



**FAST- National University of Computer and Emerging Sciences, Karachi.**

**FAST School of Computing  
Bonus Assignment, Spring 2022**

**CS3001- Computer Networks  
BONUS ASSIGNMENT (Subnetting)**

**Submission Guidelines:**

- This is an Individual assignment. Student ID and section must be mentioned clearly.
- Only HAND WRITTEN submission will be acceptable.
- Submission date: Thursday, 7<sup>th</sup> April 2022 in Lecture room.
- This assignment has hard deadline and any late submissions won't be accepted.

**Bonus Assignment (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 =  $128+64+32+16 = 240 \Rightarrow$  **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 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 192.168. 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)