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SUBNETTING

Day / Date: _____

Q2) Address = 192.168.2.0
Subnet = 255.255.255.0/24   `C`
Borrower bits = 3

Sol

#1   Borrower = 3 bits

No, of subset = $2^n = 2^3 = 8$
No. of host = $2^{8-3} = 2^5 = 32$
Usable host = $32 - 2 = 30$

 # Calculating Subnet Mask.

255.255.255.0

After borrowing bits.
255.255.255.224/27

 # Range
Since, No. of host = 32
range ⇒ 0 — 31

192.168.2.0 — SN1
192.168.2.1 — UH1
192.168.2.2 — UH2
192.168.2.3 — UH3

192.168.2.31 — UH31

Total Subnets :-
SN1 [192.168.2.0 — 192.168.2.31]
SN2 [192.168.2.32 — 192.168.2.63]
SN3 [192.168.2.64 — 192.168.2.95]
SN4 [192.168.2.96 — 192.168.2.127]
SN5 [192.168.2.128 — 192.168.2.159]
SN6 [192.168.2.160 — 192.168.2.191]
SN7 [192.168.2.192 — 192.168.2.223]
SN8 [192.168.2.224 — 192.168.2.255]

X ——————— X ——————— X

Q2)   IP : 192.16.10.22   (class C)
      Subnet : 255.255.255.252.

Sol

255.255.255.$\boxed{252}$ / 24

network bits   Host bits

252 = 1111 1100
⟹ 6 bits are active/on.

So,
   Subnet = 2^6 = 64
   Total host = 2^{8-6} = 2^2 = 4
   Usable host = 4 - 2 = 2.

Subnet   255.255.255.25$\cancel{2}$ / 30
                           24 + 6
                           = 30 bit

Total Subnets :-

SN1 [192 . 16 . 10 . 0 — 192 . 16 . 10 . 3]
SN2 [192 . 16 . 10 . 4 — 192 . 16 . 10 . 7]
SN3 [192 . 16 . 10 . 8 — 192 . 16 . 10 . 11]

SN62 [192 . 16 . 10 . 244 — 192 . 16 . 10 . 247]
SN63 [192 . 16 . 10 . 248 — 192 . 16 . 10 . 251]
SN64 [192 . 16 . 10 . 252 — 192 . 16 . 10 . 255]

X ——————————— X ——————————— X

Q3) 192.168.246.189 / 29

Sol

Subnet Mask (class c)
255.255.255. 0 / 24

So,
borrowed bits = 29 - 24 = 5 bits
subnet = 2^5 = 32
Hosts = $2^{8-5} = 2^3 = 8$
Usable host = 8 - 2 = 6

SN1 [192.168.246.0 — 192.168.246.7]
SN2 [192.168.246.8 — 192.168.246.15]
SN3 [192.168.246.16 — 192.168.246.23]

SN30 [192.168.246.232 → 192.168.246.239
SN31 [192.168.246.240 → 192.168.246.247
SN32 [192.168.246.248 → 192.168.246.255

Host belongs to SN24 because
SN24 [192.168.246.184 - 192.168.246.191]

X —————————— X —————————— X

Q4) ① 12.5.6.111 / 26
Sol class A.
Subnet = 255.0.0.0 /8
hence,
   borrowed bits = 26 - 8 = 18
   Subnets = 2^{18} = 262144
   Total bits = 2^{24-18} = 2^6 = 64
   Usable host = 64 - 2 = 62

Calculating subnet Mask !
⇒ 255.0.0.0
   borrowed bit = 18
⇒ 255.255.255.192 / 26

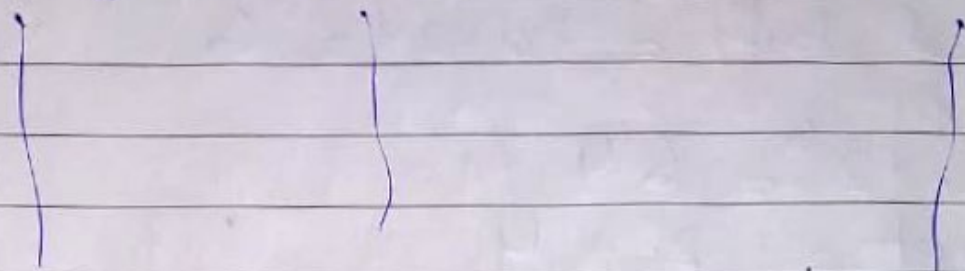| Network ID		BID
SN1 [12.0.0.0	—	12.0.0.63]
SN2 [12.0.0.64	—	12.0.0.127]
SN3 [12.0.0.128	—	12.0.0.191]

SN4 [12.0.0.192 — 12.0.0.255]
SN5 [12.0.01.0 — 12.0.1.63]
SN6 [12.0.01.64 — 12.0.1.127]

2)   100.20.200.200/25

Sol

Subnet = 255.0.0.00 /8
borrowed bits = 25-8
= 17
Subnets = 2^{17} = 131072
Total hosts = 2^{24-17} = 2^7 = 128
Usable host = 128-2 = 126

Calculating Subnet Mask
255.0.0.0
Since, borrowed bits = 17
→ 255.255.255.128 / 25

Network ID   BID
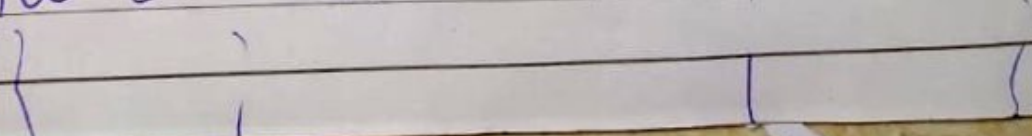SN1 [100.0.0.0   —   100.0.0.127]
SN2 [100.0.0.128 —   100.0.0.255]
SN3 [100.0.1.0   —   100.0.1.127]
SN4 [100.0.1.128 —   100.0.1.255]
SN5 [100.0.2.0   —   100.0.2.127]
SN6 [100.0.2.128 —   100.0.2.255]

4.3)   216.0.0.189 / 30

Sol

Subnet = 255.255.255.0 /24   (Class C)

borrowed bits = 30 - 24 = 6

Subnet = 2^6 = 64

Total host = 2^2 = 4

Usable host = 4 - 2 = 2

Calculating Subnet Mask

⟹ 255.255.255.0

Since, borrowed bits = 6

⟹ 255.255.255.252 / 30

Network ID		BID
SN1 [216.0.0.0	—	216.0.0.3]
SN2 [216.0.0.4	—	216.0.0.7]
SN3 [216.0.0.8	—	216.0.0.11]
SN4 [216.0.0.12	—	216.0.0.15]
SN5 [216.0.0.16	—	216.0.0.19]
SN6 [216.0.0.20	—	216.0.0.23]
⋮		
SN64 [216.0.0.252	—	216.0.0.255]

4.4) 172.18.5.150/28

Sol

Subnet = 255.255.0.0/16

Borrowed bits = 28-16
= 12

Subnets = 2^{12} → 4096

Total hosts = 2^{16-12} = 2^4 = 16

Usable hosts = 16-2 = 14

Calculating Subnet Mask

⇒ 255.255.0.0

since,

Borrowed bits = 12.

⇒ 255.255.255.240/28

Network ID   B ID

SN1 [172.18.0.0   —   172.18.0.15]
SN2 [172.18.0.16   —   172.18.0.31]
SN3 [172.18.0.32   —   172.18.0.63]
SN4 [172.18.0.64   —   172.18.0.79]
SN5 [172.18.0.80   —   172.18.0.95]
SN6 [172.18.0.96   —   172.18.0.111]

Q5)
$$\sqrt{LSM}$$
IP = 192.168.100.0/24

For subnet 1 , hosts = 50

① Total hosts = $2^6 = 64$
   Subnet = $2^2 = 4$

② Subnet Mask = 255.255.255.0
   After borrowing 2 bits.
   subnet Mask = 255.255.255.192 /26

③ Range:
   SN1 → 192.168.100.0
   Usable ID1 → 192.168.100.1
   Usable ID2 → 192.168.100.2

   Usable ID62 → 192.168.100.62
   Broadcast ID → 192.168.100.63

For subnet 2, host = 40
   SN2 → 192.168.100.64

① Total hosts = 40
   $2^6 = 64$
   Subnet = $2^2 = 4$

② Subnet Mask = 255.255.255.0
After borrowing 2 bits
255.255.255.192 /26

③ Range:
SN2 → 192.168.100.64
ID1 → 192.168.100.65
ID2 → 192.168.100.66
⋮
ID62 → 192.168.100.126
BID → 192.168.100.127

For subnet 3 ; hosts = 22
SN3 → 192.168.100.128

① Total host = 22 ≠ ∅/ ≠ ∅
$2^5 = 32$
Subnet = $2^3 = 8$

② Subnet Mask = 255.255.255.0
After borrowing 3 bits.
⟹ 255.255.255.224 /27

③ Range
SN3 → 192.168.100.128
Usable ID1 → 192.168.100.129

ID 30 $\longrightarrow$ 192.168.100.158

BID $\longrightarrow$ 192.168.100.159

For Subnet 4 ; host = 10

SN4 $\longrightarrow$ 192.168.100.160

① Total hosts = 10

$2^4 = 16$

Subnet = $2^4 = 16$

② Subnet Mask = 255.255.255.0

After borrowing 4 bits

$\Rightarrow$ 255.255.255.232 / 28

③ Range:

SN4 $\longrightarrow$ 192.168.100.160

Usable IP1 $\rightarrow$ 192.168.100.161

// ID2 $\rightarrow$ 192.168.100.162

Usable ID$_M$ $\longrightarrow$ 192.168.100.174

Broad Cast IID $\rightarrow$ 192.168.100.175

For Subnet 5 ; host = 8
SN5 → 192.168.100.176

① Total hosts = 8
$2^4 = 16$
Subnet = $2^4 = 16$

② Subnet Mask ⇒ 255.255.255.0
After borrowing bits = 4
255.255.255.240/28

③ Range
SN5 → 192.168.100.176
ID 1 → 192.168.100.177
$\vdots$
ID$_{14}$ → 192.168.100.190
BID → 192.168.100.191

For Subnet 6 ; hosts = 6
SN3 → 192.168.100.192

① Total hosts = 6
$2^3 = 8$
Subnet = $2^5 = 32$

② Subnet mask ⇒ 255.255.255.0

After borrowing bits = 5
255.255.255.248/29

③ Range
SN3 → 192.168.100.192
Usable ID1 → 192.168.100. 193
// ID2 → 192.168.100. 194
.   .   .   .
|)   ) | !
Usable ID → 192.168.100. 198
Broadcast ID → 192.168.100. 199

for Subnet 7 ; host = 4
SN4 → 192.168.100.200

① Total hosts = 4
$2^3 = 8$
Subnet = $2^5 = 32$

② Subnet Mask ⟹ 255.255.255.0
After borrowing 6 bits,
⟹ 255.255.255.248/29

③ Range
SN4 → 192.168.100.200
Usable ID1 → 192.168.100.201
.   .   .   .
| | . . |
| | | | |

Usable ID 6 → 192.168.100.206
Broadcast ID → 192.168.100.207

X ————————— X ————————————— X

Q6)   180.10.0.0/16
Subnet = 255.255.0.0   (Class B)

sol
For Subnet 1 ; hosts = 9000

① Total hosts = 9000
$2^{14} = 16384$
Subnet = $2^2 = 4$

② Subnet Mask = 255.255.0.0/16
After borrowing 4 bits.
255.255.192.0/18

③ Range
SN1 → 180.10.0.0
ID1 → 180.10.0.1
.
.
BID → 180.10.63.255

For subnet 2 ; hosts = 5000

① Total hosts = 5000
   $2^{13} = 8192$
   Subnet = $2^3 = 8$

② Subnet Mask = 255.255.0.0 /16
   After borrowing 3 bits.
   255.255.224.0 /19

③ Range
   SN 2 → 180.10.64.0
   ID 1 → 180.10.64.1
   , | | .   .
   | | .   . |
   BID → 180.10.95. 255

For subnet 3, hosts = 1500

① Total hosts = 1500
   $2^{11} = 2048$
   Subnet = $2^5 = 32$

② Subnet Mask → 255.255.0.0 /16
   After borrowing 5 bits.
   255.255.248.0 /21

③ Range

$$SN3 \rightarrow 180.10.96.0$$
$$UFD_1 \rightarrow 180.10.96.1$$
$$\vdots \qquad \qquad \vdots \quad \vdots \quad \vdots \quad \vdots$$
$$BID \rightarrow 180.10.103.255$$

For Subnet 4 ; hosts = 1000

① Total hosts = 1000
$$2^{10} = 1024$$
$$Subnet = 2^6 = 64$$

② Subnet Mask $\Rightarrow$ 255.255.0.0, /16
   255.255.252.0 /22
   (After borrowing 6 bits)

③ Range
$$SN4 \rightarrow 180.10.104.0$$
$$IDI \rightarrow 180.10.104.1$$
$$\vdots$$
$$BID \rightarrow 180.10.107.255$$

For subnet 5, host = 1000

① Total host = 1000

$$2^{10} = 1024$$
$$Subnet = 2^6 = 64$$

② Subnet Mask => 255.255.0.0
After borrowing 6 bits.
255.255.252.0 /22

③ Range
SN5 → 180.10.108.0
PD1 → 180.10.108.1

| | | |
BID → 180.10.111.255

X —————— X ——————— X