Unit 1

1. **Give the primary responsibility of the physical layer in the OSI model?**
   The primary responsibility of the Physical Layer in the OSI model is to establish and manage the physical connection between devices, ensuring the transmission of individual bits over a communication medium such as cables or wireless signals, along with functions like bit synchronization, bit rate control, and defining transmission modes.

2. **List the devices work for physical layer?**
   Devices that work for the Physical Layer include:
   - Cables (Twisted pair, Coaxial, Fiber optic)
   - Network Interface Cards (NICs)
   - Hubs
   - Repeaters
   - Switches (at physical signal transmission level)
   - Connectors and Patch Panels.

3. **What does WAP stand for?**
   WAP stands for Wireless Application Protocol, a standard for accessing internet services on mobile devices.

4. **Which cable offers highest bandwidth?**
   Fiber optic cable offers the highest bandwidth among transmission media, as it uses light signals to transmit data, enabling very high data rates over long distances with minimal signal loss.

5. **What is the use of repeater?**
   A repeater is used to regenerate and amplify signals in a network, allowing data to travel longer distances without degradation by restoring the signal to its original strength and quality.

6. **What is the use of RJ45 connector?**
   An RJ45 connector is used to connect devices in wired networks, typically for Ethernet connections, by terminating twisted pair cables and enabling data transmission between network devices.

7. **ARPANET stands for?**
   ARPANET stands for Advanced Research Projects Agency Network, the first operational packet-switching network and the precursor to the modern internet.

8. **Network access layer is combination of how many layers?**

   The Network Access Layer in the TCP/IP model is a combination of two layers from the OSI model: the Data Link Layer and the Physical Layer.

9. **What is use of VPN?**

   A VPN (Virtual Private Network) is used to create a secure, encrypted connection over a public or untrusted network, ensuring data privacy, anonymity, and safe access to remote networks.

10. **What is synchronous and asynchronous communication?**

- **Synchronous communication: Data is transmitted with a common clock signal, so sender and receiver are synchronized in time.**
- **Asynchronous communication: Data is transmitted without a shared clock, using start and stop bits to mark each data unit.**

Unit 2

1. **What is the primary responsibility of the data link layer?**
   The primary responsibility of the Data Link Layer is to enable reliable node-to-node data transfer by framing data, detecting and correcting errors, and managing flow control to ensure proper delivery over the physical link.

2. **Which devices work for data link layer?**
   Devices that work for the Data Link Layer include:
   - **Switches (for MAC address-based forwarding)**
   - **Bridges**
   - **Network Interface Cards (NICs)**
   - **Access Points (in wireless networks)**

3. **What is the use of hamming code?**
   Hamming code is used for error detection and correction, allowing the receiver to identify and correct single-bit errors in transmitted data without needing retransmission.

4. **What is MAC address?**
   A MAC (Media Access Control) address is a unique hardware identifier assigned to a network interface card (NIC) for communication within a local network, used at the Data Link Layer to ensure data reaches the correct device.

5. **What is the use of switch?**
   A switch is used to connect multiple devices within a network and forward data frames to the specific device based on its MAC address, improving network efficiency and reducing unnecessary traffic.

6. **What is framing? Why is it necessary?**
   Framing is the process of dividing a continuous data stream from the network layer into manageable units called frames, each with headers and trailers for synchronization, error detection, and addressing.
   It is necessary to ensure proper data boundaries, detect transmission errors, and allow the receiver to correctly interpret and process the transmitted data.

7. **What is the difference between a switch and a hub?**

- **Switch: Forwards data only to the specific device (port) based on MAC address, reducing collisions and improving efficiency.**
- **Hub: Broadcasts data to all connected devices, causing more collisions and wasting bandwidth.**

8. **Which protocols operate at the data link layer?**

Protocols that operate at the Data Link Layer include:

- **Ethernet**
- **Point-to-Point Protocol (PPP)**
- **IEEE 802.11 (Wi-Fi)**
- **High-Level Data Link Control (HDLC)**

9. **How does the data link layer ensure reliable data transfer?**

The Data Link Layer ensures reliable data transfer by using error detection and correction methods (like CRC and Hamming code), acknowledgements (ACK/NACK), and flow control mechanisms to prevent data loss or overflow at the receiver.

10. **What is flow control?**

Flow control is a technique used to manage the rate of data transmission between a sender and a receiver, ensuring that the sender does not overwhelm the receiver's processing capacity or buffer space.

Unit 3

1. **What is the main function of the network layer?**
   The main function of the Network Layer is to route packets from the source to the destination across multiple networks, selecting the best path and handling logical addressing through IP addresses.

2. **What does QoS stand for?**
   QoS stands for Quality of Service, which refers to the ability of a network to prioritize and manage traffic to meet specific performance requirements like bandwidth, latency, and reliability.

3. **Define routing.**
   Routing is the process of selecting the best path for data packets to travel from the source to the destination across a network using routing algorithms and tables.

4. **What is the purpose of congestion control?**
   The purpose of congestion control is to prevent network overload by regulating the amount of data entering the network, ensuring efficient use of resources and avoiding packet loss or delays.

5. **What is flooding in routing?**
   Flooding in routing is a method where every incoming packet is sent through all outgoing links except the one it arrived on, ensuring delivery without the need for routing tables but causing high redundancy and traffic.

6. **What is meant by hierarchical routing?**
   Hierarchical routing is a routing method that divides the network into regions, with routers handling routing within their region and only passing summarized information to other regions, reducing routing table size and complexity.

7. **What is distance vector routing?**
   Distance Vector Routing is a routing method where each router periodically shares its routing table with its neighbors, using distance (cost) metrics to determine the shortest path to each destination.

8. **Lit any one of the congestion control algorithms.**

   One example of a congestion control algorithm is Leaky Bucket, which controls the rate of data transmission by allowing data to flow into the network at a steady, predefined rate, preventing sudden bursts that could cause congestion.

9. **What is multicasting?**

   Multicasting is a communication method where data is sent from one sender to a selected group of receivers in a network, allowing efficient use of bandwidth by delivering a single transmission to multiple intended destinations simultaneously.

10. **What is internetworking?**

    Internetworking is the process of connecting multiple different types of networks, such as LANs and WANs, into a larger unified network so that devices can communicate seamlessly across them.