Module -7: Network fundamental -

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

two)

A. Request

B. Offer

C. Discover

D. Acknowledge

ANS: REQUEST AND DISCOVER

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

ANS: PERMIT TCP & ANY EQ 80

3- Explain network topologies?

ANS: Common Types of Network Topologies:

1. Bus Topology

- Imagine a single straight road where all houses (computers) are connected along the same line.

- How it works: All devices share the same communication line (the "bus").

Pros: Simple, cheap.

Cons: One break in the cable can bring down the whole network.

2. Star Topology

-Think of a star: all points connect to a central hub (like spokes on a wheel).

-How it works: Each device connects to a central switch or hub.

Pros: Easy to manage, one device failing doesn't crash the whole network.

Cons: If the central hub fails, everything goes down.

3. Ring Topology

- Picture a circle where each device is connected to two others, forming a ring.

- How it works: Data travels in one direction (or both, in a dual ring).

Pros: Good for managing traffic in a predictable path.

Cons: A failure in one device can affect the whole ring.

4. Mesh Topology

- Looks like a web — every device connects to every other device.

- How it works: Devices have multiple paths to communicate.

Pros: Super reliable — if one connection fails, there's another path.

Cons: Expensive and complex to set up.

5. Hybrid Topology

Combo of two or more topologies, like star + ring.

Pros: Flexible and scalable.

Cons: Can be complex to design and maintain.

4 Explain TCP/IP networking model?

ANS: The TCP/IP model is like the rulebook for how computers talk to each other over the internet or a network. It stands for:

Transmission Control Protocol / Internet Protocol

It breaks down communication into 4 layers, each with its own job — like a delivery system that gets your messages from your computer to another one, even across the world.

-Let’s Break It Down – Layer by Layer:

1. Application Layer (Top Layer)

- What it does:

This is where you, the user, interact. It includes the apps and services you use every day — like web browsers, email, or WhatsApp.-Real-life example:

Imagine writing a letter and deciding what you want to say. This is your communication starting point.

Examples: HTTP (for web), FTP (for file transfer), SMTP (for email)

2. Transport Layer

-What it does:

This layer is like a delivery person. It breaks your message into smaller pieces (called segments) and ensures it gets delivered correctly and in order.- Real-life example:

It’s like putting your letter in envelopes, numbering them, and making sure none are lost or opened during delivery.

-Main Protocols:TCP – Reliable (guarantees delivery)

UDP – Fast but not always reliable (used for videos, games)

3. Internet Layer

- What it does:

This layer is the navigator — it finds the best path to send your data across networks to reach the destination. This is where IP addresses come in.- Real-life example:

It’s like writing the home address of the person you’re sending the letter to, and the post office figures out the best route.- Main Protocol:

IP (Internet Protocol) – Handles addressing and routing

4. Network Access Layer (or Link Layer)

- What it does:

This is the physical delivery part. It deals with the actual hardware — like cables, Wi-Fi, switches, and how data is physically sent from one device to another.

- example:

This is the mail truck that takes your letter from your house and brings it to the recipient.

- Includes: Ethernet, Wi-Fi, MAC addresses

5 Explain lan and wan network ?

Ans: LAN = Local Area Network

Think of it as a small, private network — like all the devices connected inside your home, school, or office.

- Key Points about LAN:

Covers a small area (a room, building, or campus)

Fast and secure because it's local

Devices like computers, printers, and phones are connected through cables or Wi-Fi

Usually owned and managed by one organization or person

- Example:

Imagine you’re at home:

Your laptop, smartphone, smart TV, and printer are all connected to the same Wi-Fi router.They can talk to each other easily and share files or print documents.

That’s a LAN — everything stays local and close.

-WAN = Wide Area Network

A WAN is a big network that covers a large geographic area — like a city, country, or even the whole world.

- Key Points about WAN:

Connects multiple LANs together

Used by governments, big businesses, and the internet itself

Slower than LAN and more complex

Often uses public networks like phone lines, fiber cables, or satellites

- Example:

Imagine you work for a company with offices in:New York

London

Tokyo

Each office has its own LAN, but to connect all of them together, the company uses a WAN — kind of like building a bridge between cities so they can share data and work together.

6 Explain operation of a switch ?

Ans: A network switch is like the traffic controller of a local network.It connects devices (like computers, printers, or phones) in a LAN (Local Area Network) and helps them communicate efficiently.

How Does a Switch Actually Work?

1. Learns Devices (MAC Addresses)

-Every device has a unique MAC address (like a name tag).

-When a device sends data, the switch remembers which device is connected to which port.

-This info is saved in a table called the MAC address table.

2. Forwards Data Smartly

-When data comes in, the switch looks at the destination MAC address.

-Then it sends the data only to the specific port where that device is — not to everyone.

-This makes the network faster and more secure.

3. Prevents Collisions

-Unlike older hubs, switches prevent data from "bumping into each other" by creating a separate connection path for each communication.

-Think of it like giving each pair of students a private hallway to pass notes instead of shouting across the room.

7 Describe the functions and purpose of various network devices?

Ans: 1. Router

Purpose:Connects different networks together — like your home network to the internet.

Function:

Routes (forwards) data from your local network to the internet and back.

Assigns IP addresses (using DHCP).

Often includes a firewall to protect your network.

Example:Think of a router as a post office — it decides where letters (data) should go and makes sure they get delivered to the right address.

2. Switch

Purpose:Connects devices within the same network (LAN) and helps them communicate efficiently.

Function:

Learns which device is on which port.

Sends data directly to the intended device (instead of everyone).

Reduces congestion and improves speed.

Example:A switch is like a smart receptionist in an office who knows exactly which person (computer) is sitting at which desk (port) and hands the message directly to them.

3. Access Point (AP)

Purpose:Gives wireless access to a wired network (Wi-Fi).

Function:

Connects wireless devices (phones, laptops) to the network.

Extends Wi-Fi range in bigger spaces (like schools or offices).

Example:An access point is like a Wi-Fi hotspot — it’s the place where your devices connect to the internet wirelessly, like a doorway to the network.

4. Modem

Purpose:Connects your home or office network to your Internet Service Provider (ISP).

Function:

Converts signals between digital (your devices) and analog (ISP).

Acts as a bridge between your router and your internet connection.

Example:A modem is like a translator between your network and your internet provider — it makes sure they can understand each other.

5. Network Printer (or Shared Printer)

Purpose:Allows multiple devices on a network to print documents.

Function:

Connects via wired or wireless network.

Can be accessed by any authorized user on the LAN.

Example:It’s like having a shared office printer where anyone can send documents to print — no USB cable required!

6. Firewall (Hardware or Software)

Purpose:Protects the network from unauthorized access or cyber threats.

Function:

Monitors incoming and outgoing traffic.

Blocks suspicious activity or unknown sources.

Can be part of a router or a separate device.

Example:A firewall is like a security guard — it checks everyone trying to enter or leave the building and blocks anyone suspicious.

7. Hub (Old school, not used much today)

Purpose:Connects multiple devices in a network but doesn’t manage traffic smartly.

Function:

Broadcasts incoming data to all ports, even if it’s meant for just one device.

Slower and less secure than a switch.

Example:A hub is like someone shouting a message to the whole room, even if only one person needed to hear it.

8 Define network devices and hosts?

Ans: Network devices are physical pieces of hardware that help connect computers and other devices together to form a network.

They manage, direct, or assist in the flow of data between devices.

Examples of Network Devices:

Router – Connects your network to the internet

Switch – Connects devices within a local network

Modem – Connects your network to your ISP

Access Point – Allows wireless devices to connect

Firewall – Protects the network from threats

Network devices are like tools or infrastructure (roads, traffic lights, gates) that allow cars (data) to travel smoothly and safely between cities (devices).

-A host is any device connected to a network that can send or receive data.

Hosts are end devices — they use the network to communicate, share files, or access the internet.

Examples of Hosts:

Computers

Smartphones

Laptops

Tablets

Servers

Smart TVs

Printers (if connected to the network)

9 Make a list of media,cable,ports and connectors to 8-8 connects switches to others?

ANS: 1. Media Types

These are the physical or wireless methods used to transmit data.

-Twisted Pair (Copper cable) – Most common in LANs

-Fiber Optic – Used for high-speed and long-distance connections

-Wireless (rare for switch-to-switch) – Usually not used for switch interconnection

2. Cables Used to Connect Switches

Cable Type/Use /Speed

1-Ethernet Cable (Cat5e, Cat6, Cat6a, Cat7) -

Used for copper connections between switches

-Up to 10 Gbps

2-Fiber Optic Cable (Single-mode, Multi-mode)

-Long-distance or high-speed backbone links

-Up to 100 Gbps+

3-Direct Attach Cable (DAC)

-Short-range fiber or copper with fixed connectors

-10–100 Gbps

4-Crossover Cable (older use)

-Connects two switches directly (older switches)

-1 Gbps and below

3. Ports on Switches

Port Type/Used ForConnector

1-RJ-45 (Ethernet)

-Standard copper port for LAN cables

-RJ-45

2-SFP / SFP+ / SFP28

-For fiber optic or DAC modules

-LC (fiber) / Direct Plug (DAC)

3-QSFP / QSFP+ / QSFP28

-Higher-speed fiber (used in datacenters)

-MPO or LC

4. Common Connectors

Connector Used With Cable Type

1-RJ-45 Ethernet switches

-Cat5e, Cat6, Cat7

2-LC Fiber optic switches

-Single-mode/multi-mode fiber

3-MPO

-High-speed fiber (QSFP) Fiber

4-SFP/SFP+

-Plug-in transceiver slot Fiber or DAC

5. Example Setups for 8-to-8 Switch Connection

Example 1: Copper (Standard LAN)

Cable: Cat6 Ethernet cable Connector: RJ-45

Port: RJ-45 on both switches

Used for: Short-distance (within 100 meters)

Example 2: Fiber Optic (Backbone)

Cable: Multi-mode fiber optic Connector: LC connectors

Transceiver Module: SFP or SFP+

Used for: Long-distance or high-speed connections between switches