CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Addressing

Lecture No-17

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TOPICS TO BE COVERED

Problem Solving on Subnetting

Problem Solving on Subnetting Part – 3

Q.1

A company has a class C network address of 204.204.204.0. It wishes to have three subnets, one with 100 hosts and two with 50 hosts each. Which one of the following options represents a feasible set of subnet address/subnet mask pairs?

A.
204.204.204.128/255.255.255.192
204.204.204.0/255.255.255.128
204.204.204.64/255.255.255.128

B.
204.204.204.0/255.255.255.192
204.204.204.192/255.255.255.128
204.204.204.64/255.255.255.128

C.
204.204.204.128/255.255.255.128
204.204.204.192/255.255.255.192
204.204.204.224/255.255.255.192

D.
04.204.204.128/255.255.255.128
204.204.204.64/255.255.255.192
204.204.204.0/255.255.255.192
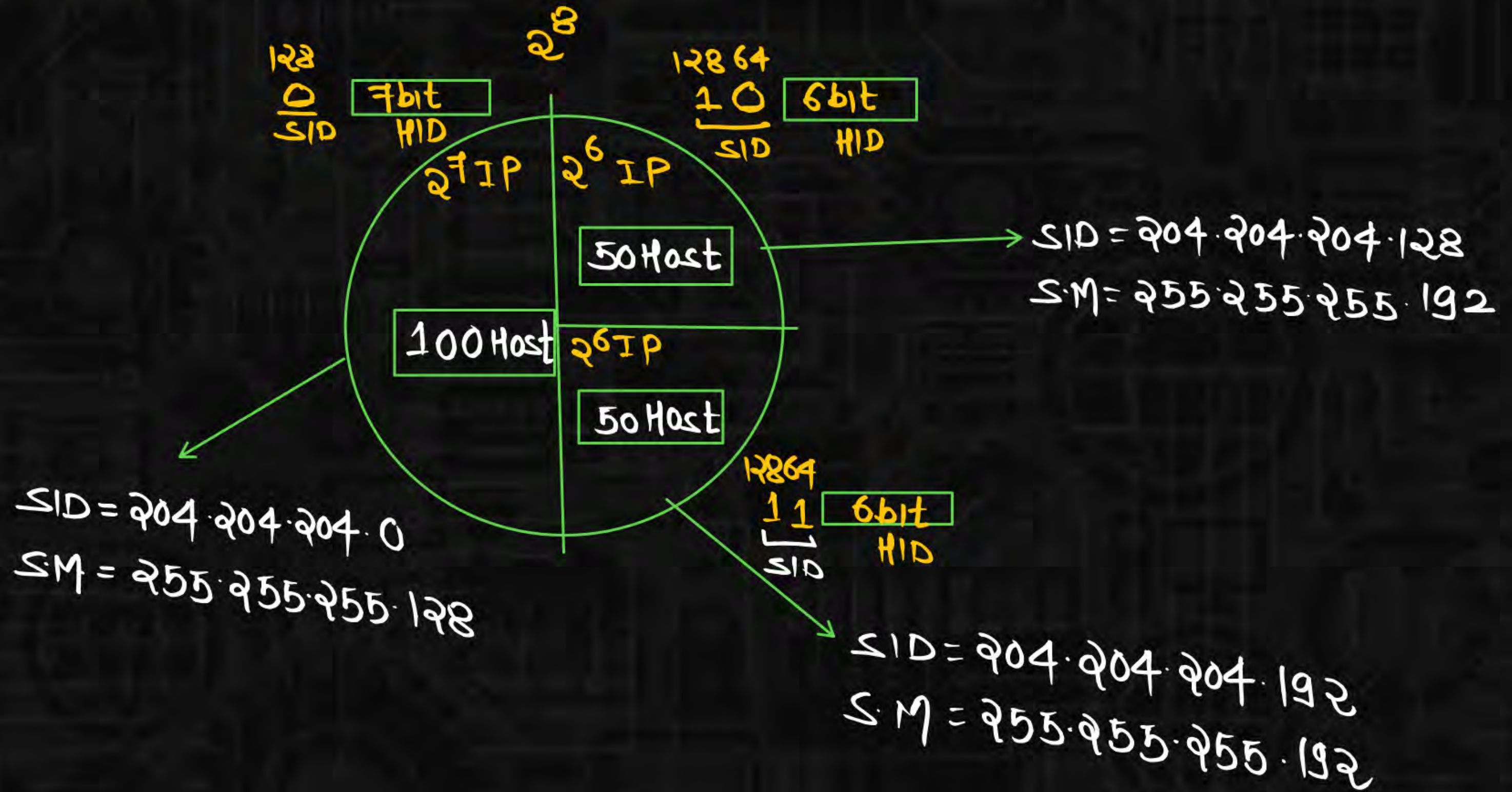
class-C

$\dfrac{NID}{24}$ $\dfrac{HID}{8}$

3 subnet

$\dfrac{2}{SID}$ $\dfrac{6}{HID}$

$2^2 = 4$ subnet

100
50
50

$200 \leq 2^8 \cdot 2$
(yes)

$2^6 - 2 = 62$ Host/sub

62H | 62H
(50) | (50)
62H | 62H

VLSM technique

SID = 204.204.204.128
S.M = 255.255.255.192

SID = 204.204.204.0
SM = 255.255.255.128

SID = 204.204.204.192
S.M = 255.255.255.192

$$2^8$$

$$\underset{SID}{\overset{128}{0}} \quad \boxed{\underset{HID}{7bit}}$$

$$\underset{SID}{\overset{128\ 64}{1\ 0}} \quad \boxed{\underset{HID}{6bit}}$$

$$\underset{SID}{\overset{128\ 64}{1\ 1}} \quad \boxed{\underset{HID}{6bit}}$$

2^7 IP 2^6 IP

50 Host

100 Host 2^6 IP

50 Host

OR

$128\ 64$

$\underset{\underset{SID}{\underbrace{\quad}}}{00}$ $\boxed{\begin{array}{c}6bit\\HID\end{array}}$

2^8

128

$\underset{\underset{SID}{\underbrace{\quad}}}{1}$ $\boxed{\begin{array}{c}7bit\\HID\end{array}}$

$2^6\ IP$ $2^7\ IP$

$SID = 204.204.204.0$

$SM = 255.255.255.192$

$\boxed{50\,Host}$

$\boxed{100\,Host}$

$2^6 IP$

$\boxed{50\,Host}$

$SID = 204.204.204.128$

$SM. = 255.255.255.128$

$128\ 64$

$\underset{\underset{SID}{\underbrace{\quad}}}{0\ 1}$ $\boxed{\begin{array}{c}6bit\\HID\end{array}}$

$SID = 204.204.204.64$

$SM = 255.255.255.192$
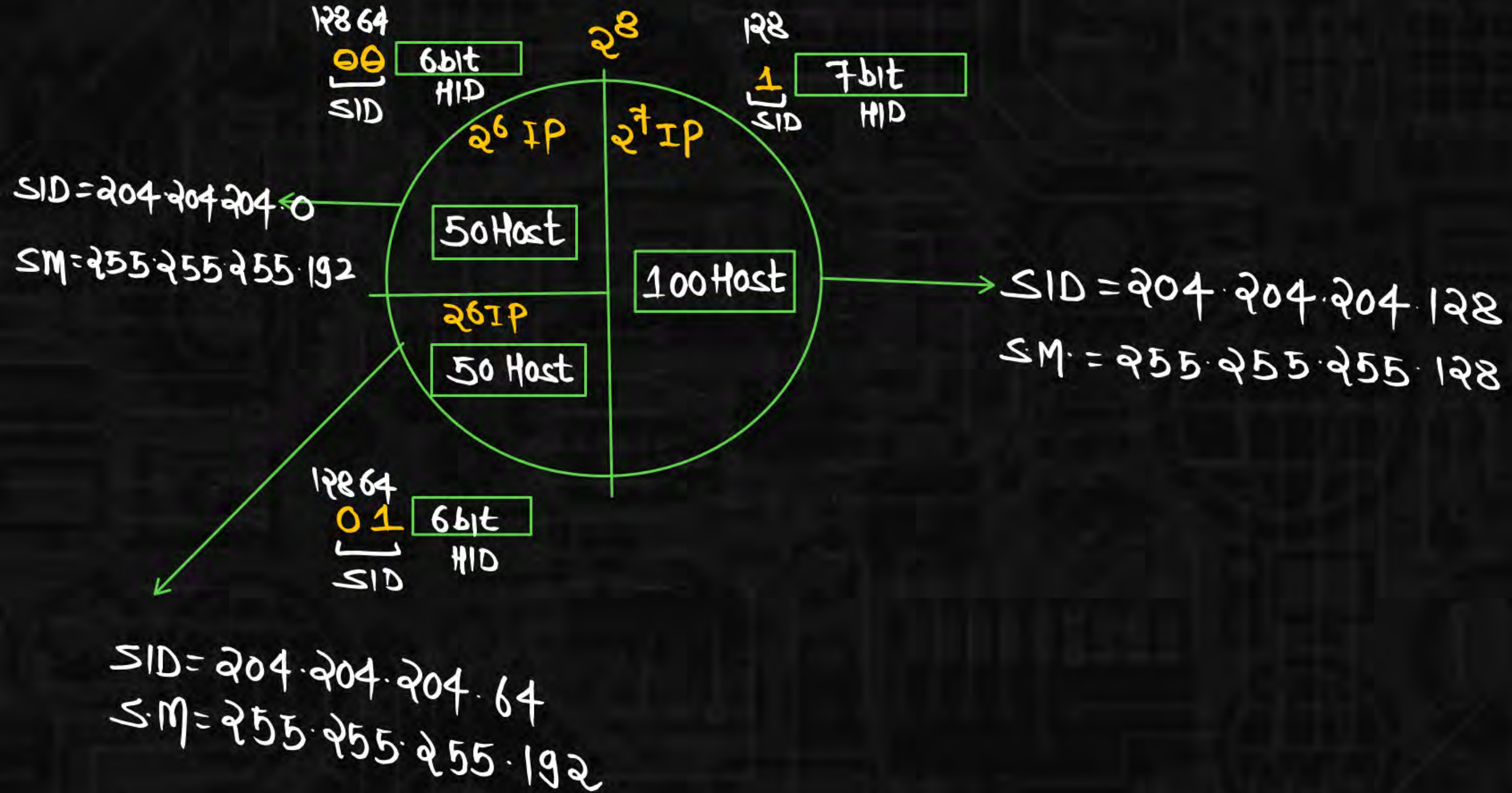
Q.2 Consider the class-c Network with 7 subnets and 25 Host per subnet. What will be the subnet mask for this network

$$7 \times 25 \leq 2^8 - 2$$
$$175 \leq 254 \,(\text{yes})$$

A. $8 + 8 + 8 + 3 = 27 \to 1's$
   255.255.255.224

B. $8 + 8 + 8 + 3 = 27 \to 1's$
   255.255.255.44

$$\frac{NID}{24} \quad \frac{HID}{8}$$

$$\boxed{7 \, subnet}$$

C. $8 + 8 + 8 + 6 = 30 \to 1's$
   255.255.255.63

$$\underset{NID}{24} \quad \underset{SID}{3} \quad \underset{HID}{5}$$

D. $8 + 8 + 8 + 3 = 27 \to 1's$
   255.255.255.112

   (A, B, D)

No. OF 1's in the S.M. $= NID + SID = 24 + 3 = 27$
No. OF 0's ,, ,, ,, $= HID = 5$

Q.3 Consider the class-B Network with 180 subnets and 200 Host per subnet. What will be the subnet mask for this network

A. $8+8+8=24 \to 1's$
255.255.255.0

B. $8+8+4+4 \to 24 \to 1's$
255.255.240.240

C. $8+8+6+3 = 25 \to 1's$
255.255.252.112

D. $8+8+6+2 = 24 \to 1's$
255.255.252.192

$180 \times 200 \leq 2^{16}-2$

$36,000 \leq 65,534 \ (yes)$

<u>class-B</u>

$\dfrac{NID}{16} \quad \dfrac{HID}{16}$

180 subnet.

$\dfrac{16}{NID} \quad \dfrac{8}{SID} \quad \dfrac{8}{HID}$

No. of 1's in the S.M = NID+SID = 16+8 = 24

Q.4 Using the IP address 172.168.4<u>2</u>.58 and subnet mask ۳ class-B 255.255.252.0, identify the correct subnet ID and directed broadcast address.

(Assuming Classful addressing scheme is followed).

A. The correct Network ID is 172.168.40.0, and the broadcast address is 172.168.255.255

B. The correct Network ID is 172.168.40.0, and the broadcast address is 172.168.43.255

C. The correct Network ID is 172.168.40.0, and the broadcast address is 172.168.44.255

D. The correct Network ID is 172.168.40.0, and the broadcast address is 172.169.43.255

$$\underset{\text{NID}}{\underline{255 \cdot 255}} \cdot \underset{\text{SID}}{\underline{111111}|00} \cdot \underset{\text{HID}}{\underline{00000000}}$$

$$172 \cdot 168 \cdot 001010\underset{\text{HID}}{\underline{- - \cdot - - - - - - -}}$$

$$172168 \cdot 001010 \; 00 \cdot 00000000 \longrightarrow 172168 \cdot 40 \cdot 0 \,] \, SID$$

$$172 \cdot 168 \cdot 001010 \; 11 \cdot 11111111 \longrightarrow 172168 \cdot 43 \cdot 255 \,] \, DBA$$

Q.5 Suppose a subnetwork X has a subnet mask 255.255.255.192 on a host address on 'c' is 130.127.48.130 Which of the following is on the same subnet with 'y'?

A. 130.127.48.120

B. 130.127.48.187 ✓

C. Both A and B

D. None of the above

$130 \cdot 127 \cdot 48 \cdot 130 \ [128+2]$
AND
$255 \cdot 255 \cdot 255 \cdot 192 \ [128+64]$
$SID = 130 \cdot 127 \cdot 48 \cdot 128$

$130 \cdot 127 \cdot 48 \cdot 120 \ [64+32+16+8]$
AND
$255 \cdot 255 \cdot 255 \cdot 192 \ [128+64]$
$SID = 130 \cdot 127 \cdot 48 \cdot 64$

(b) 130.127.48.187 [128+32+
     AND
   255.255.255.192 [128+64]
_____
SID=130. 127. 48. 128

AD Rule 2.0

255.255.255.11000000
 NID   SID SID HID

       128 64
130: 1 0
120: 0 1   > 130 & 187 will be in the same subnet
187: 1 0

Q.6 In IP(V_4), class B network (Net ID is 150.50.0.0). What are the first and last IP Addresses of hosts?

$$\underline{150 \cdot 50} \cdot \underline{0 \cdot 0}$$
$$\quad NID \qquad HID$$

A. 150.51.0.1 and 150.50.255.254

B. 150.50.0.1 and 150.50.255.254 ✓

C. 150.50.0.1 and 100.50.255.254

D. 150.0.0.1 and 150.0.255.250

First Host : 150·50·00000000·00000001
150·50·0·1

Last Host : 150·50·11111111·11111110
150·50·255·254

Q.7 Consider the following IP address 200.48.67.184 and subnet mask 255.255.255.240, what is the IP address of last host of subnet to which given IP_address belongs?

A. 200.48.67.192

B. 200.48.67.190

C. 200.48.67.255

D. 200.48.67.254

SM : 255 . 255 . 255 . $\underbrace{1111}_{SID}\underbrace{0000}_{HID}$

$\underbrace{\text{NID}}$

200 . 48 . 67 . 1011 $\underbrace{\text{----}}_{HID}$

200 . 48 . 67 . 1011 1110 → 200 . 48 . 67 . 190

Q.8 A company has a class C network address of 204.204.204.0. It wishes to have three subnets(X ,Y,Z) X with 100 hosts ,Y with 50 hosts and Z with 50 host. Which one of the following options represents a feasible set of subnet address/subnet mask pairs?

A. X-204.204.204.0/255.255.255.128
Y-204.204.204.128/255.255.255.192
Z-204.204.204.192/255.255.255.192

B. X-204.204.204.0/255.255.255.128
Y-204.204.204.192/255.255.255.192
Z-204.204.204.128/255.255.255.192

C. X-204.204.204.128/255.255.255.128
Y-204.204.204.0/255.255.255.192
Z-204.204.204.64/255.255.255.192

D. X-204.204.204.128/255.255.255.128
Y-204.204.204.64/255.255.255.192
Z-204.204.204.0/255.255.255.192

MSQ

(A, B, C, D)

Q.9 In a class A subnet, we know the IP address of one host and the mask as given below: ∘ 64+32+16

IP address: 125.134.112.66

Mask: 255.255.224.0   └ 128+64+32

What is the first address (Network address)?

A. 125.134.96.0

B. 125.134.112.0

C. 125.134.112.66

D. 125.134.0.0

IP Add = 125·134· 0 1 1 1 0 0 0 0 · 66
AND   AND
S·M = 255· 255· 1 1 1 0 0 0 0 0 · 0
─────────────────────────────────
NID or SID = 125· 134· 96· 0

Q.10

Which of following IPs may belong to last host of any subnet if subnet mask is 255.255.255.224.

I. 210.15.16.62 [001**1110**]   SM: 255.255.255.**111**00000

II. 210.15.16.94 [010**1110**]   NID   SID HID

III. 210.15.16.127 [011**11111**]

IV. 210.15.16.191 [**1**01**1111**]

A. I and II

B. I and III

C. II and IV

D. III and IV

S S S H H H H H

0 0 0 1 1 1 1 0 → 30
0 0 1 1 1 1 1 0 → 62
0 1 0 1 1 1 1 0 → 94
0 1 1 1 1 1 1 0 → 126
1 0 0 1 1 1 1 0 → 158
1 0 1 1 1 1 1 0 → 190
1 1 0 1 1 1 1 0 → 222
1 1 1 1 1 1 1 0 → 254

OR

Last Host: **11110**

Q.11 Given the following:

Host IP address: 192.168.100.66 with 3 bits of subnetting.

Which of the following is/are true for the above network and host?

class-c

$$\underline{24} \quad \underline{3} \quad \underline{5}$$
NID   SID   HID

A. The subnet address to which this host belongs is 192.168.100.32

B. The subnet address to which this host belongs is 192.168.100.64

C. Broadcast address is 192.168.100.255

D. Valid host range is 192.168.100.65 to 192.168.100.94

$192 \cdot 168 \cdot 100 \cdot \underline{010} \underbrace{}_{HID}$
$\underbrace{}_{SID}$

$192 \cdot 168 \cdot 100 \cdot \underline{010} \, 00000 \rightarrow 192 \cdot 168 \cdot 100 \cdot 64]$ SID

$192 \cdot 168 \cdot 100 \cdot \underline{010} \, 00001 \rightarrow 192 \cdot 168 \cdot 100 \cdot 65]$ Ist Host

.
.
.
.

$192 \cdot 168 \cdot 100 \cdot \underline{010} \, 11110 \rightarrow 192 \cdot 168 \cdot 100 \cdot 94]$ Last Host

$192 \cdot 168 \cdot 100 \cdot \underline{010} \, 11111 \rightarrow 192 \cdot 168 \cdot 100 \cdot 95]$ DBA

Valid Host Range

Q.12 In the Class C, if Subnet mask is 255.255.255.224 and the number of subnet is X and the Number of host in each subnet is Y, then X+Y is?

NAT

Q.13 Consider an organization with a class B network address of 150.65.0.0. Which of the following net masks should not be used to divide this into 100 sub networks?

A. $8+8+3=19 \to 1's$
   255.255.224.0

B. $8+8+5=21 \to 1's$
   255.255.248.0

C. $8+8+6=22 \to 1's$
   255.255.252.0

D. $8+8+7=23 \to 1's$
   255.255.254.0

class-B

$\dfrac{NID}{16} \quad \dfrac{HID}{16}$

100 subnet

$\dfrac{16}{NID} \quad \dfrac{7}{SID} \quad \dfrac{9}{HID}$

No. of 1's in the S.M = NID+SID = 16+7 = 23

Q.14 An organization is granted a Class B network 150.36.0.0. The administrator wants to create 512 subnets. Find the number of hosts in each subnet----

H.W

Q.15 The subnet mask for a particular network is 255.255.31.0. Which of the following pairs of IP addresses could belong to this network?

same

A. 172.57.88.62 and 172.56.87.233

B. 10.35.28.2 and 10.35.29.4

C. 191.203.31.87 and 191.234.31.88

D. 128.8.129.43 and 128.8.161.55

AD Rule 2.0

255.255.00011111.00000000

28: 00011100
29: 00011101
} Not belong to
same subnet

129 : 1000 0001

161 : 101 0 0001

129 & 161 belong to same subnet

Q.16 Suppose computers A and B have IP addresses 10.105.1.113 and 10.105.1.91 respectively and they both use the same netmask N. Which of the values of N given below should not be used if A and B should belong to the same network?

[GATE CS 2010]

A. 255.255.255.0

H·W

B. 255.255.255.128

C. 255.255.255.192

D. 255.255.255.224

Q.17 The address of a class B host is to be split into subnets with a 6-bit subnet number. What is the maximum number of subnets and the maximum number of hosts in each subnet?

H.W

A. 62 subnets and 262142 hosts.

B. 64 subnets and 262142 hosts.

C. 62 subnets and 1022 hosts.

D. 64 subnets and 1024 hosts.

Q.18 Host X has IP address 192.168.1.97 and is connected through two routers R1 and R2 to another host Y with IP address 192.168.1.80. Router R1 has IP addresses 192.168.1.135 and 192.168.1.110. R2 has IP addresses 192.168.1.67 and 192.168.1.155. The netmask used in the network is 255.255.255.224.

Given the information above, how many distinct subnets are guaranteed to already exist in the network? [GATE CS 2008]

A. 1

B. 2

C. 3

D. 6

Q.19 Host X has IP address 192.168.1.97 and is connected through two routers R1 and R2 to another host Y with IP address 192.168.1.80. Router R1 has IP addresses 192.168.1.135 and 192.168.1.110. R2 has IP addresses 192.168.1.67 and 192.168.1.155. The netmask used in the network is 255.255.255.224.

Which IP Address should X Configure its gateway as ?

[GATE IT 2008]

H.W

A. 192.168.1.67

B. 192.168.1.110

C. 192.168.1.135

D. 192.168.1.155