Assignment 4: Familiarization with Network IP, Subnetting, and Super-netting

Objective:

To understand the fundamentals of IP addressing, subnetting, and super-netting, and apply these concepts to network design and optimization.

Theory:

1. **IP Addressing Basics**

    o Explain IPv4 and IPv6 addressing.

    o Differentiate between public and private IP addresses.

    o Describe the purpose of subnet masks.

2. **Subnetting**

    o Explain CIDR notation and its role in subnetting.

3. **Supernetting**

    o Define supernetting and its advantages in networking.

    o Discuss real-world applications of supernetting.

Practical:

Problem 1: Subnetting a Corporate Network

A company has been assigned the **192.168.1.0/24** network. The company has three departments with the following host requirements:

- **HR Department**: 50 hosts

- **IT Department**: 100 hosts

- **Finance Department**: 30 hosts

Task:

- Subnet the **192.168.1.0/24** network to efficiently allocate IP addresses to each department.

- Provide the network address, broadcast address, and subnet mask for each department.

- Show calculations and justifications for your subnetting approach.

Problem 2: Supernetting an ISP Network

An ISP has four class C networks:

- **192.168.10.0/24**

- **192.168.11.0/24**

- **192.168.12.0/24**

- **192.168.13.0/24**

Task:

- Perform supernetting to combine these four networks into a single supernet.

- Determine the new network address and subnet mask.

- Explain how this supernetting improves routing efficiency.

Problem 3: IP Addressing for a University Network

A university needs to assign IP addresses to its different departments using the **172.16.0.0/16** private IP block. The following departments require IP addresses:

- **Engineering**: 2,000 hosts

- **Medical**: 1,500 hosts

- **Management**: 1,000 hosts

- **Library**: 500 hosts

- **Admin**: 300 hosts

Task:

- Subnet the **172.16.0.0/16** network to allocate IP addresses for each department.

- Determine the subnet mask, network address, broadcast address, and valid host range for each subnet.

- Justify your subnetting approach.

Submission Guidelines:

- Submit a well-structured report in **PDF or Word format**.

- Include explanations, calculations, and diagrams where necessary.