**Lab Practical #09:**

Study of IP Addressing and sub-netting.

**Practical Assignment #09:**

1. Find default subnet marks, network bits, host bits, hosts per subnet, no of subnets, subnet number, 1st valid IP address, last valid IP address, and broadcast address.
   1. 8.1.4.5/16
   2. 130.4.102.1/24
   3. 199.1.1.1/24
   4. 130.4.102.1/22
   5. 199.1.1.100/27

Answers :

1. **8.1.4.5/16**

* **Default Subnet Mask –** 255.255.0.0
* **Network bits –** 16
* **Host bits –** 32 - 16=16
* **Hosts per Subnet –** 216 - 2 = 65,534
* **No of subnets –** 256
* **Subnet number –** 8.1.4.0
* **1st valid IP address –** 8.1.4.1
* **Last valid IP address –** 8.1.4.254
* **Broadcast address –** 8.1.4.255

1. **130.4.102.1/24**

* **Default Subnet Mask –** 255.255.255.0
* **Network bits –** 24
* **Host bits –** 32 – 24 = 8
* **Hosts per Subnet –** 28 - 2 = 254
* **No of subnets –** 256
* **Subnet number –** 130.4.102.0
* **1st valid IP address –** 130.4.102.1
* **Last valid IP address –** 130.4.102.254
* **Broadcast address –** 130.4.102.255

1. **199.1.1.1/24**

* **Default Subnet Mask –** 255.255.255.0
* **Network bits –** 24
* **Host bits –** 32 - 24=8
* **Hosts per Subnet –** 28 - 2 = 254
* **No of subnets –** 1
* **Subnet number –** 199.1.1.0
* **1st valid IP address –** 199.1.1.1
* **Last valid IP address –** 199.1.1.254
* **Broadcast address –** 199.1.1.255

1. **130.4.102.1/22**

* **Default Subnet Mask –** 255.255.252.0
* **Network bits –** 22
* **Host bits –** 32 – 22 =10
* **Hosts per Subnet –** 210 - 2 = 1,022
* **No of subnets –** 64

Here CIDR notation is /22 by default CIDR notation of class-B is /16 so borrowed bits are 22 - 16 = 6

No of subnets = 26 = 64

* **Subnet number –** 130.4.100.0
* **1st valid IP address –** 130.4.100.1
* **Last valid IP address –** 130.4.103.254
* **Broadcast address –** 130.4.103.255

1. **199.1.1.100/27**

* **Default Subnet Mask –** 255.255.224.0
* **Network bits –** 27
* **Host bits –** 32 – 27 =5
* **Hosts per Subnet –** 25 - 2 = 30
* **No of subnets –** 8

Here CIDR notation is /27 by default CIDR notation of class-C is /24 so borrowed bits are 27 - 24 = 3

No of subnets = 23 = 8

* **Subnet number –** 199.1.1.96
* **1st valid IP address –** 199.1.1.97
* **Last valid IP address –** 199.1.1.126
* **Broadcast address –** 199.1.1.127

**How to calculate Network Address(Subnet Number)**

**For ex-** 199.1.1.100/27

**IP address –** 199.1.1.100

**Subnet Mask –** 255.255.255.224

first convert IP address and Subnet mask into binary like this

**199.1.1.100 =** 1 1 0 0 0 1 1 1 . 0 0 0 0 0 0 1 . 0 0 0 0 0 0 0 1 . 0 1 1 0 0 1 0 0

**255.255.255.224 =** 1 1 1 1 1 1 1 1 . 1 1 1 1 1 1 1 . 1 1 1 1 1 1 1 1 . 1 1 1 0 0 0 0 0

Now perform AND operation between them

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**1 1 0 0 0 1 1 1 . 0 0 0 0 0 0 1 . 0 0 0 0 0 0 0 1 . 0 1 1 0 0 1 0 0**

Now covert answer to Decimal

**1 1 0 0 0 1 1 1 . 0 0 0 0 0 0 1 . 0 0 0 0 0 0 0 1 . 0 1 1 0 0 1 0 0 = 199.1.1.96**

So Network Address(Subnet Number) = **199.1.1.96**

By using this method we can calculate Network Address(Subnet Number) of any given IP Address

1. A host in a class C network has been assigned an IP address 192.168.17.9. Find the number of addresses in the block, the first address, and the last address.

* Given IP is of Class-C so CIDR is /24
* So Host bits = 32-24=8
* **Number of addresses in block –** 2(host bits) =28-2=254
* **First IP Address –** 192.168.17.1
* **Last IP Address –** 192.168.17.254

1. An address in a block is given as 185.28.17.9. Find the number of addresses in the block, the first address, and the last address.

* Given IP is of Class-B so CIDR is /16
* So Host bits = 32-16=16
* **Number of addresses in block –** 2(host bits)=216-2=65,534
* **First IP Address –** 185.28.17.1
* **Last IP Address –** 185.28.17.254

1. A block of addresses is granted to a small organization. We know that one of the addresses is 205.16.37.39/28. What is the first address, last address, number of addresses in a block.

* Given IP is of Class-C but CIDR is /28
* So Host bits = 32-28=4
* **Number of addresses in block –** 2(host bits)=24-2=14
* **First IP Address –** 205.16.37.32
* **Last IP Address –** 205.16.37.47

1. Subnet the IP address 216.21.5.0 into 30 hosts in each subnet. Find Class, Default Mask, Bit Borrowed, New subnet mask, No. of Hosts & Subnet, Network Ranges (Subnets).
   * **Class -** C
   * **Default Mask -** 255.255.255.0
   * Calculate the no of usable host by using below formula
     + 2host – 2 >= No of we need in per subnet
   * We need 30 Hosts each Subnet
   * We can use above formula to calculate the Required Host bits
     + 2host >= 30
     + 25 >= 30 → 32 >= 30
   * So, Required Host Bits is 5
   * **Bit Borrowed –** 3 (for host we required 5 bits so 8 – 5 =3)
   * **New Subnet Mask** -255.255.255.224
   * **No of Hosts -**25 = 32
   * **No of Subnet –** 2(bit borrowed) = 23 = 8
   * **Network Ranges –** 
     + Subnet 1: - 216.21.5.0 – 216.21.5.31
     + Subnet 2: - 216.21.5.32 – 216.21.5.63
     + Subnet 3: - 216.21.5.64 – 216.21.5.95
     + Subnet 4: - 216.21.5.96 – 216.21.5.127
     + Subnet 5: - 216.21.5.128 – 216.21.5.159
     + Subnet 6: - 216.21.5.160 – 216.21.5.191
     + Subnet 7: - 216.21.5.192 – 216.21.5.223
     + Subnet 8: - 216.21.5.224 – 216.21.5.255
2. Subnet the IP address 192.10.20.0 into 52 hosts in each subnet. Find Class, Default Mask, Bit Borrowed, New subnet mask, No. of Hosts & Subnet, Network Ranges (Subnets).
   * **Class -** C
   * **Default Mask -** 255.255.255.0
   * Calculate the no of usable host by using below formula
     + 2host >= No of we need in per subnet
   * We need 30 Hosts each Subnet
   * We can use above formula to calculate the Required Host bits
     + 2host >= 52
     + 26 >= 52 → 64 >= 52
   * So, Required Host Bits is 6
   * **Bit Borrowed –** 2 (for host we required 6 bits so 8 – 6 = 2)
   * **New Subnet Mask -**255.255.255.192
   * **No of Hosts -**25 = 64
   * **No of Subnet –** 2(bit borrowed) = 22 = 4
   * **Network Ranges –**
     + Subnet 1: - 192.10.20.0 – 192.10.20.63
     + Subnet 2: - 192.10.20.64 – 192.10.20.127
     + Subnet 3: - 192.10.20.128 – 192.10.20.191
     + Subnet 4: - 192.10.20.192 – 192.10.20.255