

CH 1

Here are **possible viva questions** for your Computer Networks Unit 1 chapter, along with **simple, clear answers**.

1. Basics of Computer Networks

Q1: What is a computer network?

A: A computer network is a set of interconnected devices (like computers, printers) that can communicate and share resources using communication channels.

Q2: Mention two uses of computer networks in business.

A: Resource sharing (like printers) and client-server communication.

2. Network Topologies

Q3: What is network topology?

A: Network topology is the physical or logical layout of how devices are connected in a network.

Q4: Which topology is most popular and why?

A: **Star topology** is most popular because if one device fails, it doesn't affect others (only the central device failure affects the whole network).

****Q5: What is the disadvantage of Bus topology?****

A: If the main cable fails, the entire network stops.

**3. Network Types (PAN, LAN, MAN, WAN)**

****Q6: What is LAN? Give an example.****

A: LAN is a Local Area Network covering a small area like a school or office. Example: A WiFi network in a college building.

****Q7: Differentiate between LAN and WAN.****

A: LAN covers a small geographical area (like a building), while WAN covers a large area (like a country). The Internet is the largest WAN.

**4. Client-Server vs. Peer-to-Peer**

****Q8: What is a client-server network?****

A: A network where a central powerful computer (server) provides services to less powerful computers (clients). Example: Website hosting.

****Q9: What is the main advantage of P2P over client-server?****

A: P2P is cheaper and has no single point of failure.

**5. Protocols and Standards**

****Q10: What is a network protocol?****

A: A set of rules that govern how devices communicate over a network. Example: HTTP for web browsing.

****Q11: What are the three components of a protocol?****

A: Syntax (structure), Semantics (meaning), and Timing (speed & flow).

****Q12: What is the difference between de facto and de jure standards?****

A: De facto standards are adopted by practice (like HTTP), while de jure standards are officially approved by organizations (like IEEE Wi-Fi standards).

**6. OSI Model**

****Q13: How many layers are in the OSI model?****

A: 7 layers.

****Q14: Which layer is responsible for routing?****

A: Network Layer (Layer 3).

****Q15: Which layer converts data into bits for transmission?****

A: Physical Layer (Layer 1).

****Q16: What is the main function of the Transport layer?****

A: To ensure reliable end-to-end delivery of data (using TCP/UDP).

7. TCP/IP Model

Q17: How many layers are in the TCP/IP model?

A: 4 layers.

Q18: Which TCP/IP layer is equivalent to OSI's Network layer?

A: Internet Layer.

Q19: Name two protocols in the Application layer of TCP/IP.

A: HTTP and FTP.

8. Connection-Oriented vs. Connectionless Services

Q20: Compare TCP and UDP.

A: TCP is connection-oriented, reliable, and slower (used for web, email). UDP is connectionless, unreliable, and faster (used for streaming, gaming).

Q21: Which protocol uses handshaking?

A: TCP uses handshaking to establish a connection.

9. Internet, ISP, Backbone

Q22: What is an ISP?

A: Internet Service Provider – a company that provides internet access to users (e.g., WorldLink, Nepal Telecom).

****Q23: What is a backbone network?****

A: The main high-speed network that connects smaller networks together, like a highway for data.

****Q24: Which topology is used in a star backbone?****

A: Star topology with a central switch connecting multiple LANs.

**10. Layered Architecture**

****Q25: Why do we use a layered protocol architecture?****

A: To simplify design, allow modular development, make troubleshooting easier, and ensure interoperability between devices.

**Bonus: Quick Comparison Questions**

****Q26: OSI vs. TCP/IP – which has more layers?****

A: OSI has 7, TCP/IP has 4.

****Q27: Which model is used in practice on the internet?****

A: TCP/IP model.

****Q28: Where does encryption happen in OSI?****

A: Presentation Layer (Layer 6).

****Q29: What does MAC address stand for and which layer uses it?****

A: Media Access Control address, used in Data Link Layer (Layer 2).

****Q30: What is the main purpose of the Network Access Layer in TCP/IP?****

A: To handle physical transmission and data framing over the local network.

**Viva Tips:**

- Speak clearly and confidently.
- Use simple analogies (e.g., “TCP is like a phone call, UDP is like sending a postcard”).
- If you don’t know, say “I’m not sure about that” instead of guessing wrong.
- Relate answers to real examples (YouTube, email, Wi-Fi).

Good luck! 

CH 2

Networking Media & Physical Layer - Possible Viva Questions & Answers

PART 1: NETWORK DEVICES

1. What is a repeater and how does it work?

Answer: A repeater is a physical layer device that regenerates a weak network signal to its original strength before sending it forward. It's like a "signal booster" that copies and re-transmits the signal bit by bit to extend the network range. It has no intelligence to filter data.

2. Differentiate between a hub and a switch.

Answer:

- **Hub** is a dumb device that broadcasts data to all connected devices, causing collisions and inefficiency.
- **Switch** is an intelligent device that learns MAC addresses and forwards data only to the specific destination device, reducing collisions and improving security.

3. What is the function of a router?

Answer: A router connects different networks (like LAN to internet) and routes data packets based on IP addresses. It uses routing tables to find the best path and operates at the network layer (Layer 3).

4. How does a bridge differ from a switch?

****Answer:**** Both operate at data link layer, but a bridge typically has fewer ports (2-4) and connects two similar networks, while a switch has many ports (8-48+) and connects multiple devices within a network.

**PART 2: TRANSMISSION MEDIA**

**5. What are the three main types of guided media?**

****Answer:****

1. **Twisted-pair cable** (UTP/STP) - Cheapest, most common
2. **Coaxial cable** - Better shielding, used for cable TV
3. **Fiber-optic cable** - Fastest, uses light signals, immune to EMI

**6. Compare UTP and STP cables.**

****Answer:****

- **UTP** (Unshielded Twisted Pair): No shielding, cheaper, easier to install, prone to interference
- **STP** (Shielded Twisted Pair): Has metal shielding, more expensive, better against EMI, harder to install

**7. Why is fiber-optic cable superior to copper cables?**

****Answer:**** Fiber-optic cables offer: higher bandwidth, longer distances without repeaters, immunity to electromagnetic interference, lighter weight, and better security (harder to tap).

**8. What are the three types of wireless transmission?**

****Answer:****

1. **Radio waves** - Omnidirectional, used for Wi-Fi, radio
2. **Microwaves** - Unidirectional, line-of-sight, used for mobile towers

3. **Infrared** - Short-range, can't penetrate walls, used for remotes

PART 3: SWITCHING TECHNIQUES

9. Explain circuit switching with an example.

Answer: Circuit switching establishes a dedicated physical path before communication begins. Example: Traditional telephone call - a direct line is reserved between caller and receiver for the entire conversation.

10. How does packet switching work?

Answer: Data is divided into packets, each sent independently through the network. Packets may take different routes and are reassembled at the destination. This is how the internet works.

11. Compare circuit switching and packet switching.

Answer:

| Circuit Switching | Packet Switching |

|-----|-----|

| Dedicated path established | No dedicated path |

| Fixed bandwidth | Shared bandwidth |

| Wasted capacity if idle | Efficient resource use |

| Used in telephone networks | Used in internet |

12. What is store-and-forward in message switching?

Answer: Each intermediate node stores the complete message, checks for errors, then forwards it to the next node. This causes delay but ensures reliability.

PART 4: ISDN

13. What is ISDN and why was it developed?

Answer: ISDN (Integrated Services Digital Network) is a digital telephone network system that transmits both voice and data over traditional copper telephone lines, providing better quality than analog systems.

14. Differentiate between BRI and PRI.

Answer:

- **BRI** (Basic Rate Interface): 2B + D channels (144 kbps), for home/small business
- **PRI** (Primary Rate Interface): 23B + D (T1) or 30B + D (E1), for large businesses

15. What are B-channels and D-channels in ISDN?

Answer:

- **B-channels** (Bearer): Carry user data (64 kbps each)
- **D-channel** (Delta): Carries control/signaling information (16/64 kbps)

PART 5: CABLE STANDARDS

16. What is Cat 6 cable and where is it used?

Answer: Cat 6 is an Ethernet cable standard supporting 1 Gbps speed up to 100 meters with 250 MHz bandwidth. Used in modern LAN installations for high-speed networking.

17. What connector is used with UTP cables?

Answer: RJ-45 connector is used with 4-pair UTP cables for Ethernet networks.

PART 6: GENERAL CONCEPTS

18. What is bandwidth?

Answer: Bandwidth is the maximum data transfer rate of a network or internet connection, measured in bits per second (bps). Higher bandwidth means faster data transfer.

19. What is attenuation?

Answer: Attenuation is the loss of signal strength as it travels through a medium. Repeaters are used to regenerate attenuated signals.

20. What is the difference between guided and unguided media?

Answer:

| Guided Media | Unguided Media |

|-----|-----|

| Uses physical cables | Uses wireless transmission |

| More secure | Less secure |

| Higher speed | Lower speed |

| Point-to-point | Broadcast |

| Examples: UTP, Fiber | Examples: Wi-Fi, Bluetooth |

TIPS FOR VIVA:

1. **Relate to real examples** (Wi-Fi, Ethernet cables, mobile networks)
2. **Use simple analogies** (highway for bandwidth, pipes for cables)
3. **Compare and contrast** different technologies
4. **Explain advantages and disadvantages** of each
5. **Mention practical applications** for each concept

**COMMON ASKED DIFFERENCES:**

1. Hub vs Switch vs Router
2. UTP vs STP
3. Baseband vs Broadband
4. Circuit vs Packet switching
5. Guided vs Unguided media
6. Radio waves vs Microwaves vs Infrared

****Remember:**** Start with a simple definition, give an example, mention advantages/disadvantages, and conclude with current applications.

CH 3

Data Link Layer - Important Viva Questions with Answers

1. Basic Concepts

Q1: What is the main purpose of the Data Link Layer?

Ans: The Data Link Layer is responsible for **node-to-node delivery** of data. Its main jobs are:

- Framing (packaging data into frames)
- Physical addressing (MAC addresses)
- Error control (detecting and correcting errors)
- Flow control (managing data speed)
- Access control (deciding who gets to use the medium)

Q2: What are the two sublayers of DLL?

Ans:

1. **Logical Link Control (LLC)** - The "smart manager" that handles flow control, error control, and talking to upper layers
2. **Media Access Control (MAC)** - The "bouncer & packager" that deals with physical addressing and controlling access to the medium

2. Framing & Flow Control

Q3: What is framing? Why is it necessary?

Ans: Framing is wrapping raw bits from the physical layer into structured packages called **frames**. It's necessary because:

- It defines where data starts and ends
- It adds headers for addressing
- It helps in error detection
- Without framing, we'd just have a continuous stream of 0s and 1s with no structure

Q4: Compare Stop-and-Wait ARQ and Go-Back-N ARQ

Ans:

| **Stop-and-Wait** | **Go-Back-N** |

|---|---|

| Sends **one frame** at a time | Sends **multiple frames** (a window) |

| Waits for ACK after each frame | Doesn't wait for ACK for each frame |

| Simple but **slow** | More **efficient** |

| If frame lost, resends only that frame | If frame lost, resends that frame **and all following frames** |

| Window size = 1 | Window size = $2^m - 1$ |

Q5: What is piggybacking?

Ans: Piggybacking is a technique where instead of sending a separate ACK message, the ACK is attached ("piggybacked") onto a data frame going in the opposite direction. This saves bandwidth and improves efficiency.

3. Error Detection & Correction

Q6: What is the difference between error detection and error correction?

Ans:

- **Error Detection:** Only finds out if an error occurred (e.g., parity check, checksum, CRC)
- **Error Correction:** Both finds and fixes the error (e.g., Hamming Code)

Q7: Explain Hamming Code with a simple example

Ans: Hamming Code is a method to detect and correct single-bit errors. For example, to protect 4-bit data (1101):

1. Add parity bits at positions 1, 2, 4 (powers of 2)
2. Calculate each parity bit based on specific data bits
3. Result might be: 1100110
4. If received as 1000110 (bit 3 flipped), the Hamming process can pinpoint and correct it

Q8: What is Hamming Distance?

Ans: Hamming Distance is the **number of positions** where two binary strings differ. For example:

...

101101

100111

^ ^

````

Hamming Distance = 2 (positions 3 and 6 differ)

---

## \*\*4. Multiple Access Protocols\*\*

### \*\*Q9: Why do we need multiple access protocols?\*\*

\*\*Ans:\*\* When multiple devices share a single communication channel (like Wi-Fi), we need rules to prevent them from talking at once and causing collisions. These rules are Multiple Access Protocols.

### \*\*Q10: Compare Pure ALOHA and Slotted ALOHA\*\*

\*\*Ans:\*\*

| \*\*Pure ALOHA\*\* | \*\*Slotted ALOHA\*\* |

|---|---|

| Can transmit \*\*anytime\*\* | Can transmit only at \*\*slot beginnings\*\* |

| More collisions | Fewer collisions |

| Throughput = 18% | Throughput = 36% (double!) |

| Like shouting in a room anytime | Like raising hand to speak in class |

### \*\*Q11: What are the three persistence modes of CSMA?\*\*

\*\*Ans:\*\*

1. \*\*1-Persistent:\*\* Listens continuously, transmits immediately when idle (aggressive)

2. \*\*Non-Persistent:\*\* If busy, waits random time before checking again (conservative)

3. \*\*P-Persistent:\*\* If idle, transmits with probability P, waits with probability (1-P) (balanced)

### \*\*Q12: Why is CSMA/CD not used in wireless networks?\*\*

\*\*Ans:\*\* CSMA/CD (Collision Detection) doesn't work well in wireless because:

- In wireless, a device often \*\*cannot detect collisions\*\* while transmitting
- Its own transmission is too strong compared to received signals
- Hidden terminal problem: Two devices might not hear each other but both can talk to an access point

That's why wireless uses \*\*CSMA/CA\*\* (Collision Avoidance) instead.

### \*\*Q13: How does CSMA/CA avoid collisions?\*\*

\*\*Ans:\*\* CSMA/CA uses three main techniques:

1. \*\*Interframe Space (IFS):\*\* Wait before transmitting
2. \*\*Contention Window:\*\* Wait random number of slots
3. \*\*Acknowledgements:\*\* Every frame needs an ACK

---

## \*\*5. Ethernet & Wireless\*\*

### \*\*Q14: What is IEEE 802.3?\*\*

\*\*Ans:\*\* IEEE 802.3 is the \*\*Ethernet standard\*\* for wired LANs. It uses CSMA/CD and defines:

- Frame format (minimum 64 bytes, maximum 1518 bytes)
- Physical layer specifications
- MAC addressing

### \*\*Q15: What is the difference between Bluetooth and Wi-Fi?\*\*

\*\*Ans:\*\*

|                                                      |
|------------------------------------------------------|
| **Bluetooth**   **Wi-Fi**                            |
| --- ---                                              |
| **Short range** (PAN)   **Medium range** (LAN)       |
| Low power consumption   Higher power consumption     |
| Low data rate   High data rate                       |
| Connects personal devices   Provides internet access |
| IEEE 802.15.1   IEEE 802.11                          |

### \*\*Q16: What is Spread Spectrum?\*\*

\*\*Ans:\*\* Spread Spectrum is a technique where a signal is spread over a wider frequency band than necessary. It provides:

- \*\*Security\*\* (hard to intercept)
- \*\*Resistance to interference\*\*
- \*\*Better reception\*\*

Originally developed for military communications.

---

## \*\*6. WAN Technologies\*\*

### \*\*Q17: Compare Frame Relay and ATM\*\*

\*\*Ans:\*\*

|                           |
|---------------------------|
| **Frame Relay**   **ATM** |
|---------------------------|

|                                    |                                                 |  |
|------------------------------------|-------------------------------------------------|--|
| --- ---                            |                                                 |  |
| Uses **variable-size frames**      | Uses **fixed-size cells** (53 bytes)            |  |
| No error recovery                  | Minimal error control                           |  |
| Designed for reliable fiber optics | Designed for mixed traffic (voice, video, data) |  |
| High speed (1.54-44 Mbps)          | Very high speed                                 |  |
| "No-frills" approach               | More structured                                 |  |

### \*\*Q18: What is PPP? Where is it used?\*\*

\*\*Ans:\*\* PPP (Point-to-Point Protocol) is used for \*\*direct connections\*\* between two devices. Common uses:

- Dial-up internet connections
- Router-to-router links
- Broadband connections (as PPPoE)

It provides authentication, framing, and can carry multiple network protocols.

### \*\*Q19: What is a virtual circuit?\*\*

\*\*Ans:\*\* A virtual circuit is a logical path established between sender and receiver before data transfer begins. All packets follow this same path, like a dedicated "express lane" through the network.

---

## \*\*7. Numerical/Calculation Questions\*\*

### \*\*Q20: In Go-Back-N, if m=3, what is the window size?\*\*

\*\*Ans:\*\* Window size =  $2^m - 1 = 2^3 - 1 = 7$  frames

### \*\*Q21: For even parity, if data is 1101001, what parity bit is added?\*\*

\*\*Ans:\*\* Count 1s:  $1+1+0+1+0+0+1 = 4$  (even)

For even parity, add 0 to keep it even → \*\*0\*\*

### \*\*Q22: In Hamming Code, if error word is 101, which bit is wrong?\*\*

\*\*Ans:\*\* 101 in binary = 5 in decimal → \*\*Bit number 5\*\* is in error

---

## \*\*Quick Revision Tips for Viva:\*\*

1. \*\*Remember the analogies:\*\*

- DLL = Postman between neighbors
- LLC = Smart Office Manager
- MAC = Bouncer & Packager
- ALOHA = Shouting in a room
- CSMA = Listening before talking

2. \*\*Key comparisons:\*\*

- Stop-and-Wait vs Go-Back-N
- Pure vs Slotted ALOHA
- CSMA/CD vs CSMA/CA
- Frame Relay vs ATM
- Bluetooth vs Wi-Fi

3. \*\*Important numbers:\*\*

- Ethernet frame: 64-1518 bytes
- ATM cell: 53 bytes
- Bluetooth: 2.4 GHz band
- Hamming window size:  $2^m - 1$

\*\*Best of luck for your viva!\*\* Remember to speak clearly and use simple examples if you get stuck.

## CH 4

### ### \*\*Network Layer Viva Questions & Answers\*\*

---

#### ## \*\*Section 1: Basic Concepts\*\*

##### \*\*Q1: What is the main function of the Network Layer?\*\*

\*\*A:\*\* The Network Layer is responsible for \*\*logical addressing\*\*, \*\*routing\*\*, and \*\*path determination\*\* to send data from source to destination across multiple networks.

##### \*\*Q2: Name devices that work at the Network Layer.\*\*

\*\*A:\*\* Routers, Layer 3 Switches, Firewalls.

---

#### ## \*\*Section 2: IPv4 Addressing\*\*

##### \*\*Q3: What is the difference between IPv4 and IPv6?\*\*

\*\*A:\*\* IPv4 is 32-bit (4.3 billion addresses), uses dotted decimal notation. IPv6 is 128-bit (340 undecillion addresses), uses hexadecimal notation, has built-in security and auto-configuration.

**\*\*Q4: What are private IP ranges?\*\***

**\*\*A:\*\***

- Class A: 10.0.0.0 to 10.255.255.255
- Class B: 172.16.0.0 to 172.31.255.255
- Class C: 192.168.0.0 to 192.168.255.255

**\*\*Q5: What is NAT and why is it used?\*\***

**\*\*A:\*\*** Network Address Translation allows multiple private IP devices to share a single public IP. It saves IPv4 addresses and provides security.

---

### **## \*\*Section 3: Subnetting & Supernetting\*\***

**\*\*Q6: What is subnetting?\*\***

**\*\*A:\*\*** Dividing a large network into smaller subnetworks to improve performance and security.

**\*\*Q7: What is the formula for usable hosts?\*\***

**\*\*A:\*\*** Usable hosts =  $2^{(\text{host bits})} - 2$

**\*\*Q8: For 192.168.1.0/26, how many usable hosts?\*\***

**\*\*A:\*\*** /26 = 6 host bits. Usable hosts =  $2^6 - 2 = 62$ .

**\*\*Q9: What is supernetting?\*\***

**\*\*A:\*\*** Combining multiple small networks into one larger network to reduce routing table size.

---

## ## \*\*Section 4: Addressing Modes\*\*

\*\*Q10: What are the 3 addressing modes?\*\*

\*\*A:\*\*

1. \*\*Unicast:\*\* One-to-one (e.g., web browsing)
2. \*\*Broadcast:\*\* One-to-all (e.g., ARP requests)
3. \*\*Multicast:\*\* One-to-many (e.g., video streaming)

\*\*Q11: Which class is for multicasting?\*\*

\*\*A:\*\* Class D (224.0.0.0 to 239.255.255.255)

---

## ## \*\*Section 5: Routing\*\*

\*\*Q12: Difference between static and dynamic routing?\*\*

\*\*A:\*\* Static = manually configured, no auto-updates. Dynamic = automatic, routers exchange routing information.

\*\*Q13: Name routing protocols.\*\*

\*\*A:\*\*

- \*\*Interior:\*\* RIP, OSPF, EIGRP

- \*\*Exterior:\*\* BGP

**\*\*Q14: Difference between RIP and OSPF?\*\***

**\*\*A:\*\*** RIP uses hop count, slow convergence, max 15 hops. OSPF uses cost, fast convergence, supports large networks.

**\*\*Q15: What is BGP used for?\*\***

**\*\*A:\*\*** Border Gateway Protocol is used for routing BETWEEN different networks/ISPs on the Internet.

---

**## \*\*Section 6: IPv6\*\***

**\*\*Q16: Why do we need IPv6?\*\***

**\*\*A:\*\*** IPv4 addresses are exhausted. IPv6 provides virtually unlimited addresses, better security, and auto-configuration.

**\*\*Q17: What is the loopback address in IPv6?\*\***

**\*\*A:\*\*** ::1 (equivalent to 127.0.0.1 in IPv4)

---

**## \*\*Section 7: Transition Mechanisms\*\***

**\*\*Q18: How can IPv4 and IPv6 coexist?\*\***

**\*\*A:\*\*** Through:

1. **\*\*Dual Stack:\*\*** Running both protocols simultaneously

2. \*\*Tunneling:\*\* IPv6 packets inside IPv4 packets
3. \*\*Translation:\*\* Converting between IPv4 and IPv6

---

## ## \*\*Section 8: Network Security\*\*

\*\*Q19: What is a firewall?\*\*

\*\*A:\*\* A security device that filters incoming/outgoing traffic based on predefined rules.

\*\*Q20: What is an ACL?\*\*

\*\*A:\*\* Access Control List - rules on routers/firewalls that permit or deny traffic based on IP addresses, ports, etc.

---

## ## \*\*Section 9: Practical Problems\*\*

\*\*Q21: Given 200.100.50.66/27, find network and broadcast addresses.\*\*

\*\*A:\*\*

- Block size = 32 (from /27)
- Network = 200.100.50.64
- Broadcast = 200.100.50.95

\*\*Q22: How many subnets in 192.168.0.0/26?\*\*

\*\*A:\*\* Default Class C = /24. Borrowed bits = 26-24 = 2. Subnets =  $2^2 = 4$ .

**\*\*Q23: Is 192.168.1.64/26 a host, network, or broadcast address?\*\***

**\*\*A:\*\* Network address (64 is multiple of 64).**

---

**## \*\*Section 10: Real-world Applications\*\***

**\*\*Q24: How would you design a LAN for 3 departments?\*\***

**\*\*A:\*\* Use VLANs for department separation, managed switches, router with firewall, proper IP addressing scheme.**

**\*\*Q25: What is the purpose of TTL in IP header?\*\***

**\*\*A:\*\* Time To Live prevents packets from looping forever. Each router decreases TTL by 1; at 0, packet is discarded.**

**\*\*Q26: What is ICMP used for?\*\***

**\*\*A:\*\* Internet Control Message Protocol is used for error reporting and diagnostic tools (like ping).**

---

**## \*\*Tips for Viva:\*\***

1. **Understand concepts** rather than memorizing
2. **Practice calculations** (subnetting especially)
3. **Relate to real-world examples**\*
4. **Be prepared for follow-up questions**\*

5. **Use diagrams** if explaining complex topics

**Common Mistake:** Confusing subnet mask values. Remember:

- /24 = 255.255.255.0
- /25 = 255.255.255.128
- /26 = 255.255.255.192
- /27 = 255.255.255.224
- /28 = 255.255.255.240

## CH 5

Excellent question! Here are \*\*possible viva questions with clear, concise answers\*\* for the Transport Layer chapter, organized by topic.

---

### ## \*\*VIVA QUESTIONS & ANSWERS\*\*

#### ### \*\*Topic 1: Introduction & Basic Concepts\*\*

##### \*\*Q1. What is the main responsibility of the Transport Layer?\*\*

\*\*A:\*\* To provide \*\*end-to-end communication\*\* between applications on different hosts. It ensures reliable data transfer, error correction, flow control, and uses \*\*port numbers\*\* to deliver data to the correct application.

##### \*\*Q2. What is the key difference between Network Layer and Transport Layer delivery?\*\*

**\*\*A:\*\*** Network Layer delivers packets from **host to host** (using IP addresses). Transport Layer delivers data from **process to process** (using port numbers).

**\*\*Q3. What is multiplexing and demultiplexing?\*\***

**\*\*A:\*\***

- **Multiplexing:** Combining data from multiple applications into a single stream to send over the network.
- **Demultiplexing:** At the receiver, splitting the incoming stream and delivering data to the correct application.

---

**### \*\*Topic 2: TCP vs UDP\*\***

**\*\*Q4. Compare TCP and UDP in 3 key points.\*\***

**\*\*A:\*\***

1. **Connection:** TCP is connection-oriented (3-way handshake), UDP is connectionless.
2. **Reliability:** TCP is reliable (acknowledgments, retransmission), UDP is unreliable (best-effort).
3. **Speed:** UDP is faster (less overhead), TCP is slower (more reliable features).

**\*\*Q5. When would you use UDP instead of TCP?\*\***

**\*\*A:\*\*** For real-time applications where speed is more important than perfect reliability:  
**Video streaming, VoIP, online gaming, DNS queries.**

**\*\*Q6. What are port numbers? Give examples of well-known ports.\*\***

**\*\*A:\*\*** Ports are 16-bit numbers identifying applications. Examples:

- \*\*Port 80:\*\* HTTP (Web)
- \*\*Port 443:\*\* HTTPS (Secure Web)
- \*\*Port 25:\*\* SMTP (Email)
- \*\*Port 53:\*\* DNS

---

### ### \*\*Topic 3: Connection-Oriented vs Connectionless Services\*\*

\*\*Q7. Explain Connection-Oriented service with an example.\*\*

\*\*A:\*\* Like a telephone call. Establishes connection first, maintains it, then terminates.

\*\*Example: TCP.\*\* It guarantees reliable, in-order delivery.

\*\*Q8. Explain Connectionless service with an example.\*\*

\*\*A:\*\* Like sending postal mail. No connection setup, each packet travels independently.

\*\*Example: UDP.\*\* No guarantee of delivery or order.

\*\*Q9. Which is better for file transfer and why?\*\*

\*\*A:\*\* \*\*Connection-Oriented (TCP)\*\* because file transfer requires \*\*reliable, error-free delivery\*\* of all data in correct order.

---

### ### \*\*Topic 4: Congestion Control\*\*

\*\*Q10. What is network congestion?\*\*

**\*\*A:\*\*** When too many packets are sent through a network, causing routers to drop packets due to full buffers, leading to performance degradation.

**\*\*Q11. What's the difference between Open Loop and Closed Loop congestion control?\*\***

**\*\*A:\*\***

- **Open Loop:** Prevents congestion **before** it happens (proactive). Examples: Good retransmission policy, admission control.
- **Closed Loop:** Handles congestion **after** it happens (reactive). Examples: Choke packets, backpressure.

**\*\*Q12. What is Backpressure in congestion control?\*\***

**\*\*A:\*\*** A congested node tells its upstream neighbor to slow down. That neighbor tells its upstream neighbor, and so on—the "stop" signal propagates backward to the source.

**\*\*Q13. What is a Choke Packet?\*\***

**\*\*A:\*\*** A special packet sent by a congested router **directly to the source** saying "I'm congested, slow down!"

---

**### \*\*Topic 5: TCP Congestion Control (AIMD)\*\***

**\*\*Q14. What does AIMD stand for and what does it do?\*\***

**\*\*A:\*\*** **Additive Increase Multiplicative Decrease.** TCP's strategy to control congestion:

- **Additive Increase:** Slowly increase sending rate when network is clear.
- **Multiplicative Decrease:** Drastically reduce sending rate when congestion is detected.

**\*\*Q15. Explain the three phases of TCP congestion control.\*\***

**\*\*A:\*\***

1. **Slow Start:** Exponential increase in sending rate (cwnd doubles each RTT).
2. **Congestion Avoidance:** Additive increase (cwnd increases by 1 MSS per RTT).
3. **Congestion Detection:** When packet loss occurs, cut cwnd to half (multiplicative decrease).

**\*\*Q16. How does TCP detect congestion?\*\***

**\*\*A:\*\*** Through **packet loss**, indicated by:

- **Timeout:** No acknowledgment received within time limit.
- **Three Duplicate ACKs:** Receiver is missing a packet but getting later ones.

---

**### Topic 6: Traffic Shaping\*\***

**\*\*Q17. What is Traffic Shaping and why is it needed?\*\***

**\*\*A:\*\*** Controlling the **rate of data flow** into the network to prevent bursts that cause congestion. It's needed to ensure smooth network performance.

**\*\*Q18. Compare Leaky Bucket and Token Bucket algorithms.\*\***

**\*\*A:\*\***

- **Leaky Bucket:** Outputs at **constant rate**, eliminates bursts completely.
- **Token Bucket:** Allows **controlled bursts**, more flexible. Tokens represent permission to send data.

**\*\*Q19. Which algorithm would you use for video streaming and why?\*\***

**\*\*A:\*\*** **Token Bucket.** Video streaming sends data in bursts (when scene changes), and Token Bucket allows these bursts while controlling the average rate.

---

### **### \*\*Topic 7: QoS & Scheduling\*\***

**\*\*Q20. What is Quality of Service (QoS)?\*\***

**\*\*A:\*\*** Techniques to prioritize certain types of network traffic to ensure critical applications get the performance they need (like video calls over file downloads).

**\*\*Q21. Compare FIFO, Priority, and Weighted Fair Queuing.\*\***

**\*\*A:\*\***

- **FIFO:** Simple first-come-first-served. Can starve low-priority traffic.
- **Priority:** Always serves highest priority queue first. **Can completely starve** lower priorities.
- **Weighted Fair:** Gives turns to all queues based on weight. **Prevents starvation** while prioritizing.

**\*\*Q22. What is Resource Reservation in QoS?\*\***

**\*\*A:\*\*** Booking network resources (bandwidth, buffers) **in advance** for an application to guarantee performance (like reserving a lane for an ambulance).

---

### **### \*\*Topic 8: Ports and Sockets\*\***

**\*\*Q23. What is the difference between a Port and a Socket?\*\***

**\*\*A:\*\***

- **Port:** A number (0-65535) identifying an application **on a single computer** (like an apartment number).
- **Socket:** **IP Address + Port Number** combination that defines one end of a connection between two applications (like a specific phone line).

**\*\*Q24. What is Socket Programming?\*\***

**\*\*A:\*\*** Writing programs that use sockets to communicate over a network. One program (server) listens on a port, another (client) connects to it.

---

**## \*\*PRO-TIPS FOR VIVA:\*\***

1. **Start with a simple definition** before diving deep.
2. **Use analogies** (phone call, postal system, highway traffic).
3. **Compare and contrast** whenever possible.
4. **Relate to real-world examples** (YouTube uses UDP/TCP? Why?).
5. **Be clear about what each layer does** – don't confuse Network and Transport layer functions.

**\*\*Most Important Questions to Prepare:\*\***

- Difference between TCP and UDP
- Connection-oriented vs Connectionless
- AIMD and TCP congestion phases
- Leaky vs Token Bucket

- Port vs Socket

---

\*\*Good luck with your viva!\*\*  You've got this! Just remember to explain concepts simply and clearly.

## CH 6

# \*\*Unit 6: Application Layer – Viva Questions & Answers\*\*

---

### \*\*1. What is the main role of the Application Layer?\*\*

\*\*Answer:\*\* The Application Layer is the top layer of the TCP/IP model that provides the interface between the user and the network. It enables network services like email, web browsing, and file transfer. Its main functions include network virtual terminal access, file transfer, mail services, and directory services.

---

### \*\*2. What is HTTP, and how does it work?\*\*

\*\*Answer:\*\* HTTP (Hypertext Transfer Protocol) is the protocol used for transferring web pages and resources on the World Wide Web. It works on a \*\*client-server model\*\*:

- The client (browser) sends an \*\*HTTP request\*\* to a server.

- The server processes the request and sends back an \*\*HTTP response\*\* containing the requested resource (e.g., HTML page, image).
- It uses methods like \*\*GET\*\* (to retrieve data) and \*\*POST\*\* (to send data).

---

### ### \*\*3. What are Persistent and Non-Persistent HTTP Connections?\*\*

\*\*Answer:\*\*

- \*\*Non-Persistent (HTTP/1.0):\*\* A new TCP connection is opened for each resource request. After the server sends the response, it closes the connection. This is slow because each item (HTML, image, CSS) requires a new connection.
- \*\*Persistent (HTTP/1.1):\*\* The TCP connection is kept open after the first response, allowing multiple requests and responses over the same connection. This reduces overhead and speeds up web page loading.

---

### ### \*\*4. What is DNS and why is it needed?\*\*

\*\*Answer:\*\* DNS (Domain Name System) is like the phonebook of the internet. It translates human-friendly domain names (e.g., `www.google.com`) into IP addresses (e.g., `142.251.42.14`). It's needed because:

- People can't easily remember numeric IP addresses.
- It provides services like \*\*host aliasing\*\*, \*\*mail server aliasing\*\*, and \*\*load distribution\*\*.

---

### ### \*\*5. Explain the DNS lookup process.\*\*

**\*\*Answer:\*\*** When you enter a URL in your browser:

1. Your computer checks its **local cache**.
2. If not found, it asks the **DNS resolver** (usually from your ISP).
3. The resolver checks the **Root DNS Server**, then the **TLD Server** (e.g., ` .com`), and finally the **Authoritative Name Server** for the domain.
4. The IP address is returned to your browser, which then connects to the web server.

---

**### \*\*6. What are common DNS record types?\*\***

**\*\*Answer:\*\***

- **A Record:** Maps a domain name to an IPv4 address.
- **AAAA Record:** Maps a domain name to an IPv6 address.
- **CNAME Record:** Creates an alias for another domain.
- **MX Record:** Specifies mail servers for the domain.
- **TXT Record:** Holds text information, often for email security (SPF, DKIM).

---

**### \*\*7. What is the difference between FTP and SFTP?\*\***

**\*\*Answer:\*\***

- **FTP (File Transfer Protocol):** Transfers files between client and server. It uses separate control and data connections but sends data (including passwords) in **plain text**.
- **SFTP (SSH File Transfer Protocol):** A secure version that runs over an SSH connection. It **encrypts** both commands and data, protecting against eavesdropping and tampering.

---

### ### \*\*8. Differentiate between SMTP, IMAP, and POP3.\*\*

\*\*Answer:\*\*

- \*\*SMTP (Simple Mail Transfer Protocol):\*\* Used for \*\*sending\*\* emails from a client to a server and between servers.
- \*\*IMAP (Internet Message Access Protocol):\*\* Used for \*\*receiving\*\* emails. Emails are stored on the server and can be accessed and synced across multiple devices.
- \*\*POP3 (Post Office Protocol v3):\*\* Also used for receiving emails, but it \*\*downloads\*\* emails to the local device and usually deletes them from the server. Best for single-device use.

---

### ### \*\*9. What is a Proxy Server?\*\*

\*\*Answer:\*\* A proxy server acts as an intermediary between a client and the internet. It:

- Hides the client's real IP address.
- Can \*\*cache\*\* web content for faster access.
- Can filter and block unwanted content.
- Improves security and privacy.

---

### ### \*\*10. What is SNMP and what are its components?\*\*

\*\*Answer:\*\* SNMP (Simple Network Management Protocol) is used to monitor and manage network devices (routers, switches, servers). Its components are:

- \*\*SNMP Manager:\*\* The central system that queries and controls devices.

- **Managed Devices:** The network equipment being monitored.
- **SNMP Agent:** Software on each device that collects data.
- **MIB (Management Information Base):** A database that defines what data can be collected from a device (e.g., CPU usage, bandwidth).

---

### ### **11. What is the purpose of a Web Server?**

**Answer:** A web server stores, processes, and delivers web pages to clients. When a browser requests a webpage, the web server responds with the requested HTML, images, or other resources. Examples include **Apache** and **Nginx**.

---

### ### **12. What is a Mail Server?**

**Answer:** A mail server handles email transmission. It has two parts:

- **Outgoing (SMTP Server):** Sends emails.
- **Incoming (POP3/IMAP Server):** Receives and stores emails.

Services like Gmail and Outlook run on large-scale mail servers.

---

### ### **13. What are the types of DNS queries?**

**Answer:**

- **Recursive Query:** The DNS server must return the final answer (IP address or error).
- **Iterative Query:** The DNS server returns the best answer it has (or a referral to another server).

- **Non-Recursive Query:** The resolver already knows the answer from its cache or is authoritative.

---

### **14. How does DNS help in load distribution?**

**Answer:** For popular websites with multiple servers, DNS can return different IP addresses in a rotating order for each query. This spreads incoming traffic across the servers, balancing the load and improving performance and reliability.

---

### **15. What is the role of the MIB in SNMP?**

**Answer:** The MIB (Management Information Base) is a virtual database that defines the parameters that can be monitored on a network device (like CPU load, disk space, or interface status). It provides a standard way for the SNMP Manager and Agent to understand each other.\

## CH 7

Here are \*\*possible viva questions\*\* for the chapter \*\*Unit 7: Multimedia & Future Networking\*\*, along with clear and concise answers.

---

### ### \*\*Viva Questions & Answers\*\*

#### \*\*Q1. What is multimedia streaming?\*\*

\*\*A:\*\* Multimedia streaming is a method of transmitting audio, video, or text over a network in a continuous flow, allowing users to play the content without downloading the entire file first.

---

#### \*\*Q2. What is SCTP, and how is it different from TCP and UDP?\*\*

\*\*A:\*\* SCTP (Stream Control Transmission Protocol) is a transport-layer protocol that combines features of both TCP and UDP.

- Like TCP, it is \*\*reliable\*\* and connection-oriented.
- Like UDP, it is \*\*message-oriented\*\*.
- \*\*Unique feature:\*\* It supports \*\*multi-streaming\*\* (multiple data streams in one connection) and \*\*multi-homing\*\* (multiple network paths for one connection).

---

**\*\*Q3. What does "multi-homing" mean in SCTP?\*\***

**\*\*A:\*\*** Multi-homing means a single endpoint (like a computer or server) can have multiple IP addresses or network connections. SCTP can use all of them, so if one path fails, it switches to another without dropping the connection.

---

**\*\*Q4. What is SDN, and what is its main idea?\*\***

**\*\*A:\*\*** SDN (Software-Defined Networking) is a network architecture that **separates the control plane (brain)** from the **data plane (muscle)**. The control is centralized in an SDN controller, which makes the network programmable, flexible, and easier to manage.

---

**\*\*Q5. What are the three layers of SDN architecture?\*\***

**\*\*A:\*\***

1. **Application Layer** – Contains network apps (firewall, load balancer).
2. **Control Layer** – The SDN controller (the brain).
3. **Infrastructure Layer** – Physical switches that forward data.

---

**\*\*Q6. Differentiate between Control Plane and Data Plane.\*\***

**\*\*A:\*\***

- **Control Plane:** Decides *how* data should travel (routing decisions, building routing tables). It's the **brain**.

- **Data Plane:** Actually *forwards* the data packets based on the control plane's instructions. It's the **muscle**.

---

#### **Q7. What is NFV?**

**A:** NFV (Network Function Virtualization) is a method of replacing dedicated network hardware (like routers, firewalls) with **virtual software versions** that run on standard servers. This makes networks more flexible and cost-effective.

---

#### **Q8. How are SDN and NFV related?**

**A:**

- **SDN** separates control and forwarding to make the network programmable.

- **NFV** virtualizes network functions to make them run on software.

They are complementary and often used together to build agile, software-based networks.

---

#### **Q9. What is NGN?**

**A:** NGN (Next Generation Network) is a **packet-based network** that converges all communication services (voice, video, data) into a single IP-based infrastructure, replacing old separate networks like PSTN.

---

**\*\*Q10. What are the key features of NGN?\*\***

**\*\*A:\*\***

- Packet-based transfer
- Separation of service from transport
- Support for generalized mobility
- Built-in QoS (Quality of Service)
- Open access for multiple service providers

---

**\*\*Q11. What is QoS, and why is it important in NGN?\*\***

**\*\*A:\*\*** QoS (Quality of Service) is a set of techniques to prioritize important network traffic (like voice or video calls) to ensure it gets the required bandwidth and low latency. In NGN, it's essential to guarantee a good user experience for real-time services.

---

**\*\*Q12. Name techniques to improve QoS.\*\***

**\*\*A:\*\***

1. **Scheduling** – Prioritizing packets in queues.
2. **Traffic Shaping** – Controlling data flow to prevent congestion.
3. **Resource Reservation** – Reserving bandwidth in advance.
4. **Admission Control** – Allowing or denying new traffic based on available capacity.

---

**\*\*Q13. What are the different approaches to multimedia streaming?\*\***

**\*\*A:\*\***

1. **Streaming Storage Audio/Video** – On-demand (e.g., Netflix).
2. **Streaming Live Audio/Video** – Real-time broadcast (e.g., live sports).
3. **Real-Time Interactive Audio/Video** – Two-way communication (e.g., Zoom calls).

---

**\*\*Q14. What is the advantage of using SCTP for multimedia streaming?\*\***

**\*\*A:\*\*** SCTP's **multi-streaming** feature allows audio, video, and text to be sent in separate streams within one connection. If one stream is lost, it doesn't block the others, improving reliability and performance for multimedia.

---

**\*\*Q15. How does NGN support mobility?\*\***

**\*\*A:\*\*** NGN is designed with **generalized mobility**, meaning users can move between different networks (e.g., Wi-Fi to cellular) without losing their active sessions. The network handles the handover seamlessly.

---

**\*\*Let me know if you'd like these questions arranged by topic or in flashcard format!\*\***