1) Identify the following MASKS in slash notation (/n)

a) 255.0.0.0

b) 255.255.224.0

c) 255.255.255.0

d) 255.255.240.0

Here first we have to write each segment in binary format

a) 255.0.0.0

11111111 . 0000 0000 . 0000 0000 . 0000 0000

then count no.of 1's

no.of 1's : 8

\8

b) 255.255.224.0

1111 1111 . 1111 1111 . 1110 0000 . 0000 0000

no.of 1's : 19

\19

c) 255.255.255.0

1111 1111 1111 1111 1111 1111 0000 0000

no.of 1's : 24

slash notation : \24

d) 255.255.240.0

1111 1111 1111 1111 1111 0000 0000 0000

no.of 1's : 20

: \20

2) The address of a class B host is to be split into subnets with a 6-bit subnet number: calculate max no. of subnets and the maximum no. of hosts in each subnet?

In Class B, 16 bits reserved for network id and 16 for host id

6 bit is added due to subnetting

No. of subnet = $2^n - 2$ → for st and end they are reserved bits

= here $n = 6$

$\Rightarrow 2^6 - 2 \Rightarrow 64 - 2$

$\Rightarrow 62$

No. of subnets = 62

Total network Id = Network reserved + newly added

= 16 + 6

= 22

We know host Id + Network Id = 32

host Id = 32 - Network id

= 32 - 22

host Id = 10

∴ The no. of available host = $2^n - 2$

= $2^{10} - 2$

= 1024 - 2

∴ Total no. of hosts = 1022

3. Identify the class of the following IP addresses

a) 237.14.2.1 b) 208.35.54.12

c) 129.14.2.1 d) 114.34.2.8

Normally there are

class A : 1 to 126

class B : 128 to 191

class C : 192 to 223

class D : 224 to 239

class E : 240 to 255

here 127 is loop back addressing not allocated to any network used for troubleshoting and network diagonsis.

a) (237).14.2.1

↳ see first octet it belongs to class D

b) (208).35.54.12

208 belongs to class C

c) (129).14.2.1

129 belongs to class B

D) (114).34.2.8

114 belongs to class A

10) Identify the class of the fllowing IP addresses

a) (130).34.54.12

130 belongs to class B

b) (200).34.2.1

200 belongs to class C

c) (245).34.2.8

245 belongs to class E

a) Build the following IP addressing using dotted decimal notation

a) 01011110 10110000 01110101 00010101

94.176.117.21

b) 1000 1001 10007110 1101 0000 0011 0001

137.140.208.49

c) 01010111 10000100 00110111 0000 1111

87.132.55.15

5) A router with IPv4 address 123.45.21.12 and Ethernet physical address 23:45:BA:00:67:CD has recieved a packet for a host destination with IP address 124.10.78.10. Show the entries in ARP request packet sent by the router. Assume no subnetting?

In ARPC Address Resolution Protocol) request packet, router is trying to find the ethernet physical address (Mac address) corresponding to a given IPv4 address. The IPv4 address for the destination host is 124.10.78.10

ARP request packet sent by the router will have the following entries

1) Sender's IP address: 123.45.21.12
2) Sender's MAC address: 23:45:BA:00:67:CD
3) Target IP address: 124.10.78.10
4) Target MAC address: This field will be set to all

geros (00:00:00:00:00:00) in the ARP request packet because the router is trying to find the MAC address of the destination host and doesn't yet know it.

It will send broadcast address:

FF:FF:FF:FF:FF:FF → boardcast purpose special port address

router sends board cast packet, meaning it will be sent to all devices on the local network and the device with IP address 124.10.78.10 (the target IP address) will respond with its MAC address so that router can update its ARP table and send future packets directly to the destination host without need for ARP request

ARP header contains:

Hardware Type: 1 (Ethernet - 16 bits)

prototye type : 0x0800 1 for ethernet (for IPv4)

Hardware address leuth : 6 (Ethernet MAC address leuth - each is bits)

protocol Address lngth : 4

operation: 1 (1 for ARP request)

Sender Hardware address : MAC address of router Ethernet (given)

~~Target~~ Sender protocal address: IP of Ethernet (given)

Target Hardware address: MAC of target (unknown) so 00:00:00:00:00:00

Target protocol : IP of target (given)

6) Consider a company is granted the site address 201.70.64.0 /16. The company needs six subnets of equal size accordingly design the network

→ 6 is not a power of 2

→ ~~Next~~ find value of n for which the next number that is a power of 2 is 8

→ $2^n \geq 6$ first n value

→ $2^3 \geq 6$

∴ So we need 3 more 1's in the subnet mask

→ Given mask 16

total no. of 1's = 16 + 3 = 19

→ Total no. of zero = host id = ~~subnet~~ 32 - network id

= 32 - 19 = 13

So the six subnets are

201.70.64.0 - 201.70.64.12

201.70.64.13 - 201.70.64.25

201.70.64.26 - 201.70.64.38

201.70.64.39 - 201.70.64.51

201.70.64.52 - 201.70.64.64

201.70.64.65 - 201.70.64.77

7) Consider a host using leaky bucket strategy for traffic shaping. The host sends a burst data at a rate of 15Mbps for first 3 seconds and remain silent for 2 seconds. Then again a burst data at a rate of 6 Mbps is send for next 2 seconds. Now again the host sends data at rate of 5 Mbps for next 3 seconds. What will be the output data rate of the leaky bucket?

15 Mbps for 3 second

1st : $15 \times 3 = 45$

remain silent for 2 second

~~2nd~~ 6Mbps for next 2 sec

2nd : $6 \times 2 = 12$

remain silent for 2 sec
5 Mbps for 3 sec

3rd : 5×3 sec $= 15$

Total time $= 3+2+2+2+3 = 12$

Total data $= 45+12+15 = 72$

Output data rate $= \frac{72}{12} = 6$ Mbps

8) Design the following IP addresses using binary notation

a) 110 . 11 . 5 . 88

0110 1110 0000 1011 0000 0101 0101 1000

b) 12 . 74 . 16 . 18

0000 1100 0100 1010 0001 0000 0001 0010

c) 201 . 24 . 44 . 32

1100 1001 0001 1000 0010 1100 0010 0000