Q. How a network is created and how are IP addresses assigned?

Creation of a network involves the following components:

1. Network Hardware

- Router: Directs data packets between devices and the internet.
- Switch(Optional): Connects multiple devices within a local network and directs data to the router/other devices within the network.
- Modem: Connects the local network to the internet service provider (ISP).

2. Network Topology

- Star Topology: All devices connect to a central hub (e.g., a switch or router).
- Mesh Topology: Devices are interconnected.

3. Cabling and Wireless

- Ethernet Cables: For wired connections.
- Wi-Fi: Wireless connection(apparently using radio waves)

With connections established like this, a network is formed. For working, IP addresses have to be assigned and this is detailed in the next page.

How IP Addresses Are Assigned

1. Dynamic Assignment via DHCP (Dynamic Host Configuration Protocol)

- DHCP Server: Automatically assigns IP addresses to devices on the network.
- Lease Time: The period during which an IP address is assigned to a device. It can be renewed or changed.

2. Static Assignment

- Manual Configuration: IP addresses are manually set for devices, usually done for critical devices. (so that critical devices have a permanent address)

3. Private and Public IP Addresses

- Private IP Addresses: Used within a local network (e.g., 192.168.x.x, 10.x.x.x).
- Public IP Addresses: Assigned by ISPs for internet-facing devices.
- NAT: This sits between our local network and the internet and handles the translation of private IP addresses to a public IP address. It is done to solve the problem of device shortage due to 32-bit addressing

Example Process of IP Address Assignment via DHCP

1. Device Request: A device connects to the network and requests an IP address by sending a DHCPDISCOVER message.
2. DHCP Offer: The DHCP server responds with a DHCPOFFER message containing an available IP address.
3. Device Acceptance: The device accepts the offer by sending a DHCPREQUEST message.
4. Acknowledgment: The DHCP server confirms the assignment with a DHCPACK message, completing the process.