- In-class Exercise –

Instructions:

· Answer all questions.
· Show your workings where applicable.
· This exercise is timed. You have 01 hour to complete it. · Ensure
your answers are clear and concise.

Question 1: IPv4 Addressing

a) What is an IPv4 address? Explain its structure.

IPv4 address is a numerical label assigned to each device connected to a computer network that uses the Internet Protocol for communication.

An IPv4 address is a 32-bit number.Represented in dotted-decimal notation, which consists of four decimal numbers separated by periods.Each of these four decimal numbers (octets) represents 8 bits of the 32-bit address, and can range from 0 to 255.

Eg: 192.168.0.1

b) Differentiate between public and private IP addresses. Give examples of each.

Public IP addresses are accessible from the internet, while private IP addresses are limited to communication within a local network.

Public IP addresses are assigned by ISPs or network administrators, whereas private IP addresses are typically assigned by a local router using DHCP.

Public IP addresses must be unique globally, whereas private IP addresses can be reused across different local networks

c) Convert the following IPv4 address from binary to decimal notation:
11000000.10101000.00011010.00010000

11000000 - 192

10101000 - 168

00011010 - 26

00010000 - 16

11000000.10101000.00011010.00010000 —-- 192.168.26.16

Question 2: Subnetting

a) Define subnetting in the context of IPv4 networking.

Subnetting in the context of IPv4 networking refers to the process of dividing a single, larger network into multiple smaller sub-networks, or subnets. This division is primarily done to improve network efficiency, security, and management by logically segmenting network resources.

b) Explain the purpose of subnet masks and how they are used in subnetting.

Subnet masks play a critical role in subnetting within IPv4 networking by defining how IP addresses are divided between the network portion and the host portion within each subnet.

Purpose : Dividing IP Addresses , Determine Network and Host Portions , Identifying Subnets

Usage : Subnetting Process

c) Given the IP address 192.168.1.0/24, calculate the following:

Number of subnets

Number of subnet - 1

Number of usable hosts per subnet
32-24 = 8
$2^n = 2^8 = 256$

$2^n - 2$
$2^8 - 2$
256 - 2
254
Number of usable hosts per subnet - 254

IJSE®

Name:…Chamith Kavinda…………………

Question 3: Subnetting Practice

Given the network address 192.168.10.0/27:

a) Determine the subnet mask.

subnet mask in binary 11111111.11111111.11111111.11100000

11111111 - 255

11111111 - 255

11111111 - 255

11100000 - 254

Subnet Mask is - 255.255.255.254

b) Calculate the number of subnets and the number of hosts per subnet.

Total bits in the subnet mask: 27

Number of bits borrowed from the host portion: 27 - 24 (default for a Class C network) = 3 bits

Number of subnets = $2^3 = 8$

Number of hosts per subnet = $2^5 - 2$

Number of subnets: 8

Number of hosts per subnet: 30

c) Provide the range of valid IP addresses for the first three subnets.

Network address: 192.168.10.0/27

Subnet mask: 255.255.255.224 (or /27)

Number of subnets: 8 (since $2^3 = 8$)

Subnet address: 192.168.10.0 (first subnet)

Subnet mask: 255.255.255.224

Subnet address: 192.168.10.32 (second subnet)

Subnet mask: 255.255.255.224

Subnet address: 192.168.10.64 (third subnet)

Subnet mask: 255.255.255.224

Subnet 1: 192.168.10.0 - 192.168.10.31

Subnet 2: 192.168.10.32 - 192.168.10.63

Subnet 3: 192.168.10.64 - 192.168.10.95

Question 4: CIDR Notation

a) What is CIDR notation? How does it simplify IP address representation?

Inter-Domain Routing notation, is a compact representation of an IP address and its associated subnet mask.

It simplifies IP address representation by combining the IP address with the subnet mask using a slash ("/") followed by a number indicating the number of bits in the subnet mask.

CIDR notation simplifies it to: 192.168.1.0/24

b) Express the following IPv4 addresses in CIDR notation:

255.255.255.0
subnet mask corresponds to a /24 CIDR notation because it has 24 bits set to 1 (255.255.255.0 in binary)

CIDR notation: **/24**

192.168.10.128

Question 5: Subnetting Calculations

Given the IP address block 192.168.20.0/25, answer the following:

a) Determine the subnet mask.

CIDR notation (/25)

11111111 11111111 11111111 10000000

255.255.255.128

The subnet mask for /25 is 255.255.255.128.

b) Calculate the number of subnets that can be created.

32-25 = 7
$2^n = 2^7 = 128$
Number of subnets = 128

c) Calculate the number of usable hosts per subnet.

$2^n - 2$

$2^7 - 2$

128-2

126

d) Provide the range of valid IP addresses for the first four subnets.

e) Calculate the number of subnets and hosts per subnet for the following scenario:

IJSE

Name:...........................

A company has the network address 192.168.100.0/24 and requires four subnets, with the largest accommodating 50 hosts.

Question 6: Optimal IP Allocation

A company has 04 departments.

Department	Number of Users
IT	50
Sales	25
Marketing	10
HR	5

a) What is the most suitable IP class to provide Ips for these users? b) Suggest an IP range to be used for the purpose.
c) How many subnetworks do you propose?
d) Prepare an optimal IP allocation plan for the company.