

Q1) What is OSI protocol? Explain

- Protocol: is a format order of messages sent and received among the net entities and action taken on msgs

transmission receipt.

- Protocol process :

1. The format or structure of the message
2. The process by which networking devices share information about pathways with other networks
3. How and when error and system messages are passed between devices
4. The setup and termination of data transfer sessions

Q2) What is the differences between OSI and TCP-IP?

OSI(Open System Interconnection)	TCP/IP(Transmission Control Protocol / Internet Protocol)
1. OSI provides layer functioning and also defines functions of all the layers	1. TCP/IP model is more based on protocols and protocols are not flexible with other layers.
2. OSI model has a separate presentation layer	2. TCP/IP does not have a separate presentation layer
3. OSI is a general model	3. TCP/IP model cannot be used in any other application
4. Network layer of OSI model provide both connection oriented and connectionless service.	4. The Network layer in TCP/IP model provides connectionless service.
5. OSI model has a problem of fitting the protocols in the model	5. TCP/IP model does not fit any protocol
6. Protocols are hidden in OSI model and are easily replaced as the technology changes	6. In TCP/IP replacing protocol is not easy
7. OSI model defines services, interfaces and protocols very clearly and makes clear distinction between them.	7. In TCP/IP it is not clearly separated its services, interfaces and protocols
8. It has 7 layers	8. It has 4 layers

Q3) Why a layered model?

1. Breaks down communication into smaller, simpler parts.
2. Easier to teach communication process.
3. Allows different hardware and software to work together.
4. Reduces complexity

Q4) Explain the delivery of data in Layered model?

Type of delivery	Layer	Shape of data	Type of addressing
End to End	Transport	Segment	Port (socket)
Source To Destination	Network	Packet	Logical (IP)
Node to Node	Data Link	Frame	Physical(MAC)

Q5) What is HUB device and what are its types?

- A hub is a multiport repeater.
- A hub connects multiple wires coming from different branches
- A hub is a hardware device used at the physical layer to connect multiple devices in the network.
- Hubs are widely used to connect LANs.

Types of Hub

- Active Hub:
- Passive Hub
- Intelligent Hub

Q6) Firewall plays a key role in protecting network. Explain:

A firewall is a network security device that monitors and controls the flow of data between your computer or network and the internet.

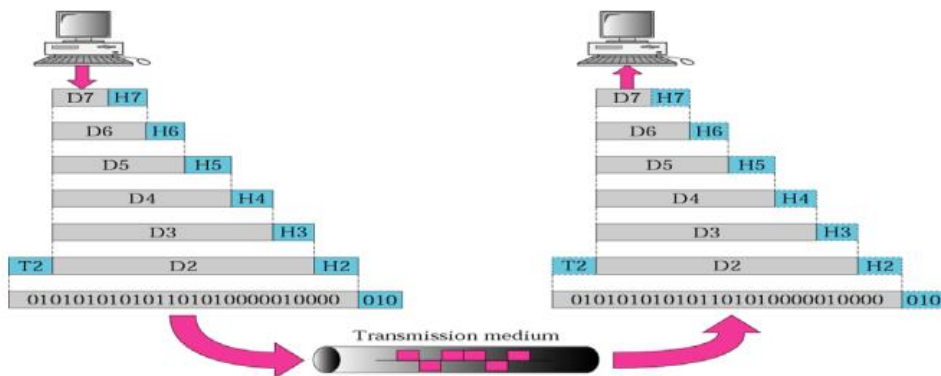
- It acts as a barrier, blocking unauthorized access while allowing trusted data to pass through.
- Firewalls help protect your network from hackers, viruses, and other online threats by filtering traffic based on security rules.
- Firewalls can be physical devices (hardware), programs (software), or even

cloud-based services, which can be offered as SaaS, through public clouds, or private virtual clouds

Q7) Draw block diagram for OSI Layered system?

OSI model

Layer	Name	Example protocols
7	Application Layer	HTTP, FTP, DNS, SNMP, Telnet
6	Presentation Layer	SSL, TLS
5	Session Layer	NetBIOS, PPTP
4	Transport Layer	TCP, UDP
3	Network Layer	IP, ARP, ICMP, IPSec
2	Data Link Layer	PPP, ATM, Ethernet
1	Physical Layer	Ethernet, USB, Bluetooth, IEEE802.11



Q8) Give class, net, host, broadcast, IP type for the following IPs

a. 11.0.0.20

b. 101.2.3.23

c. 193.134.4.2

a. 11.0.0.20

- **Class:** A (First octet is 11 → falls in range 1–126)
- **Default Subnet Mask:** 255.0.0.0
- **Network Address:** 11.0.0.0
- **Host Range:** 11.0.0.1 → 11.255.255.254
- **Broadcast Address:** 11.255.255.255
- **IP Type:** Public (not private, since private Class A is only 10.0.0.0/8)

b. 101.2.3.23

- **Class:** A (First octet is 101 → within 1–126)
- **Default Subnet Mask:** 255.0.0.0
- **Network Address:** 101.0.0.0
- **Host Range:** 101.0.0.1 → 101.255.255.254
- **Broadcast Address:** 101.255.255.255
- **IP Type:** Public

c. 193.134.4.2

- **Class:** C (First octet is 193 → falls in range 192–223)
- **Default Subnet Mask:** 255.255.255.0
- **Network Address:** 193.134.4.0
- **Host Range:** 193.134.4.1 → 193.134.4.254
- **Broadcast Address:** 193.134.4.255
- **IP Type:** Public

Q9) Suppose a company IP is 196.20.33.10. The company needs to support 10 subnets for its departments (IT, HR, Fin,...). What is the network subnet mask. Explain in simple steps.

Identify the IP Class

- The given IP is **196.20.33.10**.
- **Class C** (since the first octet is **196**, which falls in the range **192–223**).
- **Default subnet mask for Class C:** 255.255.255.0 (or /24 in CIDR notation).

Determine Number of Subnet Bits Needed

- The company needs **10 subnets**.
- To find the number of bits (n) required to create at least 10 subnets:

$$2^n \geq 10$$

- $2^3 = 8 \rightarrow$ Too small (only 8 subnets).
 - $2^4 = 16 \rightarrow$ **Sufficient (16 subnets)**.
- **Number of subnet bits needed:** 4.

Calculate New Subnet Mask

- **Original subnet mask (Class C):** 255.255.255.0 (/24).
- **Borrow 4 bits** from the host portion for subnetting.

- **New subnet mask:** 255.255.255.240 (or /28 in CIDR notation).
 - **Explanation:**
 - The last octet (0 in 255.255.255.0) is modified:
 - Subnet bits: 1111 (4 bits).
 - Host bits: 0000 (4 bits).
 - Binary: 11111111.11111111.11111111.11110000 → 255.255.255.240.

Verify Subnet and Host Count

- **Total subnets:** $2^4=16$ (meets the requirement of 10).
- **Hosts per subnet:** $2^4-2=14$ (since 4 bits remain for hosts).
 - (Subtracting 2 for **network ID** and **broadcast address**).

Example Subnet Ranges

With the subnet mask 255.255.255.240 (/28), the subnets are:

1. 196.20.33.0 – 196.20.33.15 (Hosts: .1 to .14)
2. 196.20.33.16 – 196.20.33.31 (Hosts: .17 to .30)
3. 196.20.33.32 – 196.20.33.47 (Hosts: .33 to .46)
 - ...and so on, up to 196.20.33.240 – 196.20.33.255.

Q10) What is function for

❓ OSI Application Layer

❓ OSI Data Link Layer

❓ OSI Session Layer

Application Layer	• Provides protocols that are commonly needed. • To allow access to network resource • (FTP), (HTTP), (SMTP), (SNMP),(NFS),(Telnet)
Data Link Layer	• Error detection and correction methods • Hop to hop delivery • Flow control • Frame format • IEEE LAN standards • Bridges & Switches (multi-port bridges) • physical addressing (MAC Address)
Session Layer	• Allows users on different machines to establish sessions (dialogue) between them. • managing dialogue control. • Token management. • Synchronization.

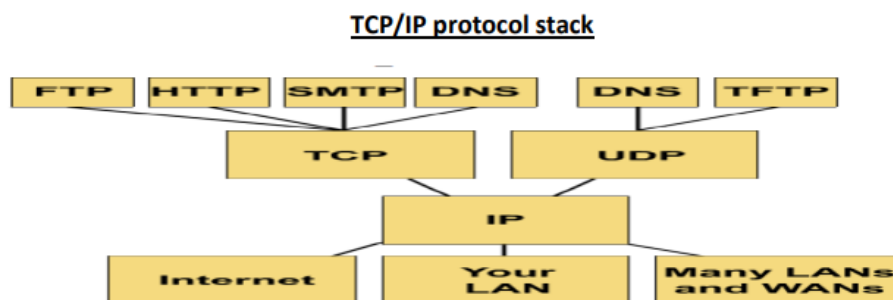
Q11) What is the function for

❑ OSI Physical Layer

❑ TCP-IP Transport Layer

OSI Physical Layer	• Transmission mediums (transmit bits over medium) • Encoding • Modulation • Repeaters • Hubs (multi-port repeater) • To provide mechanical and electrical specification
TCP-IP Transport Layer	Responsible for end-to-end communication, error checking, and data delivery between devices. It decides how data is broken into segments and reassembled.

Q12) Draw Block diagram for the TCI-IP Protocol Stack



Q13) What are the Different Between HUB and Switch?

Hub	Switch
It works on the physical layer of the OSI model.	It works on the data link layer of the OSI model .
It performs frame flooding , which includes broadcast, multicast and unicast as well.	It mainly performs broadcasts and performs multicast, and unicast whenever required.
The transmission mode is half-duplex.	The transmission mode is full-duplex.
It cannot perform data filtering.	It can filter data and send the frame to the desired destination.
There is no spanning tree.	A switch may contain more than one spanning tree possible.

Q14) What is the Private IP and what is the range for it in each class?

The Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of the IP address space for private internets (local networks):

10.0.0.0 - 10.255.255.255

172.16.0.0 - 172.31.255.255

192.168.0.0 - 192.168.255.255

Class A: 255.0.0.0

Class B: 255.255.0.0

Class C: 255.255.255.0

Q15) The repeater is device used in network. Explain:

- A repeater operates at the physical layer.
- Its main function is to amplify (i.e., regenerate) the signal over the same network before the signal becomes too weak or corrupted to extend the length to which the signal can be transmitted over the same network.
- When the signal becomes weak, they copy it bit by bit and regenerate it at its star topology connectors connecting following the original strength.
- It is a 2-port device.

Q16) Give class, net, host, broadcast, IP type for the following IPs

d. 55.0.0.20

e. 150.2.3.23

f. 202.134.4.2

d. 55.0.0.20

- **Class:** A (First octet = **55**).
- **Net ID:** 55.0.0.0 (Class A uses the first octet as net ID).
- **Host ID:** 0.0.20 (Last 3 octets).
- **Broadcast Address:** 55.255.255.255 (All host bits set to 1).
- **IP Type:** **Public** (Not in private ranges).

e. 150.2.3.23

- **Class:** B (First octet = **150**).
- **Net ID:** 150.2.0.0 (Class B uses the first 2 octets as net ID).
- **Host ID:** 3.23 (Last 2 octets).
- **Broadcast Address:** 150.2.255.255 (All host bits set to 1).
- **IP Type:** **Public** (Not in private ranges).

f. 202.134.4.2

- **Class:** C (First octet = **202**).
- **Net ID:** 202.134.4.0 (Class C uses the first 3 octets as net ID).
- **Host ID:** 2 (Last octet).
- **Broadcast Address:** 202.134.4.255 (All host bits set to 1).
- **IP Type:** **Public** (Not in private ranges).

Q17) Suppose a company IP is 193.44.133.20. The company needs to support 5 subnets for its departments (IT, HR, Fin,...). What is the network subnet mask. Explain in simple steps.

Step 1: Identify the IP Class

- The given IP is **193.44.133.20**.
- **Class C** (since the first octet is **193**, which falls in the range **192–223**).
- **Default subnet mask for Class C:** 255.255.255.0 (or /24 in CIDR notation).

Step 2: Determine Number of Subnet Bits Needed

- The company needs **5 subnets**.
- To find the number of bits (n) required to create at least 5 subnets:

$$2^n \geq 5$$

- $2^2 = 4 \rightarrow$ Too small (only 4 subnets).
- $2^3 = 8 \rightarrow$ **Sufficient (8 subnets)**.
- **Number of subnet bits needed:** 3.

Step 3: Calculate New Subnet Mask

- **Original subnet mask (Class C):** 255.255.255.0 (/24).

- **Borrow 3 bits** from the host portion for subnetting.
- **New subnet mask:** 255.255.255.224 (or /27 in CIDR notation).
 - **Explanation:**
 - The last octet (0 in 255.255.255.0) is modified:
 - Subnet bits: 111 (3 bits).
 - Host bits: 00000 (5 bits).
 - Binary: 11111111.11111111.11111111.11100000 → 255.255.255.224.

Step 4: Verify Subnet and Host Count

- **Total subnets:** $2^3=8$ (meets the requirement of 5).
- **Hosts per subnet:** $2^5-2=30$ (since 5 bits remain for hosts).
 - (Subtracting 2 for **network ID** and **broadcast address**)

Q18) Give brief description for the OSI protocol layers.

<u>Layer</u>	<u>Main Topics</u>
Physical Layer	• Transmission mediums (transmit bits over medium) • Encoding • Modulation • Repeaters • Hubs (multi-port repeater) • To provide mechanical and electrical specification
Data Link Layer	• Error detection and correction methods • Hop to hop delivery • Flow control • Frame format • IEEE LAN standards • Bridges & Switches (multi-port bridges) • physical addressing(MAC Address)
Network Layer	• Internetworking • Controls the operation of the subnet. • Routing algorithms(Routing packets from source to destination) • Internet Protocol (IP) addressing (Logical addressing) • Routers
Transport Layer	• Connection-oriented and connectionless services • Provide reliable process to process message delivery & error recovery • Transmission Control Protocol (TCP) • User Datagram Protocol (UDP) • Provides additional Quality of Service. • Port address • End-to-end flow control.
Session Layer	• Allows users on different machines to establish sessions (dialogue) between them. • managing dialogue control. • Token management. • Synchronization.
Presentation Layer	• Concerned with the syntax and semantics of the information. • Preserves the meaning of the information. • Data compression. • Data encryption.
Application Layer	• Provides protocols that are commonly needed. • To allow access to network resource • (FTP), (HTTP), (SMTP), (SNMP),(NFS),(Telnet)

Q20) What are the difference between Switch and Bridge

Switch	Bridge
A device which is responsible for channeling the data that is coming into the various input ports to a particular output port which will further take the data to the desired destination.	A device which is responsible for dividing a single network into various network segments.
A switch can have a lot of ports.	A bridge can have 2 or 4 ports only.
The switch performs the packet forwarding by using hardwares such as ASICS hence, it is hardware based.	The bridge performs the packet forwarding by using softwares so it is software based.
The switching method in case of a switch can thus be store, forward, fragment free or cut through.	The switching method in case of a bridge is store and forward.
The task of error checking is performed by a switch.	A bridge cannot perform the error checking.
A switch has buffers.	A bridge may not have a buffer.

Q21) Gateway play a key role in protection in network. Explain:

- A gateway, as the name suggests, is a passage to connect two networks that may work upon different networking models.
- They work as messenger agents that take data from one system, interpret it, and transfer it to another system.
- Gateways are also called protocol converters and can operate at any network layer. Gateways are generally more complex than switches or routers.

Q22) Give class, net, host, broadcast, IP type for the following IPs

? 2.0.0.20

3

? 220.2.3.23

? 170.134.4.2

1. 2.0.0.20

- **Class:** A (first octet is 2, which is 1-126)

- **Net ID:** 2.0.0.0
- **Host ID:** 0.0.20
- **Broadcast Address:** 2.255.255.255
- **IP Type:** Public (not in private ranges)
- **Special Notes:** This is a Class A network with a very large host capacity

2. 220.2.3.23

- **Class:** C (first octet is 220, which is 192-223)
- **Net ID:** 220.2.3.0
- **Host ID:** 23
- **Broadcast Address:** 220.2.3.255
- **IP Type:** Public (not in private ranges)
- **Special Notes:** Typical Class C network with 254 possible hosts

3. 170.134.4.2

- **Class:** B (first octet is 170, which is 128-191)
- **Net ID:** 170.134.0.0
- **Host ID:** 4.2
- **Broadcast Address:** 170.134.255.255
- **IP Type:** Public (not in private ranges)
- **Special Notes:** Class B network allows for 65,534 hosts

Q23) The router is very important device that are used for connecting varied network. Explain:

- A router 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 and have a dynamically updating routing table based on which they make decisions on routing the data packets.
- The router divides the broadcast domains of hosts connected through it.

Q24) Suppose A company IP is 199.20.33.55. The company need to

support 3 subnet for its departments (IT, HR, Fin,...). What is the network subnet mask. Explain in simple steps.

Step 1: Identify the IP Class

- IP: 199.20.33.55
- First octet (199):
 - Class C (since $192 \leq 199 \leq 223$).
- Default subnet mask for Class C: 255.255.255.0 (or /24).

Step 2: Calculate Subnet Bits Needed

- Required subnets: 3.
- Formula: $2^n \geq \text{required subnets}$
 - $2^1 = 2$ → Too small.
 - $2^2 = 4$ → Meets the requirement (since $4 \geq 3$).
- Subnet bits to borrow: 2 bits.

Step 3: Determine the New Subnet Mask

- Original mask (Class C): 255.255.255.0 (binary: 11111111.11111111.11111111.00000000).
- After borrowing 2 bits:
 - New mask: 255.255.255.192 (or /26).
 - Binary: 11111111.11111111.11111111.11000000.
 - Subnet portion (2 bits): 11
 - Host portion (6 bits): 000000

Step 4: Verify Subnets and Hosts

- Total subnets created: $2^2 = 4$ (meets the requirement of 3).
- Hosts per subnet: $2^6 - 2 = 62$ (usable addresses per subnet).
 - Subtract 2 for Network ID and Broadcast Address.

Step 5: Subnet Ranges Example

With 255.255.255.192 (/26), the subnets are:

1. 199.20.33.0 – 199.20.33.63
 - Usable hosts: .1 to .62
2. 199.20.33.64 – 199.20.33.127
 - Usable hosts: .65 to .126

3. **199.20.33.128 – 199.20.33.191**

- Usable hosts: .129 to .190

4. **199.20.33.192 – 199.20.33.255**

- Usable hosts: .193 to .254

Q25) Give class, net, host, broadcast, IP type for the following IPs

a. 133.0.0.20

b. 175.2.3.23

c. 220.134.4.2

a. 133.0.0.20

- **Class:** B (First octet is 133 → between 128 and 191)
- **Default Subnet Mask:** 255.255.0.0 (/16)
- **Network Address:** 133.0.0.0
- **Host Range:** 133.0.0.1 → 133.0.255.254
- **Broadcast Address:** 133.0.255.255
- **IP Type:** Public (not in the private IP range for Class B, which is 172.16.0.0 – 172.31.255.255)

b. 175.2.3.23

- **Class:** B (First octet is 175 → between 128 and 191)
- **Default Subnet Mask:** 255.255.0.0 (/16)
- **Network Address:** 175.2.0.0
- **Host Range:** 175.2.0.1 → 175.2.255.254
- **Broadcast Address:** 175.2.255.255
- **IP Type:** Public

c. 220.134.4.2

- **Class:** C (First octet is 220 → between 192 and 223)
- **Default Subnet Mask:** 255.255.255.0 (/24)
- **Network Address:** 220.134.4.0
- **Host Range:** 220.134.4.1 → 220.134.4.254
- **Broadcast Address:** 220.134.4.255
- **IP Type:** Public

