the result.

j **Bit :** It stands for Binary Digits. It is the smallest measuring unit data and information in computer system.

k **Node :**A node is any network device that can connect to the network and can generate process or transfer network data.

l **Crosstalk :** The interference produces when copper wire close to each other conduct electrical signals.

Internet and Email

1. **What is the Internet? Name any five browser software.**
   The Internet is the worldwide, publicly accessible network of interconnected computer networks that transmit data by packet switching using the standard Internet Protocol (IP). Some popular web browser software are Internet Explorer and Netscape Navigator, Mozilla Firefox, Opera, Google Chrome etc.

2. **Why internet is known as network of networks?**
   It is known as "network of networks" because it consists of millions of smaller domestic, academic, business, and government networks, which together carry various information and services, such as electronic mail, online chat, file transfer, and the interlinked Web pages and other documents of the World Wide Web.

3. **What is Email? List any four advantages of Email.**
   Email : The term used to describe the tool which allows one computer user to send and receive message electronically over computer network. Example : ramesh@yahoo.com, here
   ramesh : user name yahoo.com mail server which provides email service @ : at sign, separates user name and domain name
   Any four advantages of email are as follows:
   a. Cheapest and fastest means of communication
   b. It is more reliable than other means.
   c. It can be used from any part of the world at any time.
   d. Even pictures and files can be sent through email.

4. **Define Web Browser. List some examples**
   The software that is used to view HTML documents, retrieve and send information over the internet.
   Some Examples are : Internet Explorer, Netscape Navigator, Microsoft Edge, Google Chrome, Mozilla Firefox, Apple Safari, Opera

5. **What is search engine? List some examples of search engine.**
   Search engine is the communication program that searches documents on the basis of specified keywords and returns a list of the web links that matches the keywords. Examples are : google.com, ask.com, bing.com, baidu.com, altavista.com, yahoo.com, yandex.com, lycos.com

6. **List the services of internet.**
   a. **WWW :** It is a component of internet that presents information in a graphical interface.
   b. **Usenet :** It stands for User Net. It is a bulletin board system in which user from different geographical location share their views on a vast range of topics.
   c. **FTP :** It permits an internet user to move or transfer file (text, graphics, sounds, video) from one computer to another even if they are running on different platform.
   d. **Chat :** A real time conversation through computer by typing message.
   e. **Video Conferencing :** The visual communication of parties around the world.
   f. **IRC :** A service that enables an Internet user to participate in a conversation online in real time with multiple users.
   g. **URL :** A unique address that identifies the location of a web page on the Internet. Eg : http://www.google.com.np
      i. Here, http = protocol www = host computer name com = domain type

Google = domain name np = country code.

h. **E-commerce/ E-Trade/ E-Business :** Buying and Selling products and services online.
i. **E-fax :** Electronic Fax is used to send and receive faxes directly on computer through internet.
j. **Telnet :** A protocol to access a remote computer over the Internet. Also known as remote login.
k. **FAQ :** A document listing answers to the questions asked by many users.
l. **BLOG :** It stands for Web log. A personal online journal that appears on a website, which is periodically updated by the owner.
m. **Download :** The process of receiving or storing file from other computer to your computer on the internet.
n. **Upload :** The process of sending file from your computer to another on the internet
o. **POP :** POP is a protocol used for receiving email messages from an email server.
p. **SMTP :** It is a protocol that transfers electronic mail from one server to another.
q. **TCP/IP :** Transmission Control Protocol/Internet Protocol breaks the data into small packets and transmits the packets on the network.

List of major components and devices

1. **Units of memory**
   Bits, Nibble, Bytes, Kilobytes, Megabytes, Gigabytes, Terabytes, Petabytes, Exabytes, Zettabytes, Yottabytes
2. **Data Transmission Mode :** Simplex, Half-Duplex, Full Duplex
3. **List the types of modulation :** Amplitude Modulation, Frequency Modulation, Phase Modulation
4. **List of network operating system.**
   LINUX, UNIX, Novel Netware, Windows 2000 Advanced Server, Windows NT, Banyan VINES, Sun Solaris
5. **List of Protocols**
   TCP/IP, SMTP, FTP, IPX/SPX, HTTP, NetBEUI, POP, Ethernet, NNTP, SLIP, PPP, IPTV, WAP
6. **Network topologies**
   Bus Topology, Star Topology, Ring Topology, Mesh Topology, Tree Topology, Cellular Topology, Hybrid Topology
7. **Network Transmission Devices :** Media Connectors, Network Interface Card (NIC), Repeaters, Hub
8. **Inter-network transmission devices :** Bridge, Routers, Gateways
9. **Communication transmission devices :** Modem, Multiplexers, CSU/DSU
10. **List of search engines**
    Google, Bing, Baidu, Yandex, Yahoo, Duckduckgo, Ask.com, AOL, AltaVista, Lycos, Wikipedia, Answers.com, IWON, Excite, eHow
11. **List of media connectors**
    BNC-connector, RJ-45 connector, DIX Connector, RJ-11 Connector, ST Connector (Straight Tip), SC (Subscriber Connector) , MT-RJ Connector (Mechanical Transfer Registered Jack)
12. **List of Web or Internet Browser**
    Google Chrome, Mozilla Firefox, Microsoft Edge, Apple Safari, Opera, Internet Explorer, Brave Browser, Netscape Navigator
13. **List of one way communication (Simplex) :** newspaper, television, books, letter
14. **List of Two way communication (Duplex) :** Telephone, Internet, Voice chat etc.
15. **Services of Internet**

WWW, Email, Chat, FTP, Internet Telephony (VOIP), E-commerce, Telnet, Video Conferencing

16. **Services of Network**
    Print Service, File Service, Message Service, Application Service, Database Service
17. **Types of Network**
    Local Area Network(LAN), Metropolitan Area Network(MAN), Wide Area Network (WAN)
18. **Networking Architecture/Models :**
    Apple Talk Network, Client/Server Network, Peer to Peer Network, Centralized Network Architecture
19. **List of wireless media**
    Radiowave, Microwave, Satellite Communication, Infrared, Bluetooth Technology
20. **List of wired media**
    Coaxial Cable, Shielded Twisted Pair (STP), Unshielded Twisted Pair Cable (UTP), Fiber Optic
21. **Examples of Data Communication :** Internet, Email, Ecommerce, E-banking, E-fax
22. **Examples of Voice communication :** Radio, telephonic
23. **List of Video Communication :** Videotext, Videophone, Television, Video Conferencing
24. **List of Social Networking Websites**
    Facebook, Instagram, Youtube, Tiktok, Wechat, Mewe, Twitter, Linkedin, Pinterest, Reddit, Hi5, Classmates, Snapchat