Subnet Design Practice Questions

Question 1

Designing a network for a medium-sized organization that has the following requirements:

- 3 departments: HR (50 hosts), IT (110 hosts), and Accounts (30 hosts)
- All departments should be assigned to separate subnets
- Use the IP address block 170.170.0.0/16
- Ensure efficient utilization of IP addresses with minimal wastage
- Design should support future scalability (assume 20% growth in each department)

Task:
- Calculate the subnetting scheme, including subnet addresses, subnet masks, and broadcast addresses for each department. (Using VLSM)
- Assign IP address ranges to each department and explain your approach to minimize address wastage.
- Draw and describe a basic network topology that connects all departments using suitable interconnecting devices.

Question 2

A company has been assigned the IP block 10.10.0.0/17.
It has four departments:
- Admin: 40 hosts
- Sales: 25 hosts
- Engineering: 70 hosts
- Support: 15 hosts

Requirements:
- Each department must have its own subnet.
- Allow 30% growth in each department.
- Use VLSM to allocate subnets efficiently.

Tasks:
a) Calculate the subnet mask, network, and broadcast address for each department.
b) Assign IP ranges and default gateways.
c) Suggest a topology connecting all departments through a router and VLANs.

Question 3

A branch office has the IP block 192.168.0.0/16.
Departments and host requirements:
- HR: 20 hosts

- Finance: 30 hosts
- IT: 10 hosts
- Security: 5 hosts

Tasks:
a) Subnet the given network using VLSM.
b) Create a table showing network, subnet mask, usable range, and broadcast address for each department.
c) Design a logical topology showing how these subnets are connected to a router and switch.

Question 4

A university campus network uses 172.16.0.0/18 for its buildings:
- Science Building: 200 hosts
- Admin Building: 80 hosts
- Library: 50 hosts
- Cafeteria: 20 hosts

Requirements:
- Each building gets its own subnet.
- Provide 25% future scalability.
- Use VLSM to optimize address usage.

Tasks:
a) Determine subnet mask and ranges for each building.
b) Calculate the total number of usable hosts left unused.
c) Suggest a topology diagram showing router-on-a-stick configuration.

Question 5

A small company has been given 192.168.5.0/18 and has:
- IT (60 hosts)
- Accounts (30 hosts)
- HR (20 hosts)
- Guest WiFi (15 hosts)

Requirements:
- Separate VLAN for each network.
- Support 20% future growth.
- Minimize wastage using VLSM.

Tasks:
a) Design subnetting table (Network, Mask, Range, Broadcast).
b) Show how VLANs would be implemented (VLAN IDs, Gateways).
c) Draw a simple topology showing router, switch, and PCs.