FAST- National University of Computer & Emerging Sciences, Karachi.

Department of Computer Science

Assignment # 4, Spring 2021.

CS307- Computer Networks

ASSIGNMENT-IV (Subnetting)

Submission Guidelines:

- **This is an Individual assignment. Student ID and section must be mentioned clearly.**
- **Only HAND WRITTEN submission will be acceptable. You also have to submit Scan copy on Google Classroom.**
- **Submission date: Monday, 10th May 2021 in Lecture room.**
- **This assignment has hard deadline and any late submissions won't be accepted.**

Assignment # 4 (100 points)

Question #1: (40 points)

Problem 1:

Number of needed subnets = *14*
Number of needed usable hosts = *14*
Network Address = *192.10.10.0*

Address Class: C
Default Subnet Mask: 255.255.255.0
Custom Subnet Mask: 255.255.255.240
Total Number of Subnets: 16
Total Number of Host Addresses: 16
Number of Usable Addresses: 14
Number of Bit Borrowed: 4

CALCULATIONS:

Number of Hosts	256	128	64	32	16	8	4	2
Number of Subnet	2	4	8	16	32	64	128	256
Binary values	128	64	32	16	8	4	2	1
192.10.10.	0	0	0	0	0	0	0	0

- CUSTOM SUBNET Mask = 128+64+32+16 = 240 => **Custom Subnet Mask** = 255.255.255.240

- Total Number of Subnets = 2^s (s = number of borrowed bits).
  => Total Number of Subnets = $2^4 = 16$

- Total Number of Host Addresses = 2^h (h= borrowed bits subtracted from total number of bits).
  => Total Number of Host Addresses = $2^4 = 16$

- NEEDED USABLE HOST = $2^h-2 = 2^4-2 = 16-2 = 14$
- Number of Bit Borrowed: 4

Problem 2:

Number of needed subnets = *1000*
Number of needed usable hosts = *60*
Network Address = *165.100.0.0*

Address Class: B
Default Subnet Mask: 255.255.0.0
Custom Subnet Mask: 255.255.255.192
Total Number of Subnets: 1024
Total Number of Host Addresses: 64
Number of Usable Addresses: 62
Number of Bit Borrowed: 10

CALCULATIONS:

No. of Hosts	65536	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2
No. of Subnet	2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	16384	32768	65536
No. of Binary values	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1
165.100.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

- CUSTOM SUBNET Mask = 128+64+32+16+8+4+2+1 = 255,
  128+64 = 192 => **Custom Subnet Mask** = 255.255.255.192
- Total Number of Subnets = 2^s (s = number of borrowed bits).
  => Total Number of Subnets = $2^{10} = 1024$

- Total Number of Host Addresses = 2^h (h= borrowed bits subtracted from total number of bits).
  => Total Number of Host Addresses = $2^8 = 64$

- NEEDED USABLE HOST = $2^h-2 = 2^8-2= 64-2 = 62$
- Number of Bit Borrowed: 10

Problem 3:

Network Address = *148.75.0.0 /26*

Address Class: B
Default Subnet Mask: 255.255.0.0
Custom Subnet Mask: 255.255.255.192
Total Number of Subnets: 1024
Total Number of Host Addresses: 64
Number of Usable Addresses: 62
Number of Bit Borrowed: 10

CALCULATIONS:

No. of Hosts	65536	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2
No. of Subnet	2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	16384	32768	65536
No. of Binary values	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1
165.100.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

- CUSTOM SUBNET Mask = 128+64+32+16+8+4+2+1 = 255,
  128+64 = 192 => **Custom Subnet Mask** = 255.255.255.192
- Total Number of Subnets = 2^s (s = number of borrowed bits).
  => Total Number of Subnets = $2^{10} = 1024$

- Total Number of Host Addresses = 2^h (h= borrowed bits subtracted from total number of bits).
  => Total Number of Host Addresses = $2^8 = 64$

- NEEDED USABLE HOST = 2^h-2 = 2^8-2= 64-2 = 62
- Number of Bit Borrowed: 10

Question #2: (60 points)

Given below is a scenario in which there is an available IP Pool and IP's are to be to be assigned to 3 different companies. You have to perform sub-netting to efficiently assign IP's to each company. Show necessary calculations and result.

Scenario:

Following are the 3 Companies

- **Netcom has 50 hosts (PCs)**
- **Cyber-Safe has 48 hosts (PCs)**
- **CNSP-Zone has 120 hosts (PCs)**

Available IP Pool is: 192.168.1.0 /24 (255.255.255.0)

Your task is to make subnets of the IP given above and assign a range of IP addresses to all of these companies.

- **Calculations for CNSP:**

  CNSP Zone = 120 Hosts

  $2^7 - 2 = 128 - 2 = 126$ usable IP address 192.168.1.0 0000000

  So, 192. 168. 1. 0 (/25)

  And IP range of hosts will be 192. 168. 1. 1 to 192. 168. 1. 126 (/25)

- **Calculations for Netcom**:

  Netcom = 50 Hosts

  $2^6 - 2 = 64 - 2 = 62$ usable IP addresses 192. 168. 1. 01 000000

  So, 192. 168. 1. 128 (/26)

  Hence, IP range of hosts will be 192. 168. 1. 129 to 192. 168. 1. 190 (/26)

- **Calculations for Cyber safe**:

  Cyber safe = 48 hosts

  $2^6 - 2 = 64 - 2 = 62$ usable IP addresses addresses192.168. 1. 11 000000

  So, 192. 168. 1. 192 (/26)

  So, IP range of hosts will be 192. 168. 1. 193 to 192. 168. 1. 254 (/26)