✅ Practical 1 – Basic LAN Configuration

What to do (2 lines):

- Create a LAN using PCs–Switch–Router and assign IPs manually.
- Check connectivity using the ping command.

Output (2 lines):

- All devices should ping each other successfully.
- Network topology and IP assignment must work properly.

Q&A (5):

1. **Q: What is a switch?**
   A: A device that connects PCs inside a LAN using MAC addresses.

2. **Q: What is a router?**
   A: A device that connects different networks using IP addresses.

3. **Q: What is a default gateway?**
   A: The router IP used to send data outside the network.

4. **Q: Why do we use ping?**
   A: To test if two devices can communicate.

5. **Q: Which cable connects PC to switch?**
   A: Straight-through cable.

✅ Practical 2 – Router-to-Router Routing

What to do (2 lines):

- Connect two routers and configure static routes between networks.
- Assign IPs to PCs and verify communication.

Output (2 lines):

- PC of Network 1 should ping PC of Network 2.
- Routing table shows manually added routes.

Q&A (5):

1. **Q: What is a routing table?**
   A: A list that tells the router where to send packets.

2. **Q: What is static routing?**
   A: Routes added manually by the admin.

3. **Q: What is next hop?**
   A: The IP address of the next router in path.

4. **Q: Why routers cannot communicate without routes?**
   A: Because router doesn't know the destination network.

5. **Q: Why serial link is used?**
   A: For point-to-point connection between routers.

✅ **Practical 3 – Dynamic Routing (RIP & OSPF)**

What to do (2 lines):

- Configure RIP and OSPF so routers auto-learn paths.

- Remove static routes and test connectivity.

Output (2 lines):

- Routing table shows R (RIP) or O (OSPF).

- Communication works without manual routes.

Q&A (5):

1. **Q: What is dynamic routing?**
   A: Automatically learns and updates routes.

2. **Q: What metric does RIP use?**
   A: Hop count.

3. **Q: Why is OSPF better?**
   A: It is faster and supports large networks.

4. **Q: Full form of RIP?**
   A: Routing Information Protocol.

5. **Q: Full form of OSPF?**
   A: Open Shortest Path First.

✅ **Practical 4 – Subnetting Implementation**

What to do (2 lines):

- Divide Class C network into subnets using borrowed bits.

- Assign IPs from each subnet and configure router.

Output (2 lines):

- Devices inside same subnet communicate properly.

- Router allows communication between subnets.

Q&A (5):

1. **Q: What is subnetting?**
   A: Breaking one network into smaller networks.

2. **Q: What is subnet mask?**
    A: Defines network and host portion.

3. **Q: What is broadcast address?**
    A: Last IP used to reach all hosts in subnet.

4. **Q: Why do we subnet?**
    A: To reduce traffic and save IPs.

5. **Q: Formula for subnets?**
    A: 2^(borrowed bits).

✅ Practical 5 – Network Segmentation

What to do (2 lines):

- Use switches for collision domains and routers for broadcast domains.

- Create VLANs and test inter-VLAN communication.

Output (2 lines):

- Broadcasts stop at router or VLAN boundary.

- Only proper routing allows communication.

Q&A (5):

1. **Q: What is collision domain?**
    A: Area where packets can collide; each switch port is one domain.

2. **Q: What is broadcast domain?**
    A: All devices that receive broadcast messages.

3. **Q: What is VLAN?**
    A: Logical separation of networks inside a switch.

4. **Q: What is router-on-stick?**
    A: One router interface used for multiple VLANs.

5. **Q: Why segmentation is important?**
    A: To improve speed, reduce traffic, increase security.

✅ Practical 6 – DHCP Server Configuration

What to do (2 lines):

- Configure router as DHCP server for automatic IP assignment.

- Set pool, gateway, DNS, and excluded addresses.

Output (2 lines):

- PCs get IP automatically (DHCP mode).

- ipconfig shows DHCP-assigned addresses.

Q&A (5):

1. **Q: What is DHCP?**
   A: Protocol that auto-assigns IP, gateway, DNS.

2. **Q: Why DHCP is used?**
   A: To avoid manual IP assignment.

3. **Q: What is DHCP pool?**
   A: Range of IPs given to clients.

4. **Q: What is excluded address?**
   A: IPs DHCP should not assign.

5. **Q: DHCP uses which ports?**
   A: UDP 67 (server), 68 (client).

✅ Practical 7 – Static & Dynamic NAT

What to do (2 lines):

- Configure static and dynamic NAT to translate private IP to public IP.
- Test connectivity to external server.

Output (2 lines):

- NAT table shows translated IPs.
- PC from private network can reach public server.

Q&A (5):

1. **Q: What is NAT?**
   A: Converts private IPs to public IPs.

2. **Q: Static NAT meaning?**
   A: One private IP maps to one public IP.

3. **Q: Dynamic NAT meaning?**
   A: Uses a pool of public IPs for many private IPs.

4. **Q: What is PAT?**
   A: NAT overload using ports.

5. **Q: Why NAT is needed?**
   A: To save public IPs and increase security.

✅ Practical 8 – ACL (Access Control Lists)

What to do (2 lines):

- Configure Standard and Extended ACLs to allow/deny traffic.

- Apply ACL on router interface and test access.

Output (2 lines):

- Blocked PCs cannot access restricted devices.

- Allowed PCs can communicate normally.

Q&A (5):

1. **Q: What is ACL?**
   A: A rule list to permit or deny network traffic.

2. **Q: Standard ACL filters by?**
   A: Source IP only.

3. **Q: Extended ACL filters by?**
   A: Source IP, destination IP, protocol, port.

4. **Q: What is implicit deny?**
   A: All unspecified traffic is automatically denied.

5. **Q: Where to place Extended ACL?**
   A: Close to the source.

✅ **Practical 9 – Wireless Network Configuration**

What to do (2 lines):

- Create wireless network with SSID and WPA2 password.

- Connect laptop/mobile using wireless adapter.

Output (2 lines):

- Device connects to WiFi and gets IP via DHCP.

- Ping to router works successfully.

Q&A (5):

1. **Q: What is SSID?**
   A: Name of the WiFi network.

2. **Q: What is WPA2?**
   A: Secure WiFi encryption method.

3. **Q: Why secure WiFi?**
   A: To stop unauthorized access.

4. **Q: What is MAC filtering?**
   A: Allowing only selected devices by MAC address.

5. **Q: How does router give IP?**
   A: Through DHCP.

✅ **Practical 10 – DNS & HTTP Configuration**

What to do (2 lines):

- Configure DNS server with domain name → IP mapping.

- Configure HTTP server and access webpage from client.

Output (2 lines):

- PC opens webpage using domain name (not IP).

- DNS resolves the name correctly.

Q&A (5):

1. **Q: What is DNS?**
   A: Converts domain names into IP addresses.

2. **Q: What is A-record?**
   A: Maps domain name to an IP address.

3. **Q: What is HTTP?**
   A: Protocol used for web page access.

4. **Q: How browser finds website IP?**
   A: Through DNS lookup.

5. **Q: Why DNS is important?**
   A: Makes internet easy by using names instead of numbers.

✅ **1. What is RIP (Full Form)?**

RIP – Routing Information Protocol

- A dynamic routing protocol that uses **hop count** to find paths between networks.

✅ **2. What is OSPF (Full Form)?**

OSPF – Open Shortest Path First

- A dynamic routing protocol that finds the **fastest and shortest path** using cost.

✅ **3. What is Classless Addressing?**

- A flexible addressing method using **CIDR (Classless Inter-Domain Routing)** with masks like /20, /26, /30.

✅ **4. What is Classful Addressing?**

- Old system where IPs were fixed into **Class A, B, C** with default masks (A=/8, B=/16, C=/24).

✅ **5. Which is Better?**

- **Classless is better** because it saves IPs, is flexible, and supports subnetting.

✅ **6. Ranges of All 5 IP Classes**

Class	Range	Use
A	1.0.0.0 – 126.255.255.255	Large networks
B	128.0.0.0 – 191.255.255.255	Medium networks
C	192.0.0.0 – 223.255.255.255	Small networks
D	224.0.0.0 – 239.255.255.255	Multicast
E	240.0.0.0 – 255.255.255.255	Research