1- Which of the following messages in the DHCP process are broadcasted? (Choose two)

A. Request

B. Offer

C. Discover

D. Acknowledge

2- Which command would you use to ensure that an ACL does not block web-based TCP traffic?

A. permit any

B. permit tcp any any eq 80

C. permit tcp any eq 80

D. permit any any eq tcp

3-Explain Network Topologies

ANS:- **Bus Topology**

- All devices share a **single communication line** (backbone).
- Simple but prone to collisions and failure if the main cable breaks.

Star Topology

- All devices connect to a **central hub or switch**.
- Reliable and easy to manage but depends on the hub/switch.

Ring Topology

- Devices form a **closed loop** (each connected to two neighbors).
- Efficient, but failure in one device can disrupt the entire network.

Mesh Topology

- **Every device connects to every other device** (full mesh) or some (partial mesh).
- High redundancy and reliability, but expensive to implement.

Tree (Hierarchical) Topology

- Hybrid of **star and bus** topologies.
- Used in large networks but depends on the backbone structure.

Hybrid Topology

- Combination of two or more topologies (e.g., **star + mesh**).
- Offers flexibility but can be complex to manage.

4-Explain TCP/IP Networking Model

ANS:- The **TCP/IP model** is a **four-layer** framework that defines how data is transmitted over a network. It is the foundation of the internet and modern networking.

1. Application Layer (User Interaction)

- Handles **high-level protocols** like HTTP, FTP, SMTP, DNS, etc.
- Provides network services to applications (e.g., web browsers, email clients).

2. Transport Layer (Reliable Communication)

- Manages end-to-end communication.
- Uses **TCP** (for reliable, connection-oriented communication) and **UDP** (for fast, connectionless communication).

3. Internet Layer (Addressing & Routing)

- Handles **IP addressing** and **routing** of data packets.
- Protocols: **IP (IPv4/IPv6), ICMP, ARP**.

4. Network Access Layer (Physical Connection)

- Defines how data is **physically transmitted** over the network (cables, Wi-Fi).
- Includes **Ethernet, Wi-Fi, PPP, MAC addresses**.

Why TCP/IP?

- **Scalable** – Works for small and large networks.
- **Interoperable** – Used worldwide for the internet.
- **Reliable** – Ensures data reaches the correct destination.

5-Explain LAN and WAN Network

ANS:-

Feature	**LAN (Local Area Network)**	**WAN (Wide Area Network)**
Definition	A network covering a **small geographic area** (e.g., home, office, school).	A network covering a **large geographic area** (e.g., cities, countries, the internet).
Speed	**Faster** (up to **1 Gbps or more**).	**Slower** (depends on ISPs, typically **10 Mbps - 100 Mbps**).
Ownership	**Privately owned** (by organizations or individuals).	**Public or private** (maintained by ISPs or governments).

Feature	LAN (Local Area Network)	WAN (Wide Area Network)
Connectivity	Uses **Ethernet, Wi-Fi** for communication.	Uses **fiber optics, satellites, leased lines** for long-distance communication.
Example	Home Wi-Fi, Office Network.	The Internet, Global Corporate Networks.

6-Explain Operation of Switc

ANS:- **Operation of a Switch**

A **network switch** operates at **Layer 2 (Data Link Layer)** of the **OSI model** and is used to efficiently forward data between devices in a **LAN**.

How a Switch Works:

1. **Receives Data (Frame)** – A switch receives a data frame from a connected device.
2. **Reads MAC Address** – It examines the **source and destination MAC addresses**.
3. **Stores MAC in a Table** – It maintains a **MAC address table (CAM table)** to map devices to ports.
4. **Forwards Data** –
    - If the **destination MAC is known**, it forwards the frame to the correct port.
    - If the **MAC is unknown**, it floods the frame to all ports (except the sender).
5. **Learns and Updates** – The switch continuously updates the MAC table as devices communicate.

Key Features of a Switch:

✓ **Reduces network congestion** (compared to hubs).
✓ **Provides dedicated bandwidth** per port.
✓ **Supports VLANs, Full-Duplex Communication, and Security Features.**

7-Describe the purpose and functions of various network devices

ANS:- **Network Devices: Purpose & Functions**

1. **Router**
    - **Purpose:** Connects different networks (e.g., LAN to the internet).
    - **Function:** Routes data based on **IP addresses** and enables **internet access**.
2. **Switch**
    - **Purpose:** Connects multiple devices within a LAN.
    - **Function:** Forwards data based on **MAC addresses** to improve efficiency.

3. **Hub**
    - **Purpose:** Basic device to connect multiple computers in a LAN.
    - **Function:** Broadcasts data to all devices (less efficient than a switch).
4. **Modem**
    - **Purpose:** Converts **digital** signals to **analog** and vice versa for internet access.
    - **Function:** Connects users to **ISP (Internet Service Provider)**.
5. **Access Point (AP)**
    - **Purpose:** Extends a wired network to wireless devices.
    - **Function:** Provides **Wi-Fi connectivity** in a LAN.
6. **Firewall**
    - **Purpose:** Protects the network from unauthorized access.
    - **Function:** Filters traffic based on **security rules**.
7. **Repeater**
    - **Purpose:** Extends network range by boosting signals.
    - **Function:** Regenerates and retransmits weak signals.
8. **Gateway**
    - **Purpose:** Connects networks using different protocols.
    - **Function:** Translates data formats between systems.

7-Make list of the appropriate media, cables, ports, and connectors to 8-

ANS:- **List of Appropriate Media, Cables, Ports, and Connectors**

1. Network Media Types

- **Wired Media**: Ethernet (Copper), Fiber Optic
- **Wireless Media**: Wi-Fi, Bluetooth, Infrared

2. Network Cables

- **Twisted Pair (Copper) Cables**:
    - **Cat5e** – Up to **1 Gbps**
    - **Cat6/Cat6a** – Up to **10 Gbps**
    - **Cat7/Cat8** – Higher speeds & shielding for reduced interference
- **Coaxial Cable**: Used for **cable TV & broadband internet**
- **Fiber Optic Cables**:

- **Single-mode fiber (SMF)** – Long-distance, high-speed
- **Multi-mode fiber (MMF)** – Shorter distances, cheaper

3. Network Ports & Connectors

- **Ethernet Ports (RJ45)** – Used for LAN connections
- **Fiber Optic Ports**:
  - **SC (Subscriber Connector)** – Square-shaped, used in enterprise networks
  - **LC (Lucent Connector)** – Smaller, used in high-density networks
  - **ST (Straight Tip)** – Older, used for fiber optic networks
- **USB Ports** – Used for modems, mobile tethering
- **Coaxial Connectors (F-type, BNC)** – Used for cable modems & CCTV
- **Serial Ports (DB9, DB25)** – Used for legacy networking & console access

8-connect switches to other

ANS:- **Connecting Switches to Other Devices**

1️⃣ **Switch to Switch**

- Use **Ethernet (RJ45)** or **Fiber Optic (SFP/SFP+)** cables.
- Connect **uplink port** of one switch to a regular port of another.
- Use **switch stacking** for managed switches.

2️⃣ **Switch to Router**

- Connect **switch's uplink port** to **router's LAN port** using an **Ethernet cable**.
- Configure IP addressing and DHCP if needed.

3️⃣ **Switch to Access Point (AP)**

- Use **Ethernet (RJ45)** cable.
- Use **PoE (Power over Ethernet)** if supported.

4️⃣ **Switch to Computers/Servers**

- Use **Ethernet (Cat6/Cat7) cables** for high-speed connections.

9-Define Network devices and hosts

ANS:- **Network Devices & Hosts (Short Explanation)**

🔹 **Network Devices** – Hardware used to manage and facilitate network communication.

- **Router** – Connects different networks, routes data.
- **Switch** – Connects devices in a LAN, forwards data based on MAC addresses.

- **Hub** – Basic device that broadcasts data to all ports.
- **Modem** – Converts signals for internet access.
- **Access Point (AP)** – Provides Wi-Fi connectivity.
- **Firewall** – Protects networks by filtering traffic.

🔹 **Network Hosts** – Devices that send/receive data within a network.

- **Computers (PCs, Laptops, Servers)** – Process and store data.
- **Smartphones & Tablets** – Wireless network access.
- **Printers & IoT Devices** – Connected for specific tasks.

Summary:

- **Network devices** manage & direct traffic.
- **Hosts** are end devices that use the network.