1. Define interfaces and services. Explain in brief OSI reference model.

Ans> Interface is an shared boundary that allows two or more seperate computer system components to exchange data. Software, computer hardware, peripheral devices, humans, and combinations of these can all be exchanged.

A network service is an application that runs at the network application layer or higher and provides data storage, manipulation, presentation, communication, or other functionality.

OSI is a reference model that describes how information from one computer's software application moves through a physical medium to another computer's software application.

It is divided into seven layers, each of which performs a specific network function. The OSI model divides the whole task into seven smaller and manageable tasks.

Characteristics of OSI model.

1. The OSI model is divided into two layers: upper layers and lower layers.
2. The upper layer of the OSI model mainly deals

with the application related issues, and they are implemented on in hardware and software.

Sender → Receiver

↓ Application ↑
↓ Presentation ↑
↓ Session ↑
↓ Transport ↑
↓ Network ↑
↓ Data link ↑
Physical

1) Physical layer

It is concerned with the transmission of raw data bits over communication lines.
It receives the frames from the data link layer and converts them into electrical pulses, which represent binary data (0's and 1's) and send over the wired and wireless media.

2) Data link layer.

It is concerned with reliable transfer of data over communication channel provided by physical layer.
It breaks the data into data frames, transmits the frames sequentially over channel and checks for transmission errors

3) Network layer.

It determines the best path for data transmission.

It is responsible to identify the host by using IP address and deliver the data packet from one host to another host on different networks.

4) Transpost layer

It accepts data from the above layer, splits it up into smaller units and passes these to lower layers isolating from each other.

5) Session layer.

It allows user on different machines to establish sessions between them.

6) Presentation layer.

It selects data structure, provides data transfer syntax and semantics. It maintains the format of data and ensures the data is readable by the application. ↳

7) Application layer.

Here the users interact with the application provide network services to the end users.

Date
Page

2. Explain in brief the types of services provided by network layer to its upper layer.

→ Network layer is the third layer of the OSI model. It handles the service requests from the transport layer and further forwards the service request to the data link layer. The network layer translates the logical addresses into physical addresses.

The main role of the network layer is to move the packets from the sending host to receiving host.

The main functions performed by the network layer are:

1) Routing: When a packet reaches the router's input link, the router will move the packets to the router's output link. for eg:- a packet from S1 to R1 must be forwarded to next router on path to S2.

2) Logical Addressing: The data link layer implements the physical addressing and n/w layer implements the logical addressing. It is also used to distinguish bet^n source and destination system.

3) Internetworking:

This is the main role of the network layer that it provides the logical connection between different types of networks.

4) Fragmentation:

It is a process of breaking the packets into the smallest individual data units that travel through different networks.

The OSI model is divided into two layers: upper layers and lower layers. The upper layer of OSI model mainly deals with the application related issues, and they are implemented only in software. The application layer is closest to end user. Both the end user and the application layer interact with the s/w applications. An upper layer refers to layer just above another layer.

The lower layers of the OSI model deals with the data transport issues. The data link layer and the physical layer are implemented in hardware and software. The physical layer is the lowest layer of the OSI model and is closest to physical medium.

Date
Page

3. List the three reasons for using layered protocols. Mention two advantages and disadvantages of having international standards for network protocols.

A protocol is used for communication between entities in different systems. The terms 'entity' and 'system' are used in general sense.

Protocol is a set of rules ~~and regulations~~ of governing the exchange of data between two entities.

The main function of protocol is orderly exchange of data messages and process synchronization. Whereas the main aim of layered architecture is to divide the design into small pieces. We require the layered protocol for:

1) Divide and conquer approach: Divide-and-conquer approach makes a design process in such a way that the unmanageable tasks are divided into small and manageable tasks. In short, we can say that this approach reduces the complexity of design.

2) Modularity: It is more modular. Modularity provides the independence of layers. which is easier to understand and implement.

3) Easy to modify: It ensures the independence of layers so that implementation in one layer can be changed without affecting other layer.

Advantages of having international standards for network protocols.

→ A common benchmark for others to build upon.
→ If everyone follows the standard, then they would all be able to interconnect easily.
→ Maintenance and installation became simplified due to a common underlying standard.
→ Widespread use encourages people to develop applications that comply with existing standards.

Disadvantages of having international standards for network protocols.

→ Once a standard has been adopted worldwide it would be difficult to modify if any issues are identified in it.
→ If new techniques are discovered, it would be difficult to incorporate those techniques into an already accepted standard.

Date
Page

→ less focus on developing new techniques once all organizations start following a standard.
→ Every standard has its own inherent limitation.

4) How is hub different than repeater and switch?

A switch is a networking device which provides the facility to share the information and resources by connecting different network devices such as computers, printers, and servers within a small business network.

Repeaters

→ It operates in the physical layer.
→ These are analog devices that work with signals on the cables to which they are connected.
→ They don't understand frames, packets or headers.
→ A signal appearing on one cable is regenerated and put out on another cable. / extends the physical length of LAN.

For eg:- Classic Ethernet was designed to allow four repeaters that would boost the signal to extend the max. cable length from 500 m to 2500 m.

Date
Page

Hub :

⇒ It has a no of input lines that it joins electrically. Active and passive hub are 2 types of hub.

⇒ Frames arriving on any of lines are sent out on all others. It is broadcast device.

⇒ They are physical layer devices that do not examine the link layer addresses in any way.

Switches :

⇒ They are modern bridges by another name.

⇒ a intelligent device.

⇒ a point-to-point device.

⇒ layer 2 and layer 3 switches. Sophisticated and expensive device.

5) Difference between TCP/IP and OSI layer.

TCP model consists of Transmission Control Protocol, whereas IP stands for Internet Protocol. The OSI stands for Open System Interconnection. which was developed in 1960s. It is a conceptual model used for network communication.

OSI	TCP/IP.
→ It represents Open System Interconnection.	→ It represents Transmission Control Protocol / Internet Protocol.
→ It is difficult than TCP/IP	→ It is simpler than OSI.
→ It uses a horizontal approach.	→ It uses a vertical approach.
→ It is a reference model.	→ Implementation of OSI model.
→ It has 7 layers.	→ It has only 4 layers.
→ Protocol Model was developed before developm- ent of protocols.	→ Protocol were developed first and then the model was developed.
→ Stricter boundaries for protocol.	→ Protocols aren't strictly defined.
→ Supports connectionless & connection-oriented comm- unication in nlw layer.	→ Supports only connection- less communication in nlw layer.

Date
Page

6) Explain the functions of TCP/IP layers in brief.

The TCP/IP model or Transfer Control Protocol/ Internet Protocol model is a suite of communication protocols that are used to describe how data is actually the communicated between one device to another within a computer network.

The TCP/IP layers consists of fire layers: the application layer, transport layer, n/w layer, data link layer, and physical layer. The first four layers provide physical standards, network interface, internetworking and transport functions

Network Access layer.

→ It is the lowest layer of TCP/IP model.

⇒ It defines how the data should be sent physically through the n/w.

⇒ An internet layer is the second layer of the TCP/IP model.

⇒ An internet layer is also known as the network layer.

⇒ An n/w layer is the combination of physical layer and Data link layer defined in OSI reference model.

Date
Page

It is mainly responsible for transmission of the data between two devices on the same n/w.

→ The main responsibility of the internet layer is to send the packets from any n/w, and they arrive at the destination irrespective of the route they take.

Transport layer

→ An application layer is the topmost layer in the TCP/IP model.
This layer allows the user to interact with the application.
The ~~transpo~~ two protocols used in the transport layer are User Datagram protocol and Transmission control protocol.

Date
Page

(7) Why TCP/IP is called implementation model?

The TCP/IP model or Transfer Control Protocol/Internet Protocol model is a suite of communication protocols that are used to describe how data is actually communicated between one device to another within a computer n/w.

1. It supports many routing-protocols.
2. It can be operated independently.
3. Supports a no of routing protocols.
4. It operates independently of the operating system.
5. It can be used to establish a connection between two computers.
6. TCP/IP model has a highly scalable client-server architecture.
7. It helps you to establish/set up a connection between different types of computers.

Date
Page

(8) What do you mean by routing device? Explain design issues of layers.

Ans A routing device is a networking device that forwards data packets between computer nlws. The different types of routing devices are :-

- Repeater : It operates at the physical layer. Its job is to regenerate the signal over same network before the signal becomes too weak or corrupted so as to extend the length to which the signal can be transmitted over the same network.

- Hub : A hub is basically a multiport ~~layer~~ repeater. A hub connects multiple wires coming from different ~~stations~~ branches, for eg: connector in star topology which connects different stations. Hubs can't filter data, so data packets are sent to all connected devices.

- Bridge : A bridge operates at the data link layer. A bridge is a repeater, with add on the functionality of filtering content by reading the MAC addresses of source and destination.

Date
Page

- Switch : It is a multiport bridge with a buffer and a design that can boost its efficiency and performance. A switch is a data link layer device.

- Routers : It is a device like a switch that routes data packets based on their IP addresses. The router is mainly a Network layer device. Routers normally connect LANs and WANs together and have a dynamic routing table.

- Gateway : A gateway as the name suggests, is a passage to connect two networks together that may work upon different networking models.

B router : It is also known as bridging router is a device that combines features of both bridge and router. It can work either at the data link layer or a n/w layer.

NIC : NIC or network interface card is a n/w adapter that is used to connect the computer to a n/w.

Date
Page

A number of design issues exit for the layer to layer approach of computer nlws. Some of the main design issues are as follows :

- Reliability : Network channels and components may be unreliable, resulting in loss of bits while data transfer. So, an imp. design issue is to make sure that information transferred is not distorted.

- Scalability : Networks are continously evolving. The sizes are continually increasing leading to congestion. Also, when new technologies are applied to the added components, it may be lead to incomptability issues.

Addressing : At a particular time, innumerable messages are being transferred between large numbers of computers.

- Error Control.
- Flow Control :
- Resource Allocation
- Security
- Routing.