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Q1) what is Computer network? explain the various types of networks with neat diagram.

Computer Network:

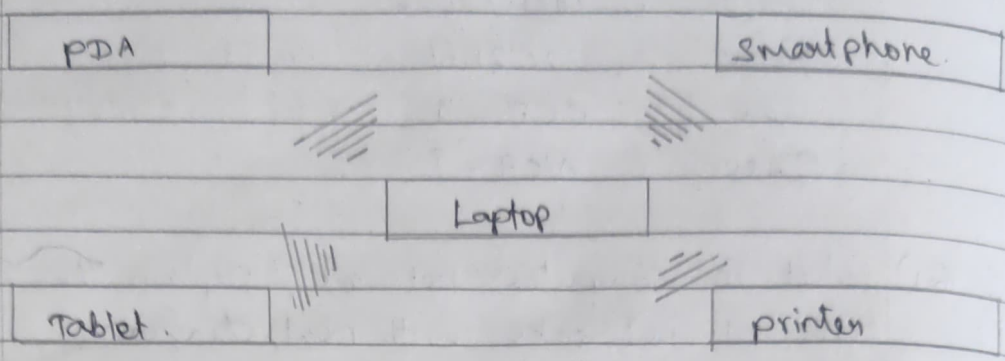
- A computer network is a system that connects many independent computers to share information (data) and resources.
- the integration of computers and other devices allow users to communicate more easily.
- it's a collection of two or more computer system that are linked together. A network connection can be established using either cable or wireless media. Hardware and software are used to connect computers and tools in any network.

Types of Computer network.

computer network are classified several factor. such as geographical area, ownership architecture, topology and transmission technology.

Personal Area network (PAN).

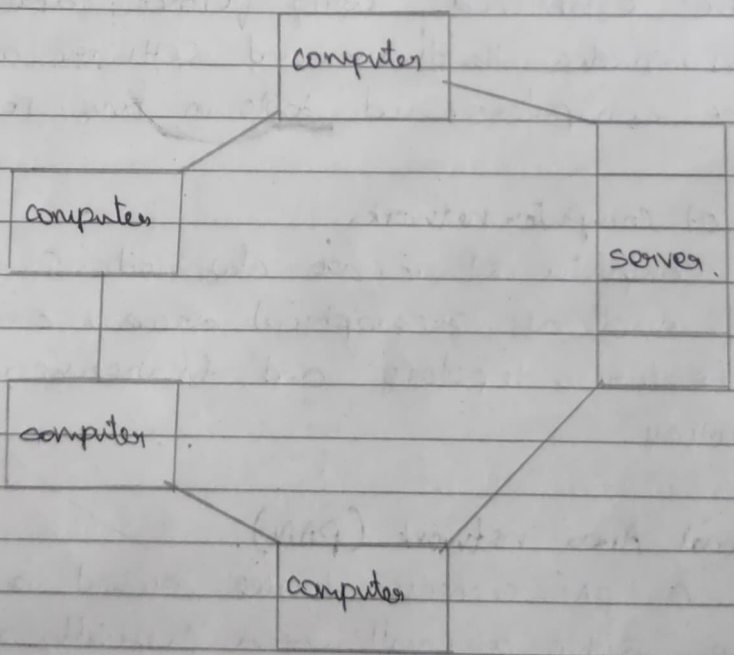
- A PAN connects devices around a single person within a small area (usually within 10 meters).
- Connecting your smartphone, laptop and bluetooth headset.



personal areal Network (PAN).

Local Area Network (LAN).

- A LAN connects computers and devices within a limited area such as an office, school or building.
- computers connected in an office or lab through a shrich or router.
- LAN are WFI in a home or school wired LAN in a company office.



Local Area Network (LAN).

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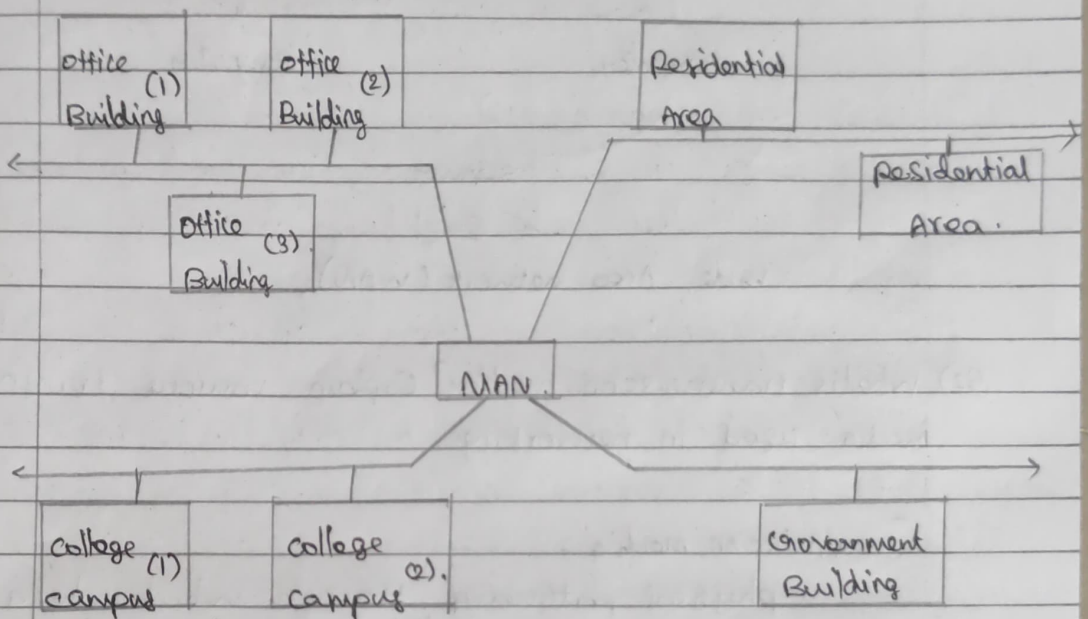
Metropolitan Area network (MAN).

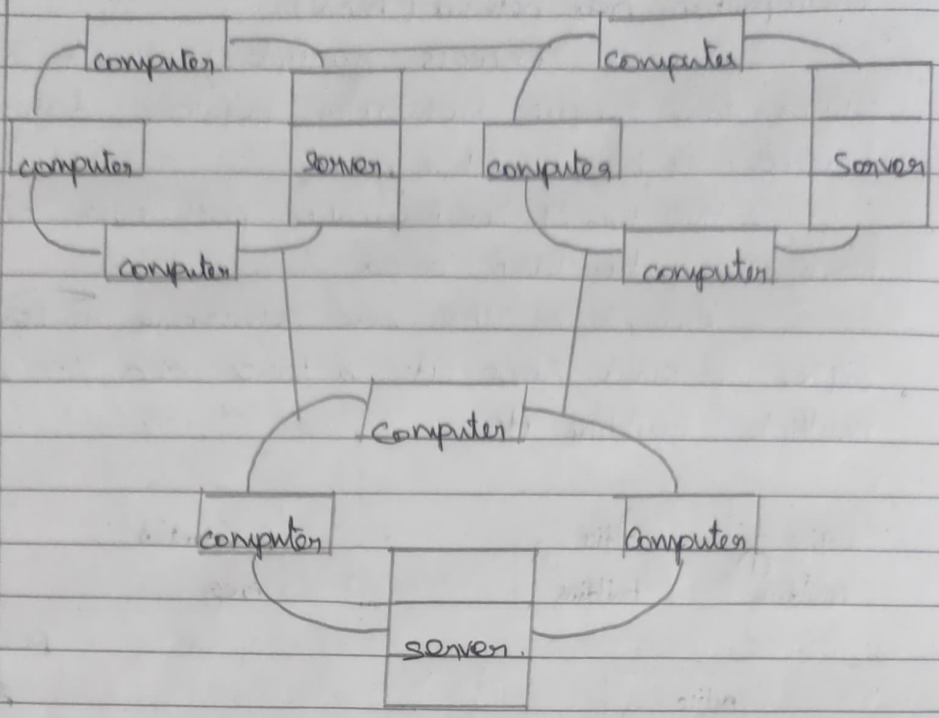
- A MAN connects multiple LAN with in a city or large Campus. Networking between different branches of bank with in a city.
- this type of communication path over city, town or metropolitan area
- example of MAN are networking in towns, cities, a single large city a large area with in multiple building etc.



Metropolitan Area network (MAN).

Wide Area Network (WAN).

- A WAN covers a large geographical area such as country or continent and connects multiple LAN and MANs. Internet is the best example of WAN.
- WAN can also be defined as a group of local area network that communicate with each other with a range above 50km.



Wide Area network (WAN).

Q2) What is transmission media? Explain various transmission media used in networking.

Transmission media:

- physical pathways through which data is transmitted from one device to another device with in a interconnected network.
- A communication channel that carries the information from the sender to the receiver.
- The transmission signals can be sent through the copper wire, fiber optics, atmosphere, water and vaccum.
- The characteristics and quality of data transmission are determined by the characteristics of medium and signal.

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Characteristics of transmission media:

- Bandwidth.
- Delay and latency.
- Cost
- Distance.
- security.

Types of transmission media:

- Guided transmission media.
- Unguided transmission media.

Guided transmission media:

-Guided transmission media also know as wired or bounded media refer to physical transmission path in which the data signals are transmitted along a specific pathway typically through a physical medium like cable.

twisted pair cable:

twisted pair cable are a type of guided transmission media. Used for voice and data communication. They consist of two insulted copper wires twisted together to reduce electromagnetic interface and crosstalk.

Coaxial cable:

coaxial cable are guided transmission media. used mainly in Tv networks and broadband internet. This design offers strong protection against interference, making it ideal for high frequency data transmission.

optical fiber cable:

optical fiber cable are advanced guided media that transmit data using light pulses.

made of thin glass or plastic stands they carry light signals with minimal loss, making them ideal for long distance and high speed communication.

Unguided transmission media:

Unguided media also known as wireless or unbounded media refers to transmission paths where electromagnetic signals are transmitted through the air without need for physical cables.

Radio waves:

Radio waves are a types of unguided media that carry electro magnetic signals over long distance. They can penetrate walls and obstacles, making them ideal for broadcasting technologies like AM/FM radio television and mobile communication.

Microwave:

Microwave communication is a wireless transmission method using high frequency radio waves for point-to-point data transfer. widely used in mobile networks, satellite links, and building-to-building communication. It support high speed long distance data transmission but is sensitive to physical obstruction.

Transmission impairments:

- Refer to any factors that negatively affect the quality or integrity of a signal as it travels through a communication medium.

Attenuation: Mean the loss of energy (strength of signal decrease with increasing the distance.

Distortion: occure when there is change in the signal.

Noise: some unwanted signal is added to it which creates the noise.

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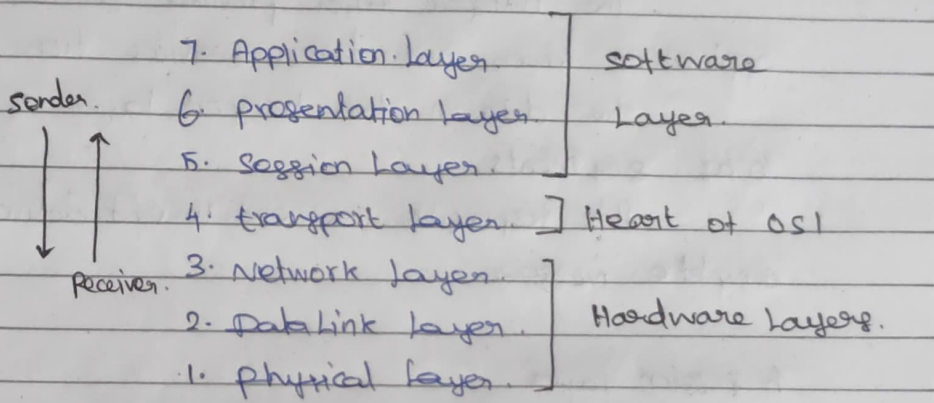
Q3) Explain OSI Reference model with suitable block diagram showing various functional layers.

OSI Reference model:

The OSI (Open System interconnection) Reference model is a conceptual framework developed by ISO to standardize the functions of a network system.

it divides the communication process into (7) layers.

Block diagram of 7 layer:



1. physical layer.

- The lowest layer of the OSI reference model is the physical layer.
- It's responsible for the actual physical connection between the devices.
- The physical layer contains information in the form of bits.

2. Data link layer:

- The data link layer is responsible for the node-to-node delivery of the message.
- The main function of this layer is to make sure data transfer is error-free from one node to another node over the physical layer.

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3. Network Layer:

- The network layer works for the transmission of data from one host to other located in different networks.
- it also takes care of packet routing (i.e) selected the shortest path to transmit the packet from the number of routes available.
- the sender & receiver's IP address are placed in the header by the network layer.

4. Transport layer.

- The transport layer provides services to the application layer and takes services from the network layer.
- The data in the transport layer is referred to as segments.
- it's responsible for end-to-end delivery of the complete message.

5. Session Layer:

- This layer is responsible for the establishment of connection maintenance of sessions, authentication, and also ensures security.

6. presentation Layer:

- The presentation layer is also called the translation layer.
- The data from the application layer is extracted here and manipulated as per the required format to transmit over the network.

7. Application Layer:

- At the very top of the OSI Reference model stack of layers, we find the Application layer, which is implemented by the network applications.
- These application produce the data which has to be

transferred over the network.

- This layer also provides at a window for the applications services to access the network and for displaying the received information to the user.

Q4) What is network protocol? Explain why protocols are essential for computer networks.

Network protocol:

- A network protocol is set of rules standard, and procedures, that define how data is formatted, transmitted, and received across computer network.
- protocols ensure that devices from different manufacturers can communicate with each other in a reliable and standardized manner.

1. Standardization of communication:

protocols are create a common language for devices. without protocol devices from different vendors could not communicate.

2. Reliable Data transmission:

protocols ensure data is delivered correctly, in order and without errors.

3. Interoperability:

Different hardware and software systems can work together because protocol define universal rule.

4. Efficient network communication:

protocol manage:

- Routing
- FlowControl
- Congestion control
- segment and reassembly.

5. Security of data.
- protocols provide mechanism for,
Encryption.
Authendication.
secure data transfer.

6. Addressing and Identification:
protocol defines addressing schemes to identify source and destination devices uniquely.

7. coordination between Layers:
In layered model like OSI and TCP/IP, each layer performs specific tasks and use protocols to coordinate with other layers.

Q5) Explain any four network components with an examples:

1. Network interface card (NIC).
A network interface card allows a computer or device to connect to a network. it provides the hardware address (MAC) used for communication

Functions:
- convert data into signal for network transmission
- enable wired or wireless communication.

Examples:
- Ethernet LAN card.
- WiFi adapter.

2. Switch:
A switch connects multiple devices in a Local area network (LAN) and forwards data based on (MAC) address.

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Functions:

- Reduces collisions.
- sends data only to the destination device.
- create separate collision domains.

Examples:

- cisco 24 port switch.
- Netgear gigabit switch.

3. Router:

A Router connects multiple networks and forwards data packets between them using IP address.

Function:

- Routing between LAN and WAN.
- provides DHCP (ip assignment).
- Supports NAT and basic firewall feature.

Examples:

- Home WIFI router
- cisco Enterprise router.

4. Hub:

A Hub is a simple networking device that connects multiple computers in a LAN and broadcast incoming data to all connected device.

Functions:

works at physical layer.
No filtering or routing.
create single collision domain.

Examples:

4-port ethernet hub.
8-port Fast Ethernet hub.

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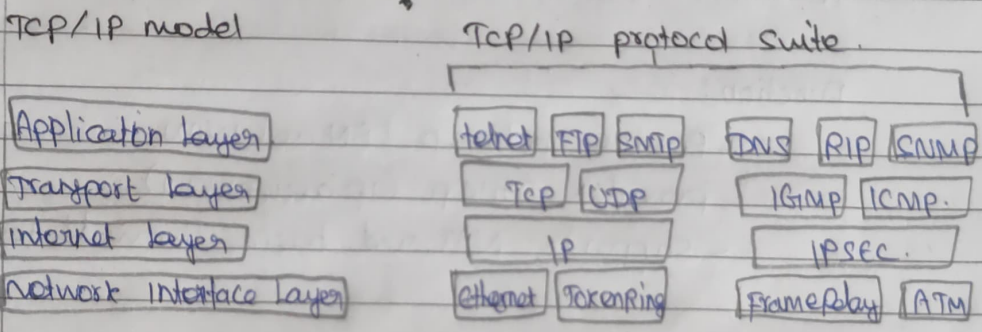
Q6). What is TCP/IP? Explain the function of each layer.

TCP/IP:

TCP/IP (Transmission control protocol/ internet protocol) is a set of communication protocols used for connecting network devices on the internet

It's the standard protocol suite for data transmission over networks, including the internet

TCP/IP is a 4-layer architecture that defines how data should be packaged, addressed, transmitted, routed and received.



1. Network interface layer:

- The network interface layer also called the link layer or the data-link layer or Host to network layer is interface to the actual network hardware
- This interface may or may not provide reliable delivery and may be packet or stream oriented.

2. Internet layer:

- It provides the "virtual network" image of an internet this layer shields the higher levels from the physical network architecture below it.
- Internet protocol (IP) is the most important protocol in this layer. It is a connectionless protocol that doesnot assume reliability from

lower layers.

3. Transport layer:

- The transport layer provides the end-to-end data transfer by delivering data from an application to it's remote peer.
- Multiple applications can be supported simultaneously.
- The most-used transport layer protocol is the data transmission control protocol, which provides connection oriented reliable data delivery, duplicate data suppression, congestion control, and flow control.

4. Application layer:

- The application layer is provided by the program that uses TCP/IP for communication.
- An application is a user process cooperating with another process usually on a different host (there is also a benefit to application communication within a single host)