CS & IT ENGINEERING

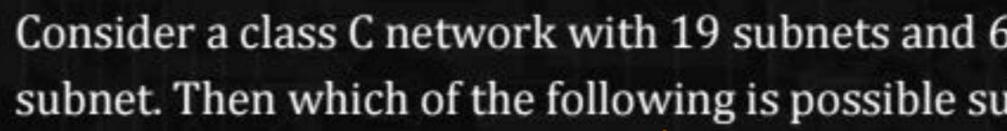Computer Networks

IPv4 Addressing
(Discussion Notes)

DPP 05

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Q.1 Consider a class C network with 19 subnets and 6 hosts per subnet. Then which of the following is possible subnet mask?

(P)(W)

[MCQ]

A. 255.255.255.241

B. 255.255.255.244

C. Both (a) and (b)

D. None of these

class-c

$$19 \times 6 \leq 2^8 - 2$$

$$114 \leq 254 \ (yes)$$

class-c

$$\underset{24}{\underline{NID}} \quad \underset{8}{\underline{HID}}$$

19 Subnet

No. of 1's in the SM = NID + SID
= 24 + 5 = 29

No. of 0's in the S.M = HID = 3 bit

$$\underset{SID}{\underset{5}{\leftarrow}} \quad \underset{HID}{\underset{3}{}}$$

No. of subnet = $2^5 = 32$

$2^3 - 2 = 6$ Host/subnet

11111111 . 11111111 . 11111111 . 11111000

255 . 255 . 255 . 248 (Best subnet Mask)

(A) 255 . 255 . 255 . 241

11111111 . 11111111 . 11111111 . 11110001 → No. of 1's = 29

(B) 255 . 255 . 255 . 244

11111111 . 11111111 . 11111111 . 11110100 → No. of 1's = 29

Q.2 An organization need Class B network with 32 subnet and each subnet need 100 hosts which of the following is/are possible subnet mask?

[MSQ]

A. $255.255.7.3 \rightarrow$ 11111111 . 11111111 . 00000111 . 00000011 $\rightarrow$ 21 $\rightarrow$ 1's

B. $255.255.128.135 \rightarrow$ 11111111 . 11111111 . 10000000 . 10000111 $\rightarrow$ 21 $\rightarrow$ 1's

C. $255.255.248.0 \rightarrow$ 11111111 . 11111111 . 11111000 . 00000000 $\rightarrow$ 21 $\rightarrow$ 1's

D. $255.255.0.248 \rightarrow$ 11111111 . 11111111 . 00000000 . 11111000 $\rightarrow$ 21 $\rightarrow$ 1's

$$\frac{class-B}{32*100 \leq 2^{16} - 2 \, (yes)}$$

A,B,C,D

class-B

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

$$\boxed{3^{0} \text{subnet}}$$

$$\underset{NID}{16} \quad \underset{SID}{5} \quad \underset{HID}{11}$$

No. of 1's in the sm = NID+SID = 16+5 = 21

No. of 0's in the sm = HID = 11

Q.3 A physics wallah organization is granted a class B network with IP address 186.24.0.0. For revolution 2.0, 10 bits are fixed for subnet. Then, the total number of hosts in each subnet are __62__.

(P)(W)

[NAT]

$$\text{class-B}$$

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

$$\frac{10}{SID} \quad \frac{6}{HID}$$

No. of subnet $= 2^{10}$

No. of Host/subnet $= 2^6 - 2 = 62$

Q.4 Consider a class C network 200.200.250.68. if 3 bits are borrowed from HID part, instead of first 3 subnet bits, last 3 bits are borrowed from HID part. Then which of the following is belong to 3rd subnet ID?　　　　　　　　　　 **[NAT]**

A. 200.200.250.96

B. 200.200.250.64

C. 200.200.250.3

D. 200.200.250.2

$IP\,Add = 200.200.250.68$

$NID = 200.200.250.0$

Class-C

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

$\dfrac{5}{HID}\quad \dfrac{3}{SID}$

Subnet ID's (ADRule)

200.200.250.00000010

200.200.250.2

```
        4 2 1
        ‾ ‾ ‾
1st  ←  0 0 0
2nd  ←  0 0 1
3rd  ←  0 1 0  →  2
        0 1 1
        1 0 0
        1 0 1
        1 1 0
        1 1 1
```

200.200.250.2

Q.5

Consider a class C network address of 220.220.220.0. it is divided into 3 subnets A, B and C each subnet need 90, 40 and 33 hosts respectively. Which of the following is a valid subnet mask for subnet $\underline{B}$ and $\underline{C}$ respectively?

[MCQ]

A. 255.255.255.128 and 255.255.255.192.

B. 255.255.255.192 and 255.255.255.128.

C. Both the subnet mask are same.

D. None of these.

$A = 90$

$B = 40$

$C = 33$

$$\frac{2^8}{4} = \frac{2^8}{2^2}$$

$$= 2^{8-2} = 2^6$$

$$\frac{33}{163} \leq 2^8 - 2 \ (\text{yes})$$

Class-C

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

$\boxed{3 \text{subnet}}$

2^8

$2^6 IP \quad 2^6 IP$
ⓑ   ⓒ
$2^6 IP \quad 2^6 IP$

X

No. of subnet $= 2^2 \leftarrow \frac{2}{SID} \frac{6}{HID}$
$= 4$

No. of Host/subnet $= 2^6 - 2 = 62$

VL SM

PW

128

$\underset{\text{SID}}{0}$ $\boxed{\underset{\text{HID}}{7\text{bit}}}$ 2^8

$128\,64$

$\underset{\text{SID}}{10}$ $\boxed{\underset{\text{HID}}{6\text{bit}}}$

2^7 IP $\quad 2^7 \; 2^6$

Subnet mask ←

$\boxed{A}$

$\boxed{B}$

$\xrightarrow{\text{sm}} 255\cdot255\cdot255\cdot192$

No. of 1's in the sm = NID+SID
$= 24+2 = 26$

$\underset{255}{\text{IIIIIIII}}\cdot\underset{255}{\text{IIIIIIII}}\cdot\underset{255}{\text{IIIIIIII}}\cdot\underset{192}{\text{11000000}}$

$255\cdot255\cdot255\cdot128$

2^6

$\boxed{C}$

$128\,64$

$\underset{\text{SID}}{11}$ $\boxed{\underset{\text{HID}}{6\text{bit}}}$

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

$\underset{255}{\text{IIIIIIII}}\cdot\underset{255}{\text{IIIIIIII}}\cdot\underset{255}{\text{IIIIIIII}}\cdot\underset{128}{10000000}$

$255\cdot255\cdot255\cdot128$

$\underset{\text{sm}}{\bigsqcup} 255\cdot255\cdot255\cdot192$

No. of 1's in the sm = NID+SID = 24+2 = 26

$\underset{255}{\text{IIIIIIII}}\cdot\underset{255}{\text{IIIIIIII}}\cdot\underset{255}{\text{IIIIIIII}}\cdot\underset{192}{11000000}$

$255\cdot255\cdot255\cdot192$

Q.6 Suppose, a class C network is divided into 3 subnets P, Q and R. Subnet P need 50 host, subnet Q need 40 hosts and subnet R need 120 hosts. Which of the following is an appropriate subnet mask for R? **[MCQ]**
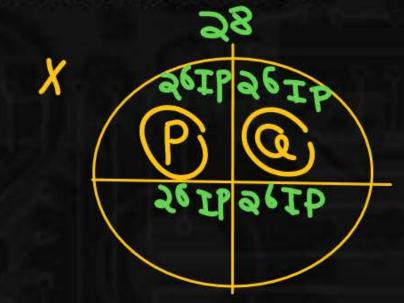
(Hints: using VLSM technique)

(A.) 255.255.255.128

(B.) 255.255.255.224

(C.) 255.255.255.0

(D.) 255.255.255.192

$P = 50$
$Q = 40$
$R = \dfrac{120}{210 \le 2^8 - 2}$ (yes)

$\underline{\text{class-c}}$

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

$\dfrac{2}{SID} \quad \dfrac{6}{HID} \quad \rightarrow 2^6 - 2 = 62 \text{ Host/sub}$

No of subnet $= 2^2 = 4$

28

X

26IP 26IP

(P) (@)

26IP 26IP

SM: २55.२55.२55.1२8

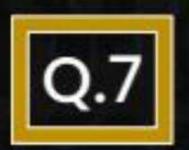**Q.7**

Suppose, an organization is divided into 6 departments → class-c
with network 199.198.197.196 For each department 3 **[MCQ]**
bits are borrowed from HID part of given network.

SID	Department Number
010	1
100	2
110	3
101 →	4
111 →	5
101	6

class·c

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

$$\frac{3}{SID} \quad \frac{5}{HID}$$

Which of the following is direct broadcast address of
department number 5 and 4 respectively?

Dept 5 → $\underset{NID}{199 \cdot 198 \cdot 197} \cdot \underset{SID}{111} \quad \underset{HID}{11111}$ → 199·198·197·255

(P W)

A. 199.198.197.191 and 199.198.197.255

B. 199.198.197.169 and 199.198.197.191

C. 199.198.197.169 and 199.198.197.255

D. 199.198.197.255 and 199.198.197.191

Dept - 4 → $\underset{NID}{\underline{199.198.197}}.\underset{SID}{\underline{101}}\ \underset{HID}{\underline{1\ 1\ 1\ 1\ 1}}$ → 199.198.197.191

Q.8 In a class B network. On the internet has a subnet mask 255.255.240.0 How many minimum number of subnets are possible?

[MCQ]

A. 32

B. 30

C. 16

D. 14

$$\underbrace{\text{|||||||}}_{\text{NID}} \cdot \text{|||||||} \cdot \underbrace{\text{||||}0000}_{\text{SID}} \cdot \underbrace{0000\,0000}_{\text{HID}}$$

No. of 1's = 20, No of 0's = 12

NID + SID = 20

16 + SID = 20

SID = 4 bit

No. of subnet = 2^4 = 16