Assignment - III

Title :- Subnetting

Problem statement :-
Write a program in java or python to demonstrate subnetting & find the subnet masks.

Objective :- To be able to
- Understand the concept of subnetting & subnet masks.
- Understand class-less & class-full addressing.

Outcome :- students will be able to
- Implement code to find subnet mask of the given IP address.
- To understand concept of class-less & class-full addressing scheme

S/W & H/W requirements :- 64 bit system with Fedora OS, Eclipse IDE, J2SE / python.

Theory :-
Netmask : A netmask is a 32-bit mask used to divide an IP address into subnets & specify the networks available hosts.

In network mask, 2 bits are always automatically assigned & can't be used (0 & 255)
The no. of networks a netmask can support are

$$2^{\wedge(\text{netmask length} - \text{no of used segments})} - 2$$

Ex.:- A 24-bit netmask is

Netmask →	255	255	255	0
Binary →	11111111	11111111	11111111	00000000
Netmask length →	8	8	8	...

total no. of networks = $2^{24-3} - 2$

$= 2^{21} - 2$

$= 2097150$

2 are substracted because of network & broadcast address that are already used.

No of host a netmask can support are

$2^{\wedge(\text{no. of zeroes})} - 2$

Eg. For the 24 bit net mask,

no. of hosts = $2^8 - 2 = 254$.

Given below are commonly used network classes they are also called class-full addressing as the no. of bits reserved for network-id or the netmask length is fixed.

Class	Netmask length	No. of networks	No. of hosts
class A	8	$2^8 - 2$	$2^{24} - 2$
class B	16	$2^{16} - 2$	$2^{16} - 2$
class C	24	$2^{24} - 2$	$2^8 - 2$

Netmask of class A → 255.0.0.0
class B → 255.255.0.0
Class C → 255.255.255.0

For class-less addressing, netmask length is mentioned in the address & it is calculated by the binary conversion of no. of bits.

Ex. 192.168.2.0 /20

Binary →	11111111	11111111	11110000	00000000
Netmask →	255	255	240	0

Subnet Mask :-

- It is used to determine what subnet an IP address belongs to.
- Subnet mask is a data used for bitwise operation on a network of IP address that has been divided into 2 or more groups.
- This process is called subnetting, which divides IP network into blocks of logical addresses.

Ex. 192.168.2.0 /20

Consider no. of subnet = 4 (binary → 100)
3 bit from host bits are borrowed.

Binary →	11111111	11111111	11111110	00000000
Subnetmask →	255	255	254	0

Algorithm :-

1. Get the IP address of network & no. of subnets from user.
2. check which type of addressing, the given address belongs to & if it is valid address
3. Calculate the network mask, network address, broadcast address & display them.
4. Verify if given no of subnets can be formed
5. Calculate no. of bits borrowed, subnet mask, subnet IP's & range of subnets & display them.
6. Get source & destination address from user & verify if they belong to the given network.
7. check weather the source & destination address belongs to the same subnet or not & display the same.
8. repeat 1-7 if user wants to continue
9. Exit

Test Cases :-

I/P	O/P	Expected O/P	Result
IP = 192.168.5.0/26 subnet = y	class-less Netmask 255.255.255.192	—11—	Success

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source
192.168.5.1
destinat^n
192.168.5.5

subnet mask
255.255.255.248

Subnet ID's :-
192.168.5.0,
192.168.5.8,
192.168.5.16,
192.168.5.24,
192.168.5.32,
192.168.5.40,
192.168.5.48
192.168.5.56
192.168.5.[illegible]

They are in same subnet
ID : 192.168.5.0

Success.

Conclusion :-
We have successfully calculated the subnet mask of given IP address.