Name:	ID:
Time: 30 mins	**Marks: 25**
CSE 316, Quiz 2, Date 16-06-2019	**Section: 1**

Problem 1. **Marks: 2+4+14 = 20**

(i) For the proper operation of the CIDR, what are the two restrictions needed to be applied to the allocated IP blocks?

(ii) An ISP has requested a block of 1000 addresses. How many actual addresses are granted? What is the prefix length? Provide an example of the first address of such a block.

(iii) An organization is granted a block of addresses with IP address 152.199.79.122/22 belonging to that block. What is the first and last address and number of addresses in that block. The organization needs to have 3 sub-blocks of addresses to use in its three subnets: one sub-block of 20 addresses, one sub-block of 232 addresses, and one sub-block of 503 addresses. Design the sub-blocks. (show first and last address of the blocks, and the unused addresses)

Solution:

(i) For the proper operation of the CIDR, two restrictions need to be applied to the allocated block:

- The number of addresses in a block must be a power of 2. For example: 2, 4, 8, 16,….,256,…, 1024,….. so on.
- The first address must be evenly divisible by the number of addresses. For example: if a block contains 4 addresses, the first address must be divisible by 4.

(ii) An ISP has requested a block of 1000 addresses. Since 1000 is not a power of 2, 1024 addresses are granted. The prefix length is calculated as $n = 32 - \log_2 1024 = 22$. An available block, 18.14.0.0/22, is granted to the ISP. It can be seen that the first address in decimal is 302907392 which is divisible by 1024.

(iii) There are $2^{32-22} = 1024$ addresses in this block.
The first address is 152.199.76.0/22;
The last address is 152.199.79.255/22.

Sub block 1:
The number of addresses in the largest sub-block, which requires 503 addresses, is not a power of 2. We allocate 512 addresses.
The subnet mask for this subnet can be found as $n1 = 32 - \log 2512 = 23$.

The first address in this block is 152.199.76.0/23
The last address is 152.199.77.255/23.

Sub block 2:
The number of addresses in the second largest sub-block, which requires 232 addresses, is not a power of 2 either. We allocate 256 addresses.
The subnet mask for this subnet can be found as n2 = 32 − log2 256= 24.
The first address in this block is 152.199.78.0/24
The last address is 152.199.78.255/24.

Sub block 3:
The number of addresses in the smallest sub-block, which requires 20 addresses, is not a power of 2. We allocate 32 addresses.
The subnet mask for this subnet can be found as n1 = 32 − log2 32 = 27.
The first address in this block is 152.199.79.0/27
The last address is 152.199.79.31/27.

Unused Addresses:
152.199.79.32 to 152.199.79.255

Problem 2. **Marks: 3**

Change each of the following prefix lengths to a subnet mask in dotted-decimal notation:
a) n = 12 b) n = 18 c) n = 25

Solution:
We can first write the prefix in binary and then change each 8-bit chunk to decimal:

a. 255.240.0.0
b. 255.255.192.0
c. 255.252.255.128

Problem 3. **Marks: 2**

Compare NAT and DHCP. What is the problem both these techniques can solve and how?

Solution:

Both NAT and DHCP can be used to solve the problem of a shortage of addresses in an organization.

DHCP dynamically assigns one of the assigned addresses when a host needs to access the Internet.

NAT permanently assigns a set of private addresses to the host, but maps the private address to the global address when a host needs to use the Internet.