* **Network fundamental**

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

ANS: (A) Request

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

ANS: (B) permit tcp any any eq 80

1. Explain Network Topologies

ANS:

1. **Bus Topology**:

In a bus topology, all devices are connected to a single cable (backbone). Data is transmitted in a linear sequence, and each device checks if the data is intended for it.

**Advantages:**

- Simple installation

- Less cable required

**Disadvantages:**

- Difficult to troubleshoot

- A single fault can bring down the entire network

2. **Star Topology:**

In a star topology, all devices are connected to a central device (hub or switch). Data is transmitted from the central device to the intended recipient.

**Advantages:**

- Easy to install and troubleshoot

- Fault tolerance (a single device failure won't bring down the network)

**Disadvantages:**

- Requires more cable

- Central device can be a single point of failure

3. **Ring Topology:**

In a ring topology, devices are connected in a circular configuration. Data is transmitted in a sequential manner, and each device acts as a repeater.

**Advantages:**

- Data transmission is efficient

- Fault detection is easy

**Disadvantages:**

- Difficult to install and maintain

- A single fault can bring down the entire network

4. **Mesh Topology:**

In a mesh topology, each device is connected to every other device. Data can be transmitted through multiple paths.

**Advantages:**

- High reliability and fault tolerance

- Data transmission is efficient

**Disadvantages:**

- Complex installation

- Requires a large amount of cable

5. **Tree Topology:**

In a tree topology, a combination of bus and star topologies is used. It consists of a central bus with multiple star networks connected to it.

**Advantages:**

- Combines advantages of bus and star topologies

- Easy to expand

**Disadvantages:**

- Complex installation

- Can be difficult to troubleshoot

6. **Hybrid Topology:**

A hybrid topology combines two or more different topologies. It is used to create a network that combines the advantages of different topologies.

**Advantages:**

- Combines advantages of different topologies

- Can be customized to meet specific needs

**Disadvantages:**

- Complex installation

- Can be difficult to troubleshoot

1. Explain TCP/IP Networking Model

ANS: The TCP/IP (Transmission Control Protocol/Internet Protocol)

1. **Application Layer**

- Provides services to end-user applications

- Protocols: HTTP, FTP, SMTP, DNS, etc.

- Functions: email, file transfer, web browsing

2. **Transport Layer**

- Ensures reliable data transfer between devices

- Protocols: TCP, UDP, SCTP

- Functions: segmentation, connection establishment, flow control

**3. Internet Layer**

- Routes data between networks

- Protocols: IP, ICMP, IGMP

- Functions: addressing, routing, fragmentation

4. **Network Access Layer**

- Defines how devices access the network

- Protocols: Ethernet, Wi-Fi, PPP

- Functions: framing, error detection, transmission

**Comparison with the OSI Model**

1. Explain LAN and WAN Network

ANS:

**LAN (Local Area Network)**

A LAN is a computer network that spans a small geographical area, typically within a building or campus. It connects devices such as computers, printers, and servers, allowing them to communicate with each other.

**Characteristics of LAN:**

1. Small geographical area: LANs typically cover a small area, such as a home, office building, or campus.

2. High-speed data transfer: LANs usually offer high-speed data transfer rates, often in the range of 100 Mbps to 10 Gbps.

3. Low latency: LANs typically have low latency, meaning data travels quickly between devices.

4. Private network: LANs are usually private networks, not accessible to the general public.

**Examples of LAN:**

1. Home network: A network connecting devices in a home, such as computers, smartphones, and smart TVs.

2. Office network: A network connecting devices in an office building, such as computers, printers, and servers.

3. Campus network: A network connecting devices across a university or college campus.

**WAN (Wide Area Network)**

A WAN is a computer network that spans a large geographical area, often connecting multiple LANs. It can cover entire cities, countries, or even continents.

**Characteristics of WAN:**

1. Large geographical area: WANs cover large areas, often connecting multiple LANs.

2. Lower data transfer rates: WANs typically have lower data transfer rates compared to LANs, often in the range of 1.5 Mbps to 100 Mbps.

3. Higher latency: WANs usually have higher latency due to the longer distances data must travel.

4. Public or private network: WANs can be public, such as the internet, or private, such as a company's internal network.

**Examples of WAN:**

1. Internet: A global WAN connecting billions of devices worldwide.

2. MPLS (Multiprotocol Label Switching) network: A private WAN used by companies to connect multiple locations.

3. Cellular network: A WAN providing mobile internet access to devices across a wide area.

1. Explain Operation of Switch

ANS:

**Key Functions of a Switch:**

1. Forwarding: Switches forward incoming data packets to the intended destination device.

2. Filtering: Switches filter out unnecessary data packets, preventing them from being transmitted to other devices.

3. Address Learning: Switches learn the MAC (Media Access Control) addresses of connected devices, allowing them to forward data packets efficiently.

Operation of a Switch:

4. Receiving Data Packets: A switch receives incoming data packets from devices connected to its ports.

5. Examining Destination MAC Address: The switch examines the destination MAC address of the incoming data packet.

6. Checking MAC Address Table: The switch checks its MAC address table to determine which port the destination device is connected to.

7. Forwarding Data Packet: If the destination MAC address is found in the MAC address table, the switch forwards the data packet to the corresponding port.

8. Flooding: If the destination MAC address is not found in the MAC address table, the switch floods the data packet to all ports except the one it received the packet on.

9. Learning MAC Addresses: As devices communicate with each other, the switch learns their MAC addresses and updates its MAC address table.

Types of Switches:

10. Unmanaged Switch: A basic switch that simply forwards data packets without any configuration options.

11. Managed Switch: A switch that can be configured and managed to provide advanced features such as VLANs, QoS, and security.

12. Smart Switch: A switch that provides a balance between unmanaged and managed switches, offering some configuration options but not as many as a fully managed switch.

Advantages of Switches:

13. Improved Network Performance: Switches improve network performance by reducing collisions and increasing bandwidth.

14. Increased Security: Switches provide security features such as VLANs and access control lists to restrict network access.

15. Easy Installation: Switches are easy to install and require minimal configuration.

1. Describe the purpose and functions of various network devices

ANS:

**Network Devices**

1. **Router**

- Purpose: Connects multiple networks together and routes traffic between them.

- Functions:

- Routes data packets between networks.

- Performs network address translation (NAT).

- Provides network security features such as firewalling and access control.

2. **Switch**

- Purpose: Connects devices within a network and forwards data packets between them.

- Functions:

- Forwards data packets based on MAC addresses.

- Learns MAC addresses of connected devices.

- Provides network segmentation and isolation.

3. **Hub**

- Purpose: Connects devices within a network and broadcasts incoming data packets to all connected devices.

- Functions:

- Broadcasts incoming data packets to all connected devices.

- Amplifies incoming signals to extend network range.

4. **Bridge**

- Purpose: Connects two or more networks together and filters traffic between them.

- Functions:

- Filters traffic based on MAC addresses.

- Forwards data packets between networks.

- Provides network segmentation and isolation.

5**. Modem**

- Purpose: Connects a network to the internet via a broadband connection.

- Functions:

- Modulates and demodulates digital signals for transmission over analog phone lines.

- Establishes and maintains internet connections.

6. **Firewall**

- Purpose: Protects a network from unauthorized access and malicious activity.

- Functions:

- Blocks incoming and outgoing traffic based on predetermined security rules.

- Hides internal network addresses from external networks.

- Provides network segmentation and isolation.

7. **Network Interface Card (NIC)**

- Purpose: Connects a device to a network.

- Functions:

- Translates data between the device and the network.

- Provides a unique MAC address for the device.

- Manages data transmission and reception.

8. **Wireless Access Point (WAP)**

- Purpose: Connects wireless devices to a network.

- Functions:

- Translates data between wireless devices and the network.

- Provides wireless network connectivity.

- Manages wireless network security and authentication.

9. **Gateway**

- Purpose: Connects a network to another network or the internet.

- Functions:

- Routes data packets between networks.

- Translates data between different network protocols.

- Provides network address translation (NAT).

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

ANS:

1. **Twisted Pair (TP) cable**: Used for Ethernet connections, telephone systems, and other networking applications.

2. **Coaxial cable**: Used for broadband internet, cable television, and other high-frequency applications.

3. **Fiber Optic cable**: Used for high-speed data transmission, telecommunications, and other applications requiring high bandwidth.

4. **Wireless**: Used for wireless networking, Bluetooth, and other wireless communication applications.

**Cables**

1. RJ-45 cable: Used for Ethernet connections, typically with TP cable.

2. RJ-11 cable: Used for telephone connections, typically with TP cable.

3. BNC cable: Used for coaxial connections, typically with RG-58 or RG-59 cable.

4. SC/ST/LC fiber optic cable: Used for fiber optic connections.

5. HDMI cable: Used for high-definition video and audio connections.

6. USB cable: Used for device connections, such as peripherals and smartphones.

**Ports**

1. RJ-45 port: Used for Ethernet connections.

2. RJ-11 port: Used for telephone connections.

3. Serial port: Used for serial communication connections.

4. Parallel port: Used for parallel communication connections.

5. USB port: Used for device connections.

6. HDMI port: Used for high-definition video and audio connections.

**Connectors**

1. RJ-45 connector: Used for Ethernet connections.

2. RJ-11 connector: Used for telephone connections.

3. BNC connector: Used for coaxial connections.

4. SC/ST/LC connector: Used for fiber optic connections.

5. USB connector: Used for device connections.

6. HDMI connector: Used for high-definition video and audio connections.

7. DB-9/DB-25 connector: Used for serial and parallel connections.

8. DVI connector: Used for digital video connections.

1. connect switches to other

ANS:

**Physical Connection**

1. Use Ethernet cables: Use Cat5e, Cat6, or Cat7 Ethernet cables to connect the switches.

2. Identify the ports: Identify the ports on each switch that you want to use for the connection.

3. Connect the cables: Connect the Ethernet cables to the corresponding ports on each switch.

**Configuration**

1. Set the port mode: Set the port mode on each switch to "trunk" or "access" depending on your network requirements.

2. Configure VLANs: Configure VLANs (Virtual Local Area Networks) on each switch to ensure that the traffic is properly segregated.

3. Set the port speed and duplex: Set the port speed and duplex to match the capabilities of the connected devices.

**Types of Connections**

1. Trunk link: A trunk link is a connection between two switches that carries traffic from multiple VLANs.

2. Access link: An access link is a connection between a switch and a device (such as a computer or printer) that carries traffic from a single VLAN.

3. Stacking: Some switches support stacking, which allows multiple switches to be connected together to form a single logical switch.

**Best Practices**

1. Use redundant connections: Use redundant connections to ensure that the network remains available even if one connection fails.

2. Use different VLANs: Use different VLANs for different types of traffic to ensure that the traffic is properly segregated.

3. Monitor the network: Monitor the network regularly to ensure that the connections are working correctly and that the network is performing optimally.

1. Define Network devices and hosts

ANS:

**Network Devices**

Network devices are hardware and software components that facilitate communication, data transfer, and network management within a computer network. Examples of network devices include:

1. **Routers:** Connect multiple networks together and route traffic between them.

2**. Switches:** Connect devices within a network and forward data packets between them.

3. **Hubs:** Connect devices within a network and broadcast incoming data packets to all connected devices.

4. **Modems:** Connect a network to the internet via a broadband connection.

5**. Firewalls:** Protect a network from unauthorized access and malicious activity.

6. **Network Interface Cards (NICs):** Connect devices to a network.

7**. Wireless Access Points (WAPs):** Connect wireless devices to a network.

**Hosts**

Hosts are devices on a network that communicate with each other and share resources. Examples of hosts include:

1. **Computers:** Desktops, laptops, and mobile devices that access and share resources on a network.

2. **Servers:** Provide services such as file sharing, printing, and email to other hosts on a network.

3. **Printers:** Share printing resources with other hosts on a network.

4. **Smartphones:** Access and share resources on a network, such as email and internet browsing.

5. **Tablets:** Access and share resources on a network, such as email and internet browsing.

6. **IoT Devices:** Internet of Things (IoT) devices, such as smart home devices and wearables, that access and share resources on a network.