

CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Addressing

Lecture No-11



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TOPICS TO
BE
COVERED



Subnetting Part-3

Q.1

Consider a Class C network with 7-subnets and 25 hosts per subnet. An appropriate Subnet Mask for this network?

class-c
 $7 \times 25 \leq 2^8 - 2$
 $175 \leq 254$ (Yes)

class-c
 $\frac{24}{\text{NID}} \quad \frac{8}{\text{HID}}$
 7 Subnet
 $\frac{3}{\text{SID}} \quad \frac{5}{\text{HID}}$
 $2^3 = 8$ subnet
 $2^5 - 2 = 30$ Host/subnet



<u>NID</u>	<u>SID</u>	<u>HID</u>
24	3	5

No. of 1's in the subnet Mask = $NID + SID = 24 + 3 = 27$

No. of 0's in the subnet Mask = $HID = 5$

$\underbrace{\text{|||||||} \cdot \text{|||||||} \cdot \text{|||||||} \cdot \text{|||}}_{NID} \underbrace{\text{00000}}_{SID} \underbrace{\text{00000}}_{HID} \rightarrow 255.255.255.224 \text{] Best}$

$\text{|||||||} \cdot \text{|||||||} \cdot \text{|||||||} \cdot \text{00000111} \rightarrow 255.255.255.7$

$\text{|||||||} \cdot \text{|||||||} \cdot \text{|||||||} \cdot \text{00101100} \rightarrow 255.255.255.44$

$\text{|||||||} \cdot \text{|||||||} \cdot \text{|||||||} \cdot \text{00101001} \rightarrow 255.255.255.41$

All are Possible

SM	No. of 1's
① $255 \cdot 255 \cdot 255 \cdot 2$ $8 + 8 + 8 + 1$	25 (Invalid)
② $255 \cdot 255 \cdot 255 \cdot 9$ $8 + 8 + 8 + 2$ $(8+1)$	26 (Invalid)
③ $255 \cdot 255 \cdot 255 \cdot 10$ $8 + 8 + 8 + 2$ $(8+2)$	26 (Invalid)
④ $255 \cdot 255 \cdot 255 \cdot 11$ $8 + 8 + 8 + 3$ $[8+2+1]$	27 (Valid)
⑤ $255 \cdot 255 \cdot 255 \cdot 12$ $8 + 8 + 8 + 2$ $(8+4)$	26 (Invalid)
⑥ $255 \cdot 255 \cdot 255 \cdot 13$ $8 + 8 + 8 + 3$ $(8+4+1)$	27 (Valid)
⑦ $255 \cdot 255 \cdot 255 \cdot 14$ $8 + 8 + 8 + 3$ $(8+4+2)$	27 (Valid)
⑧ $255 \cdot 255 \cdot 255 \cdot 15$ $8 + 8 + 8 + 4$ $(8+4+2+1)$	28 (Invalid)

Q.2

Consider a Class B network with 180-subnets and 200 hosts per subnet. An appropriate Subnet Mask for this network?

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

$$36,000 \leq 65,534 (\text{yes})$$

class-B

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

180 subnet

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

$$2^8 = 256 \text{ subnets}$$

$$2^8 - 2 = 254 \text{ Host/subnet}$$

$$\begin{array}{ccc} \text{NID} & \text{SID} & \text{HID} \\ \hline 16 & 8 & 8 \end{array}$$

No. of 1's in the subnet mask = NID + SID = 16 + 8 = 24

No. of 0's in the subnet mask = HID = 8

$$\begin{array}{ccc} \text{|||||} & \text{|||||} & \text{|||||} \\ \hline \text{NID} & \text{SID} & \text{HID} \end{array} \rightarrow 255.255.255.0 \text{] Best}$$

$$\text{|||||} \cdot \text{|||||} \cdot \text{||||0000} \cdot \text{||||0000} \rightarrow 255.255.240.240$$

$$\text{|||||} \cdot \text{|||||} \cdot \text{||||100} \cdot \text{||000000} \rightarrow 255.255.252.192$$

$$\text{|||||} \cdot \text{|||||} \cdot \text{||000000} \cdot \text{||||100} \rightarrow 255.255.192.252$$

All are Possible

Q.3

Consider a Class C network with 15-subnets and 20 hosts per subnet. An appropriate Subnet Mask for this network ?

$$15 \times 20 \leq 2^8 - 2$$

$$300 \leq 254 \text{ (No)}$$

(Not possible)

class-c

<u>NID</u>	<u>HID</u>
24	8

15 subnet

<u>4</u>	<u>4</u>
<u>SID</u>	<u>HID</u>

$2^4 = 16 \text{ subnet}$

$2^4 - 2 = 14 \text{ Host/subnet}$

Q.4

Consider a Class C network with 3-subnets and 60, 60, 120 hosts per subnet. An appropriate Subnet Mask for this network ?

CSEA : 120

CSEB : 60

CSEc : 60

$$240 \leq 2^8 - 2 \text{ (yes)}$$

CASE I

Class-c

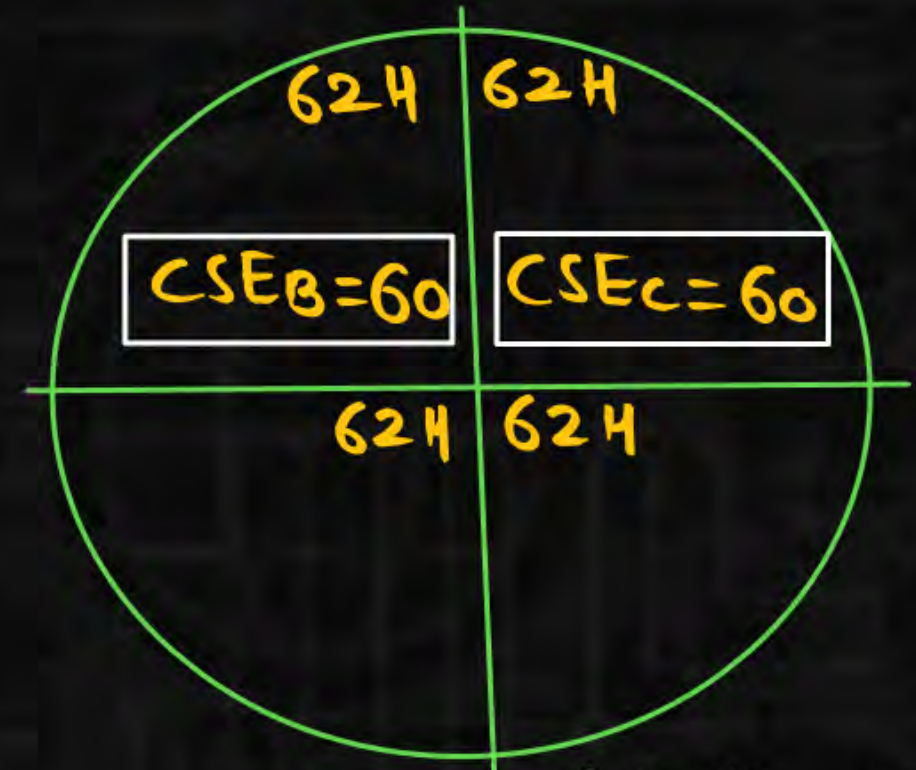
NID	HID
24	8

3 subnet

2	6
SID	HID

$$2^2 = 4 \text{ subnet}$$

$$2^6 - 2 = 62 \text{ Host/subnet}$$



Not Possible

Case II

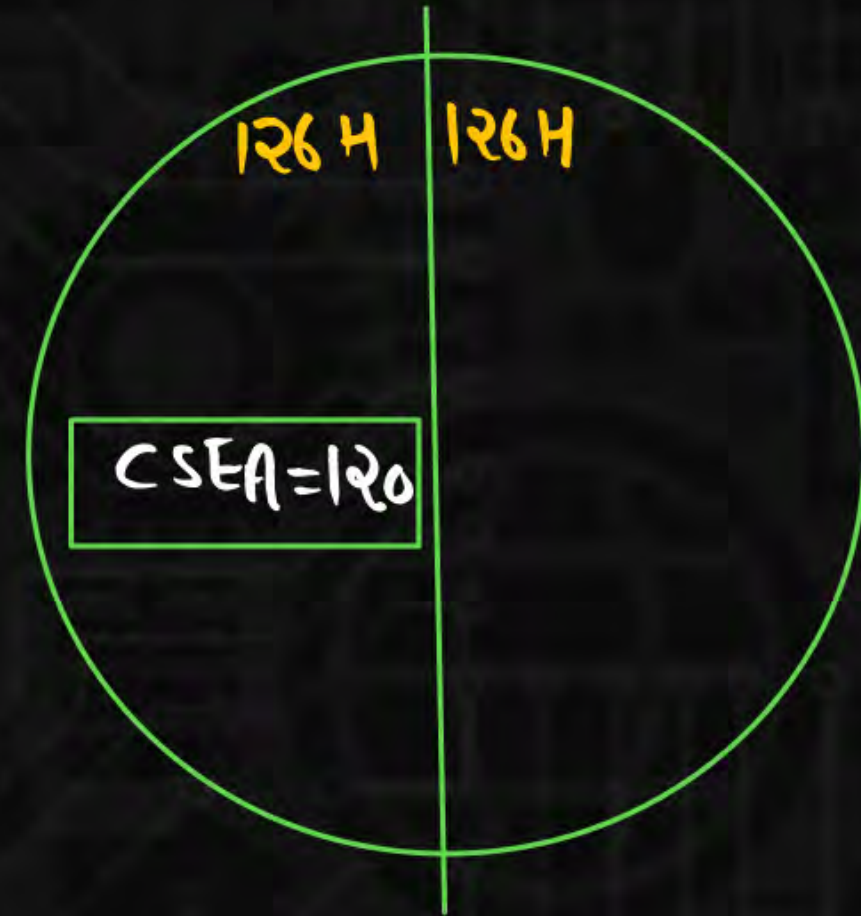
Class-C

NID	HID
24	8

$\frac{1}{SID}$	$\frac{7}{HID}$
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$2^1 = 2$ subnet

$2^7 - 2 = 126$ Host/subnet



Note: Both the Case are Not possible
Here to solve this Problem
we use VLSM technique

VL SM technique

Subnetting Category 4

Q.1

Consider a Class C network with 3-subnets and 60, 60, 120 hosts per subnet. An appropriate Subnet Mask for this network ? $9F \text{ NID} = 200 \cdot 200 \cdot 200 \cdot 0$

$$CSEA = 120$$

$$CSE_B = 60$$

$$CSE_c = 60$$

$$240 \leq 2^8 - 2(42)$$

class-c

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

$\frac{1}{SID} \quad \frac{7}{HID}$

$2^1 = 2 \text{ subnet}$

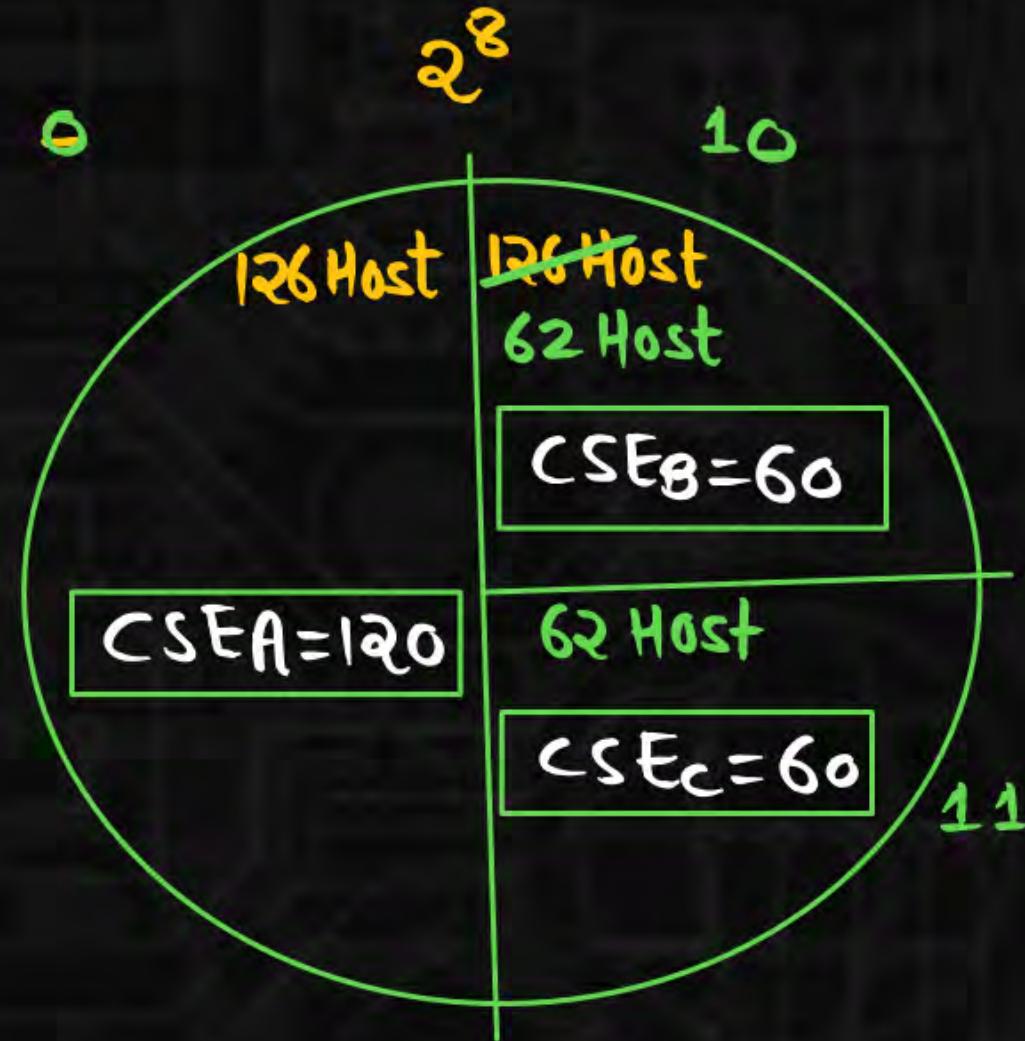
$2^7 - 2 = 126 \text{ Host/subnet}$

$\frac{HID}{7}$

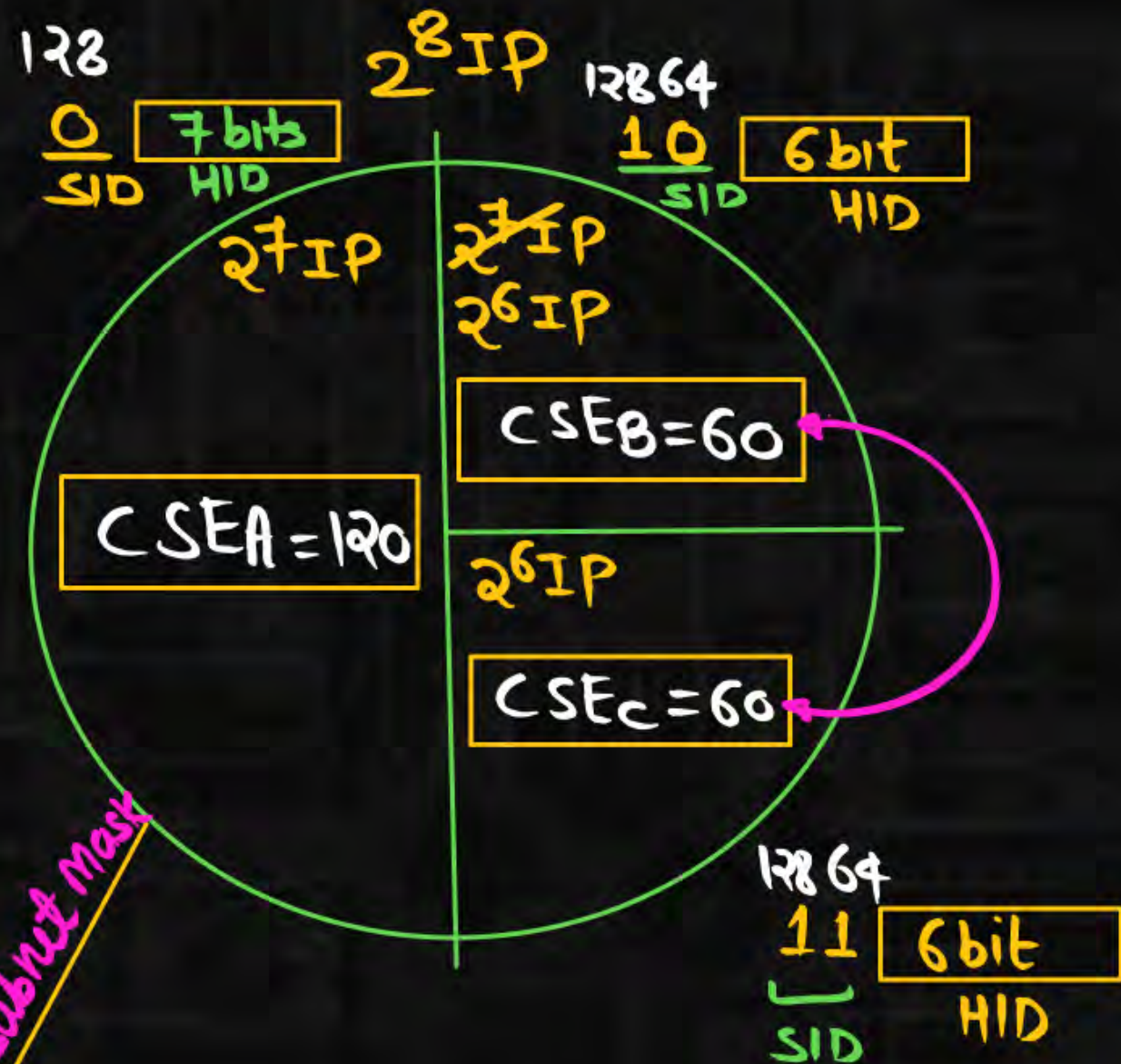
$\frac{1}{SID} \quad \frac{6}{HID}$

$2^1 = 2 \text{ subnet}$

$2^6 - 2 = 62 \text{ Host/subnet}$



1st way



CSEA

SID	200.200.200.0
DBA	200.200.200.127
SM	255.255.255.128

CSEB

SID	200.200.200.128
DBA	200.200.200.191
SM	255.255.255.192 (128+64)

CSEc

SID	200.200.200.192
DBA	200.200.200.255
SM	255.255.255.192 (128+64)

No. of 1's in the SM = NID + SID
= 24 + 1 = 25

No. of 0's in the S.M = HID = 7
 1111111.1111111.1111111.10000000
 255.255.255.128

2nd way



CSE_A

SID	200.200.200.0
DBA	200.200.200.127
SM	255.255.255.128

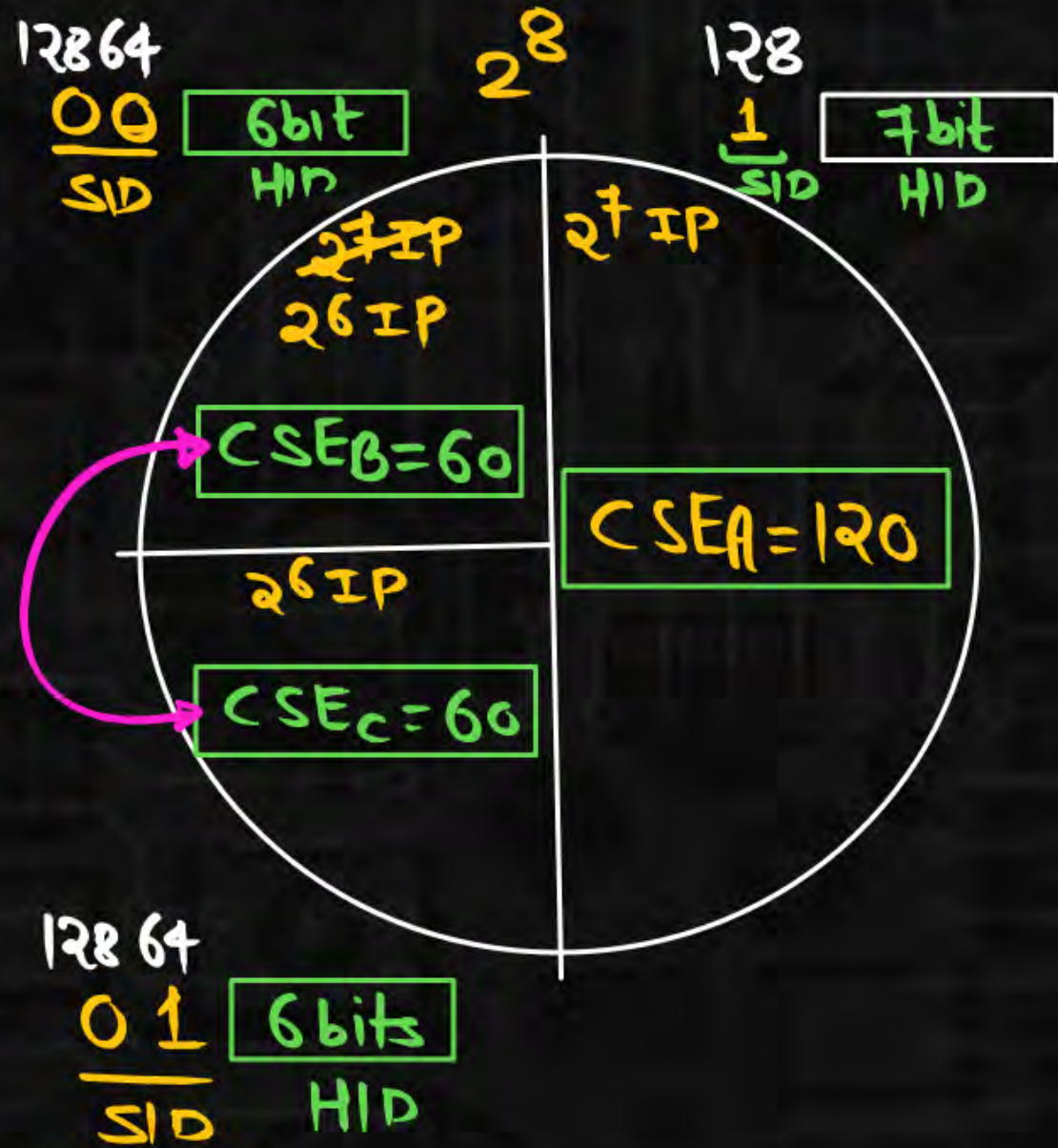
CSE_B

SID	200.200.200.192
DBA	200.200.200.255
SM	255.255.255.192

CSE_C

SID	200.200.200.128
DBA	200.200.200.191
SM	255.255.255.192

OR 3rd way



CSEA

SID	DBA	SM
200.200.200.128	200.200.200.255	255.255.255.128

CSEB

SID	DBA	SM
200.200.200.0	200.200.200.63	255.255.255.192 (128+64)

CSEc

SID	DBA	SM
200.200.200.64	200.200.200.127	255.255.255.192 (128+64)

4th way



Q.2

Consider a Class C network with 4-subnets and 75, 35, 25, 20 hosts per subnet. An appropriate Subnet Mask for this network ?

75
35
25
20

$$155 \leq 2^8 - 2 \text{ (Yes)}$$

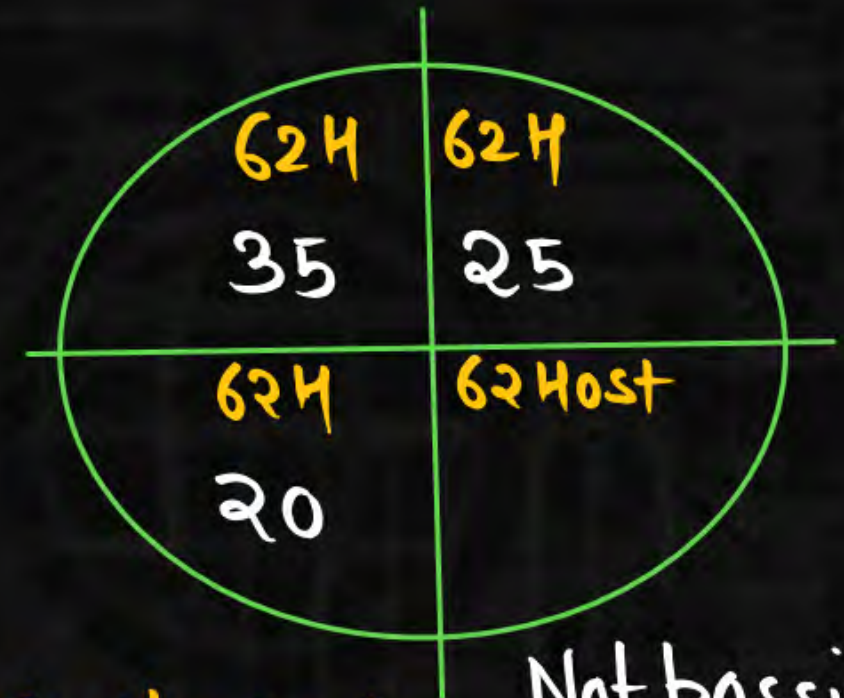
class-c

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

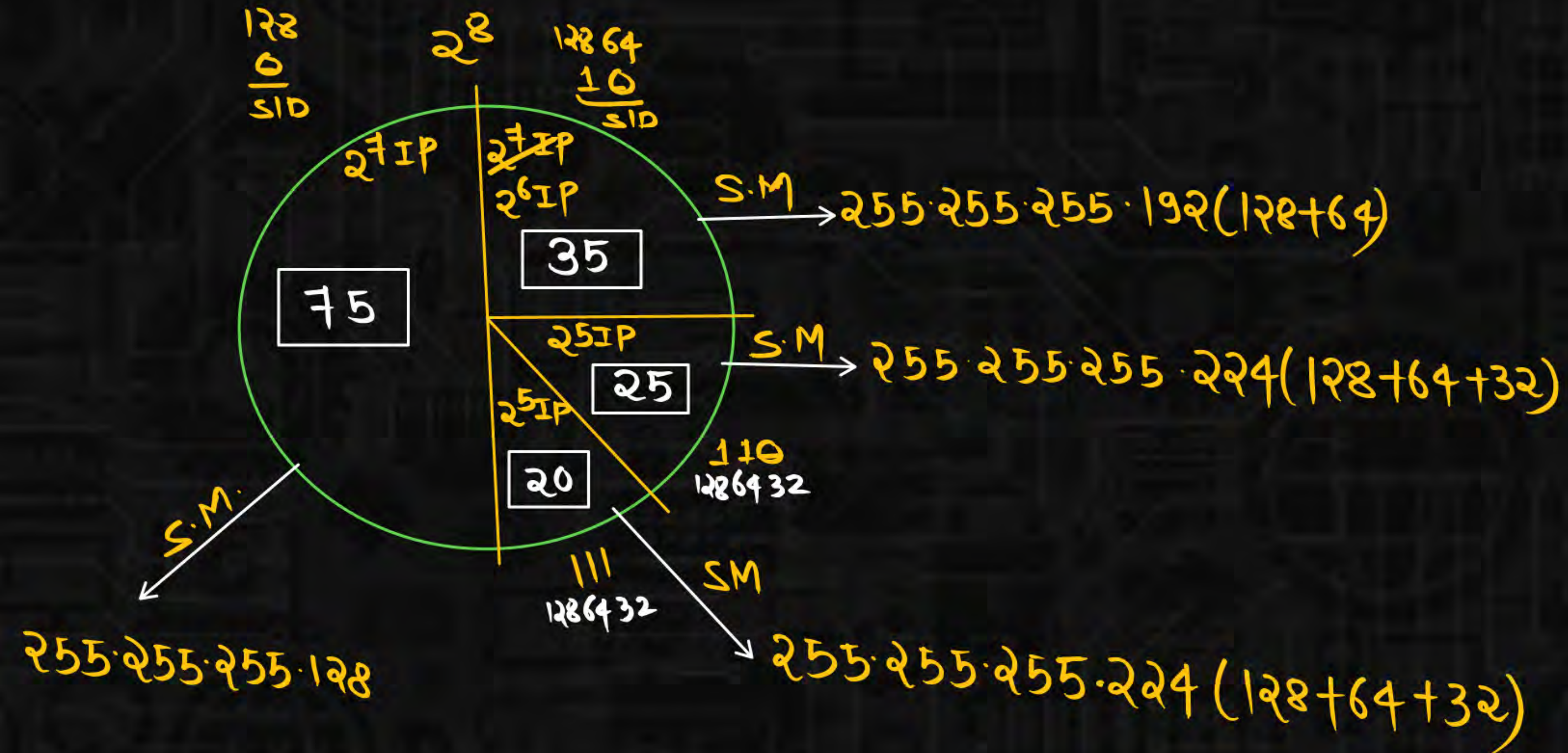
$\frac{2}{SID} \quad \frac{6}{HID}$

$$2^2 = 4 \text{ subnet}$$

$$2^6 - 2 = 62 \text{ Host/subnet}$$



Not possible



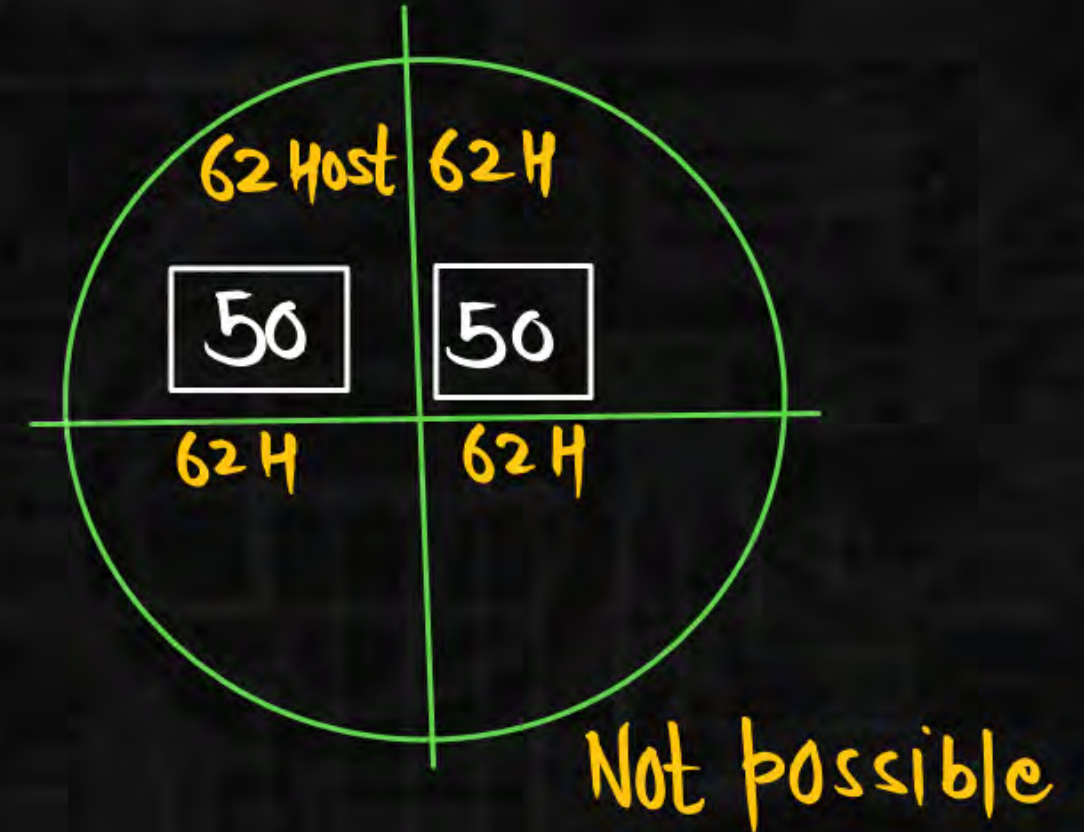
Q.3

Consider a Class C network with 3-subnets and 130, 50, 50 hosts per subnet. An appropriate Subnet Mask for this network ?

$$\begin{array}{r}
 130 \\
 50 \\
 50 \\
 \hline
 230 \leq 2^8 - 2 \text{ (yes)}
 \end{array}$$

$$\begin{array}{r}
 \text{class-c} \\
 \hline
 \begin{array}{cc}
 \text{NID} & \text{HID} \\
 \hline
 24 & 8
 \end{array} \\
 \boxed{3 \text{ subnet}}
 \end{array}$$

$$\begin{array}{cc}
 \frac{2}{\text{SID}} & \frac{6}{\text{HID}} \\
 \swarrow & \searrow \\
 2^2 = 4 \text{ subnet} & 2^6 - 2 = 62 \text{ Host/subnet}
 \end{array}$$



VLSM technique



Soln is Not possible

Q.4

Consider a Class C network with 6-subnets and 5, 10, 15, 20, 25, 30 hosts per subnet. An appropriate Subnet Mask for this network ?

$$\begin{array}{r}
 5 \\
 10 \\
 15 \\
 20 \\
 25 \\
 30 \\
 \hline
 105 = 2^8 - 2
 \end{array}$$

class-c

NID HIP
24 8

6 subnet

3 5
SID HIP

$2^3 = 8 \text{ subnet}$
 $2^5 - 2 = 30 \text{ Host/subnet}$



No. of 1's in the subnet mask = NID + SID = 24 + 3 = 27

No. of 0's " " " " " = HID = 5

|||||· |||||· |||||· ||00000 → 255.255.255.224

