Computer Networks: 5-Mark Answers (Q11–22)

11. State the functionality of the logical link control. Briefly explain HDLC.

Logical Link Control (LLC) is a sublayer of the Data Link Layer in the OSI model. It provides error checking, flow control, and frame synchronization between devices. It helps in identifying the protocol used at the network layer and manages data exchange.
HDLC (High-Level Data Link Control) is a bit-oriented protocol used for transmitting data over point-to-point and multipoint links. It supports error detection, flow control, and synchronous communication. HDLC frames consist of flag, address, control, information, and checksum fields.

12. Explain the different types of flow control mechanisms in brief.

Flow control ensures that a sender does not overwhelm a receiver by sending data too fast. Types include:
- Stop-and-Wait: Sender waits for acknowledgment before sending the next frame. Simple but inefficient.
- Sliding Window: Allows multiple frames to be sent before requiring an acknowledgment. Efficient and used in TCP.
- Credit-Based Flow Control: Receiver informs sender about buffer availability, often used in high-speed networks.
These mechanisms help in reliable and efficient data transmission.

13. Difference between different Ethernet standards.

Ethernet standards differ in speed, cable type, and distance:
- 10Base-T: 10 Mbps, twisted pair cable, max 100m.
- 100Base-TX (Fast Ethernet): 100 Mbps, twisted pair, max 100m.
- 1000Base-T (Gigabit Ethernet): 1 Gbps, twisted pair, max 100m.
- 10GBase-T: 10 Gbps, twisted pair, shorter distances.
- 1000Base-LX: Gigabit Ethernet over fiber, longer distances.
Higher standards offer better speed and performance but require more advanced infrastructure.

14. What is CSMA/CD? Why is there no need for it on a full-duplex Ethernet LAN?

CSMA/CD (Carrier Sense Multiple Access with Collision Detection) is a network protocol used in traditional Ethernet where devices listen to the network before transmitting. If two devices transmit simultaneously, a collision occurs, and each waits a random time before retrying.
In full-duplex Ethernet, devices can send and receive data simultaneously on separate

channels, eliminating the chance of collisions. Therefore, CSMA/CD is unnecessary in full-duplex environments.

15. What is ALOHA? Explain its different versions with their efficiency. How and why is the efficiency of one better than the other?

ALOHA is a simple wireless communication protocol where devices send data whenever they have it. Collisions are resolved by retransmission after a random delay.
- Pure ALOHA: Transmits anytime; max efficiency ~18%.
- Slotted ALOHA: Time is divided into slots; transmission occurs at slot beginnings; max efficiency ~37%.
Slotted ALOHA is more efficient because it reduces the chance of collision by synchronizing transmissions.

16. What is peer-to-peer network architecture? Who are its users? List down its advantages and disadvantages.

In a Peer-to-Peer (P2P) network, each device (peer) can act as both client and server. No centralized control is needed. Commonly used for file sharing (e.g., BitTorrent).
Advantages:
- Easy to set up
- Cost-effective
- No dedicated server needed
Disadvantages:
- Less secure
- Poor scalability
- Difficult to manage
Used in small networks or decentralized systems where central authority isn't required.

17. What do you mean by ISDN? What are its types? What kind of services are provided by a classic ISDN to its users?

ISDN (Integrated Services Digital Network) is a set of communication standards for digital transmission over ordinary telephone lines. It allows simultaneous voice, video, and data services.
Types:
- BRI (Basic Rate Interface): 2 B-channels (64 kbps) + 1 D-channel (16 kbps)
- PRI (Primary Rate Interface): 23 B-channels + 1 D-channel (in North America)
Classic ISDN services include internet access, voice calls, video conferencing, and fax transmission.

18. What do you mean by client-server network? How is it different from P2P?

A Client-Server network is a centralized model where clients request resources or services, and servers provide them. It offers centralized control, better security, and scalability.
In contrast, P2P networks have no central server—each peer is both a client and a server.
P2P is easier to set up but less secure and harder to manage.

Client-Server is ideal for large organizations; P2P suits small groups or decentralized environments.

19. Differentiate between error detection and error correction methods. Find the hamming code for data 0110011.

Error detection identifies errors in transmitted data; error correction identifies and fixes them.
- Detection: Parity check, CRC
- Correction: Hamming Code
For 7-bit data 0110011, adding 4 parity bits at positions 1, 2, 4, and 8 gives 11-bit Hamming Code: 0110011 → 00110100111 (calculated by determining parity at positions 1, 2, 4, and 8 based on Hamming rules).

20. What are the different types of errors? Give a practical example of the working of CRC and how it detects errors in the 8/10-bit data.

Types of errors:
- Single-bit error: One bit is altered
- Burst error: Multiple bits in sequence change
- Random error: Unpredictable changes
CRC (Cyclic Redundancy Check) works by dividing data by a generator polynomial and appending the remainder. At the receiver end, the same division is done; if the remainder isn't zero, an error is detected.
Example: For 8-bit data '11010101' and generator '1001', CRC will detect if any bit changes during transmission.

21. Write short notes on: i. Packet Switching ii. LAN iii. Multipoint Network iv. Protocol and Standards v. Bridge

- Packet Switching: Data is broken into packets and sent independently. Efficient, fast, and supports multiple users.
- LAN (Local Area Network): Covers small area, high-speed, low cost, e.g., office networks.
- Multipoint Network: Single channel shared among multiple devices. Cost-effective but prone to data collision.
- Protocol and Standards: Protocols define communication rules; standards ensure interoperability (e.g., IEEE 802.3).
- Bridge: Connects two LANs and filters traffic. Works at the Data Link Layer.

22. Write short notes on: vi. IPv4 vii. Bluetooth viii. Frame Relay ix. ATM x. PPP xi. HDLC xii. Checksum

- IPv4: Internet Protocol version 4 uses 32-bit addresses. Provides logical addressing and routing.
- Bluetooth: Wireless tech for short-range communication. Used in headsets, IoT, etc.
- Frame Relay: WAN protocol using virtual circuits. Efficient for bursty data.
- ATM (Asynchronous Transfer Mode): High-speed switching tech using fixed-size 53-byte

cells.

- PPP (Point-to-Point Protocol): Used to establish direct connections over serial links.
- HDLC: Bit-oriented protocol with error control.
- Checksum: Used for error detection by summing data values and validating at the receiver.