**1. Networking Devices**

Devices used to connect and manage a network:

1. **Hub** –
   * Basic device, broadcasts data to all devices.
   * Works at **Physical Layer (OSI Layer 1)**.
   * Example: Old lab networks.
2. **Switch** –
   * Smarter than hub, sends data only to the correct device using **MAC address**.
   * Works at **Data Link Layer (Layer 2)**.
   * Used in LANs.
3. **Router** –
   * Connects different networks, forwards data using **IP address**.
   * Works at **Network Layer (Layer 3)**.
   * Example: Wi-Fi router at home.
4. **Gateway** –
   * Connects two networks that use **different protocols**.
   * Like a translator.
5. **Bridge** –
   * Connects two LAN segments.
   * Works at **Data Link Layer**.
6. **Repeater** –
   * Boosts weak signals to extend network range.
   * Works at **Physical Layer**.
7. **Access Point (AP)** –
   * Provides **wireless connectivity** in a network.
   * Example: Wi-Fi hotspot.

**2. Types of Network Cables**

1. **Twisted Pair Cable**
   * Most common (Ethernet).
   * Two wires twisted to reduce interference.
   * Types:
     + **UTP (Unshielded Twisted Pair)** → Cheaper, used in LAN.
     + **STP (Shielded Twisted Pair)** → Shielding to reduce noise.
2. **Coaxial Cable**
   * Copper core with insulation and shield.
   * Used in TV networks, CCTV, older networks.
3. **Fiber Optic Cable**
   * Uses **light signals** through glass fiber.
   * Very high speed, long distance, immune to interference.
   * Types:
     + **Single Mode** → Long distance, expensive.
     + **Multi Mode** → Short distance, cheaper.

**3. Network Topologies**

1. **Bus Topology**
   * All devices connected to one main cable.
   * Cheap, simple but failure in main cable affects whole network.
2. **Star Topology**
   * All devices connected to a central switch/hub.
   * Most common in colleges.
   * Easy to manage, but if hub fails → network down.
3. **Ring Topology**
   * Devices connected in a circle (each has 2 neighbors).
   * Data travels in one direction.
   * Failure in one device can break network.
4. **Mesh Topology**
   * Every device connected to every other device.
   * Very reliable but costly.
5. **Tree/Hierarchical Topology**
   * Mix of star + bus.
   * Good for large organizations.
6. **Hybrid Topology**
   * Combination of two or more topologies.

**In colleges, mostly Star Topology is used** (LAN with switches).

**4. Networking Commands**

1. **PING**
   * Tests connectivity between your computer and another device.
   * Example: ping google.com
   * Sends ICMP packets and shows reply time.
2. **IPCONFIG** (Windows)
   * Shows your computer’s **IP address, subnet mask, gateway**.
   * Example: ipconfig /all
3. **TRACERT**
   * Shows the **path (hops/routers)** packets take to reach destination.
   * Example: tracert google.com
4. **NSLOOKUP**
   * Resolves **domain name to IP address**.
   * Example: nslookup google.com → gives Google’s IP