COMMUNICATION NETWORK ANSWERS

Q1.a List the difference between Switch and Hub? **2MARKS**

What is a Router?

The router forwards data packets along networks. It is connected to at least two networks, commonly two LANs or WANs or a LAN and its ISP's network. Routers are located at gateways, the places where two or more networks connect. Routers use headers and forwarding tables to determine the best path for forwarding the packets, and they use protocols to communicate with each other and configure the best route between any two hosts.

What is a Switch?

In networks the switch is the device that filters and forwards packets between LAN segments. Switches operate at the data link layer (layer 2) and sometimes the network layer (layer 3) of the OSI Reference Model and therefore support any packet protocol. LANs that use switches to join segments are called switched LANs or, in the case of Ethernet networks, switched Ethernet LANs.

what is a Hub?

A hub is a common connection point for devices in a network. Hubs connect segments of a LAN. It contains multiple ports so when a packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets.

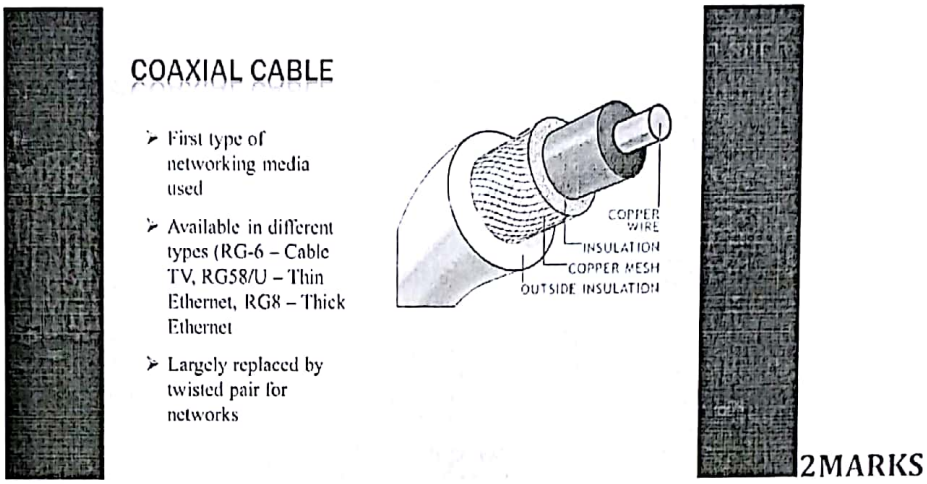
Q1.b Sketch & Describe the different types of LAN topologies **4MARKS**

Star	• Transmitted data from sender to receiver.Passes through central controller.Hub or centralized topology Advantages: Permits easy routing. Easy access control to network Disadvantages: Requires extremely reliable central site. Requires ability to handle all network traffic. No matter how heavy
Ring	• Sites connected in closed loop. May connect to other networks. Using bridge (same protocols). Using gateway (different protocols) • Data transmitted in packets. Source and destination address fields • Packet passed from node to node.One direction only. Every node must be functional. Bypass failed node needed for proper operation
Bus	Sites connect to single communication line. Messages circulate in both directions. One site sends messages at a time ssuccessfully Need control mechanism. Prevent collision. Data passes directly from one device to another. Data may be routed to end point controller at end of the line.

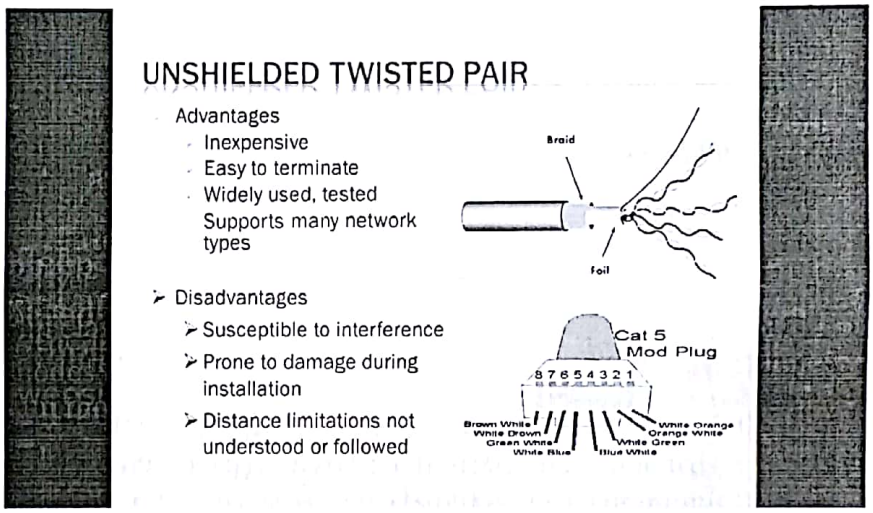
Q1.c Describe two of the transmission media needed to create a local area network.

Guided media, which are those that provide a conduit from one device to another, include

- **Twisted-Pair Cable**
- **Coaxial Cable**



2MARKS



Q1.e Briefly Explain the need of the data link layer if the transmission channels are virtually error free. **2MARKS**

Solution:

The data link layer is still needed (1) for framing the data and for flow control over the transmission channel. In a multiple access medium such as a LAN, the data link layer is required to coordinate access to the shared medium among the multiple users (1)

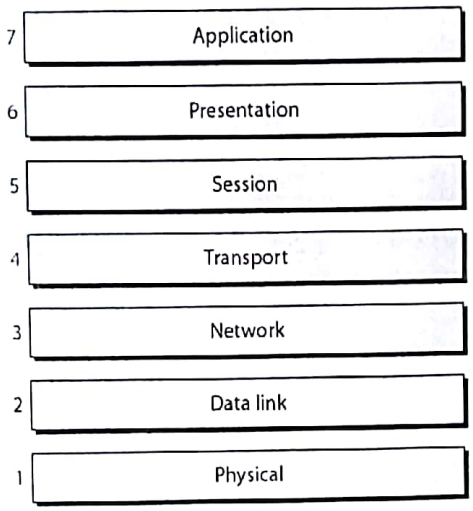
Qestion2

THE OSI MODEL

The International Standards Organization **(ISO)** is a multinational body dedicated to worldwide agreement on international standards.

An **ISO** standard that covers all aspects of network communications is the Open Systems Interconnection (OSI) model.

Seven layers of the OSI model



Physical layer: The physical layer is responsible for movements of individual bits from one hop (node) to the next.

Data link layer: The data link layer is responsible for moving frames from one hop (node) to the next.

Network layer: The network layer is responsible for the delivery of individual packets from the source host to the destination host.

Transport layer: The transport layer is responsible for the delivery of a message from one process to another.

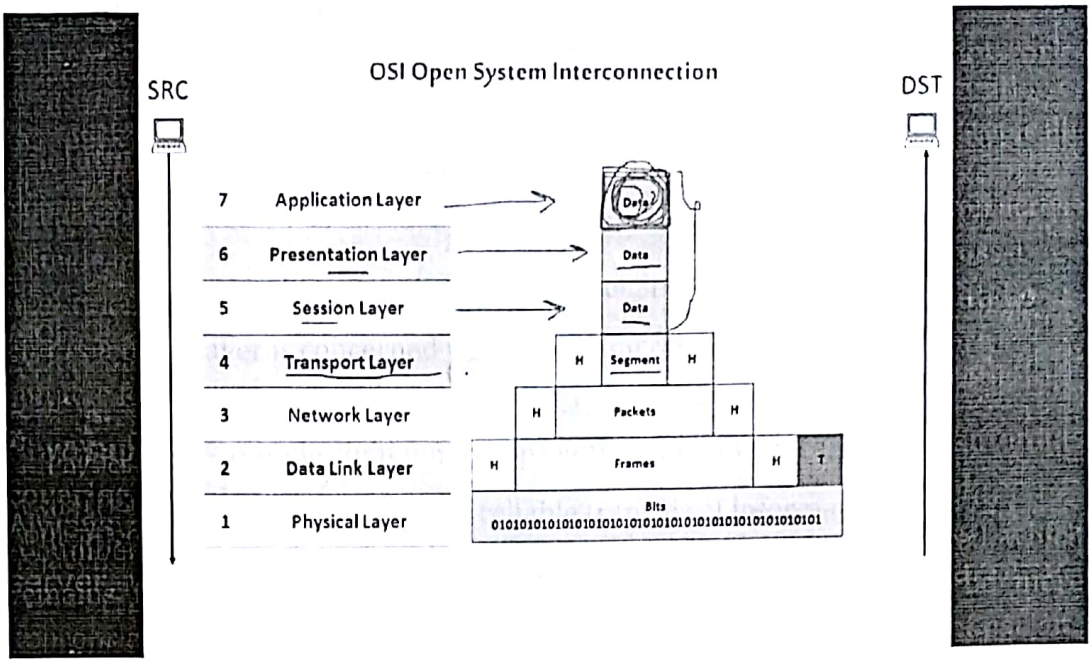
Session layer: The session layer is responsible for dialog control and synchronization.

Presentation layer: The presentation layer is responsible for translation, compression, and encryption.

Application layer: The application layer is responsible for providing services to the user.

Answer to Why? – Same reason as dividing a big program into smaller functions. It is difficult to attack big problems as a whole.

Answer to interaction question? – Modules have a layered structure. Each layer (module) provides service to upper layer and expects service from lower layer.



=b) Which OSI layer is responsible for the following?

- Determining the best path to route packets. [1 mark]
- The network layer is concerned with the selection of paths across the network.
- Providing end-to-end communications with reliable service. [1 mark]
- The transport layer is concerned with providing reliable service on an end-to-end basis across the network.
- Providing node-to-node communications with reliable service. [1 mark]
- The data link layer provides for the reliable transfer of information between adjacent nodes in a network.

e) Suppose all laptops in a large city are to communicate using radio transmissions from a high antenna tower. Is the data link layer or network layer more appropriate for this situation? [2 marks]

Solution:

The data link layer is concerned with the transfer of frames of information across a single hop . The network layer involves the transfer of information across a network using multiple hops per path in general. The connection from a radio antenna to the laptops is direct, and thus a data link layer protocol is more suitable for this situation (2).

f) Now suppose the city is covered by a large number of small antennas covering smaller areas. Which layer is more appropriate? [2 marks]

A number of areas each covered by small antennas can be interconnected, which remains in the data link layer. However, the network layer may be more appropriate (2) because it provides for the transfer of data in the form of packets across the communication network. A key aspect of this transfer is the routing of the packets from the source machine to the destination machine, typically

traversing a number of transmission link and network nodes where routing is carried out.

Q3.a.b

TCP is a connection oriented data service that provides a reliable loss free end to end connection_ Peer to peer communication between applications is often managed using TCP_(file transfer)

UDP is an unreliable datagram service which provides end to end packet delivery without recovery and retransmission for applications that might wish to implement their own packet management and error recovery protocols(Watching a real time streamed video)

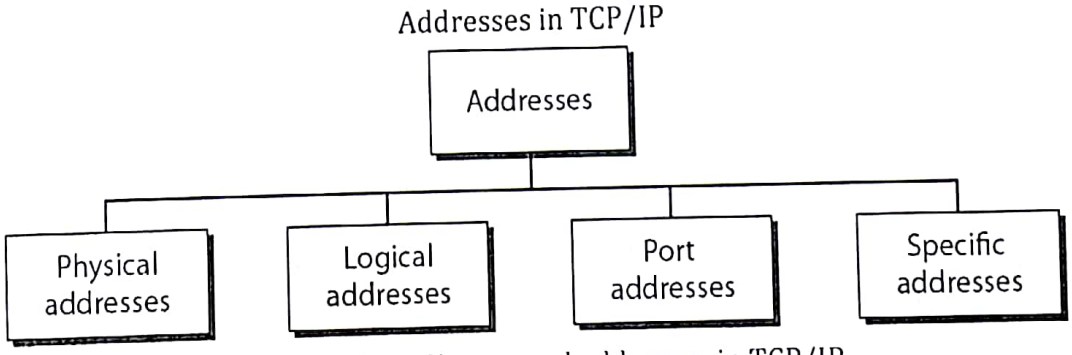
IP The Internet Protocol (IP) is the principal communications protocol in the Internet protocol suite for relaying datagrams across network boundaries. Its routing function enables internetworking, and essentially establishes the Internet.

HTTP The Hypertext Transfer Protocol (HTTP) is an application protocol for distributed, collaborative, and hypermedia information systems HTTP is the foundation of data communication for the World Wide Web. Hypertext is structured text that uses logical links (hyperlinks) between nodes containing text. HTTP is the protocol to exchange or transfer hypertext.

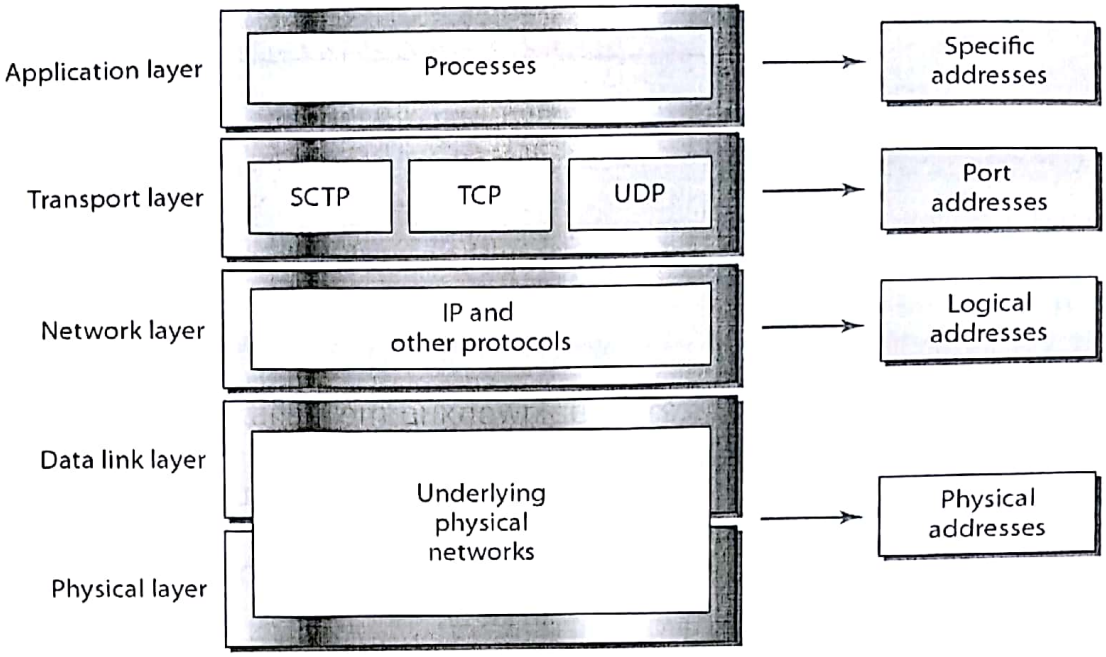
FTP The **File Transfer Protocol (FTP)** is the standard network protocol used for the transfer of computer files between a client and server on a computer network.

Q3.c.d.Four levels of addresses are used in an internet employing the TCP/IP protocols:

Physical Addresses
Logical Addresses
Port Addresses
Specific Addresses



Relationship of layers and addresses in TCP/IP



Q4.a.

Use an effective antivirus and keep it updated at all times

Keep a backup of your files

Never open emails from unknown senders.

Avoid visiting unsafe websites.

Always Keep your Windows OS Updated

Always be cautious with the programs you install or run

Q4.b.Describe the packet filter fire wall operation

A firewall is a network security system, either hardware- or software-based, that uses rules to control incoming and outgoing network traffic. A firewall acts as a barrier between a trusted network and an untrusted network. A firewall controls access to the resources of a network through a positive control model. This means that the only traffic allowed onto the network is defined in the firewall policy; all other traffic is denied.

Q4.c. Distributed Denial of Service

A distributed denial-of-service (DDoS) attack is an attack in which multiple compromised computer systems attack a target, such as a server, website or other network resource, and cause a denial of

service for users of the targeted resource. The flood of incoming messages, connection requests or malformed packets to the target system forces it to slow down or even crash and shut down, thereby denying service to legitimate users or systems.

Q5.a Write about Line coding and its characteristics.

Signals travel through transmission media, which are not perfect. The imperfection causes signal impairment. This means that the signal at the beginning of the medium is not the same as the signal at the end of the medium. What is sent is not what is received.

The three different causes of impairment are attenuation, distortion, and noise.

Attenuation:

Attenuation means a loss of energy. When a signal, simple or composite, travels through a medium, it loses some of its energy in overcoming the resistance of the medium.

Distortion:

Distortion means that the signal changes its form or shape. Distortion can occur in a composite signal made of different frequencies. Each signal component has its own propagation speed (see the next section) through a medium and, therefore, its own delay in arriving at the final destination.

Noise:

Noise is another cause of impairment. Several types of noise, such as thermal noise, induced noise, crosstalk, and impulse noise, may corrupt the signal. Thermal noise is the random motion of electrons in a wire which creates an extra signal not originally sent by the transmitter. Induced noise comes from sources such as motors and appliances.