21. If IP=204.15.16.139 and subnet mask=255.255.255.240 is given, find out : Subnet address (SID) and Direct broadcast address (DBA) of that subnet

(A) SID : 204.15.16.192, DBA 204.15.16.255
(B) SID : 204.15.16.128, DBA : 204.15.16.254
(C) SID : 204.15.16.128, DBA : 204.15.16.143
(D) SID : 204.15.16.192, DBA : 204.15.16.254

Answer: Option (C)
Explanation:

To find the Subnet ID, we have to do bitwise AND with IP and Subnet Mask.

SM: 11111111.11111111.11111111.11110000
IP : 11001100.00001111.00010000.10001011
……...
SID: 11001100.00001111.00010000.10000000

From the given Subnet Mask we can see that first 28 bits are NID and remaining 4 bits are HID part. And for DBA, all HID part should be 1's.

So DBA is 11001100.00001111.00010000.10001111

DBA of the subnet: 204.15.16.143

22. If a class B network is divided into subnets, and the subnet mask is 255.255.192.0, then how many subnets and hosts per subnet are possible?

(A) 4, 2^{14} - 2 (B) 4, 16 (C) 16, 16 (D) 4, 2^{14}

Answer: Option A
Explanation:

Number of 1's= NID + SID
In class B, NID = 16
255.255.192.0= 11111111.11111111.11000000.00000000
∴ 1's = 18
18 = NID + SID
=> 16+ SID =18 => SID= 2
∴ Number of subnets= $2^2 = 4$
Number of 0's in SM indicates HID part.
In the SM given, number of 0's = 14

∴ Hosts per subnet= 2^{14} - 2

23. 255.255.63.0 is the subnet mask for the network. Which of the following pairs of IP addresses could belong to same network ?
(A) 176.64.88.62 and 176.64.87.23.42
(B) 11.45.28.12 and 11.45.99.24
(C) 125.18.130.25 and 125.18.194.46
(D) 193.213.31.67 and 193.213.96.89

Answer : Option C

Explanation :

To find whether hosts belong to same network or not , we have to find their net id, if net id is same then hosts belong to same network and net id can be find by ANDing subnet mask and IP address.

SM 255.255.63.0 255.255.63.0

IP 125.18.130.25 125.18.194.46

Anding

…….
NID 125.18.2.0 125.18.2.0

Common Data Questions: 24 and 25

An ISP has a block with block ID as shown: 193.1.0/24

24. The number of bits reserved for Host ID and the number of hosts possible is?

(A) 2^4, 2^{24} - 2 **(B) 8, 2^8 - 2** (C) 3^2, 2^{32} - 2 (D) 16, 2^{16} - 2

Answer: Option B
Explanation:

If CIDR representation is a.b.c.d/n, then host ID = 32 - n.
Here n= 24
So, host ID = 32 – 24 = 8
Therefore, no. of Hosts = 2^8 - 2

25. Match A with B

List A		List B
	Source IP Destination IP	
a.	Data | 240.255.255.255 | 40.40.40.40	1.Unicast packet with in network.
b.	Data | 22.21.23.34 | 255.255.255.255	2. This packet will never exist
c.	Data | 24.23.22.21 | 24.22.23.24	3. Limited broadcast address.

	a	b	c
(A)	1	2	3
(B)	**2**	**3**	**1**
(C)	1	3	2
(D)	2	1	3

Answer: Option B
Explanation:

Data | sender address | destination address
a - 2 (we can not use DBA in sender address)
b - 3 (Limited broadcast address 255.255.255.255)
c - 1 (unicast Packet within the network)
A is class E address... So these address are reserved... And we don't practically use them.

26. Given the following IP address and network mask, find the corresponding broadcast address?
IP: 160.168.30.100 Net Mask: 255.255.240.0

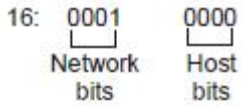
A. 160.168.240.255 B. 160.168.30.255
C. 160.168.31.255 D. 160.168.255.255

Answer: Option C
Explanation:

In the Broadcast Address, all the host bits need to be 1.
The network ID is the result obtained after bitwise AND operation of IP and Netmask.
i.e.

```
160.168.30.100
255.255.240.0
---------------
160.168.16.00
---------------
```

By expanding 3rd octet we observe



∴ The broadcast address is 160.168.31.255 obtained by placing 1's in host bits.

27. Consider a router connecting a college's network to the Internet applies the subnet mask 255.255.252.0 to the destination address of incoming IP packets. Find the corresponding subnet for the destination IP address of packet 159.133.7.220.

A. 159.133.0.0**B. 159.133.4.0**C. 159.133.6.0D. 159.133.7.0

Answer: Option B
Explanation :

To find the subnet id, given the IP address and subnet mask, we need to perform Boolean AND operation over the IP address and subnet mask.
IP Address: 159.133.7.220 Boolean AND operation

Mask: 255.255.252.0
159.133.4.0

The subnetwork is 159.133.4.0.

28. What could be the network mask if the direct broadcast address of a network is 186.19.07.255?

A. 255.255.248.0 B. 255.255.252.0

C. 255.255.254.0 **D. All the above**

Answer: Option D

Explanation:

Without knowing how many subnets are there or how many bits are used for subnetting, we can not say the netmask perfectly.
If we assume 3rd octet first 5 bits as subnet borrowed bits, the mask will be 255.255.248.0. and network ID is 186.19.0.0
If we assume 3rd octet first 6 bits as subnet borrowed bits, the mask will be 255.255.252.0. and network ID is 186.19.4.0
If we assume 3rd octet first 7 bits as subnet borrowed bits, the mask will be 255.255.254.0. and network ID is 186.19.6.0
All are possible, so All the above

29. Given the IP-address 0xBF2F1582, 5 bits are borrowed from Host ID to do subnetting. How many valid host IPs are possible for each subnet?

A. **2046** B. 2048 C. 1024 D.022

Answer: Option A

Explanation:

Given the IP address is in hexadecimal form.
The IP address in decimal form: 191.47.21.130
It's a class B address, so 16-bits are Network ID and 16-bits are Host ID.
If 5 bits are borrowed for subnet from Host ID,

Therefore, remaining 16 - 5 = 11 bits are for the Host ID
Total possible valid host IPs are 2^{11}- 2 = 2046

30. A large number of the consecutive IP address are available starting at 192.168.0.0. Suppose that five universities, HU, BU, CU, DU and PU have requirement of 4000, 2000, 500, 1000 and 7000 IP address blocks respectively. There is a large number of consecutive IP address available with starting of 192.168.0.0. What will be the valid first and last IP address assigned for BU?

A. 192.168.12.0/21 → 192.168.61.255/21

B. 192.168.48.0/21 → 192.168.55.255/21

C. Either (A) or (B)
D. Neither (A) nor (B)

Answer: Option C

Explanation:

Total host ID's require is 4000 + 2000 + 500 + 1000+ 7000 = 14500
For BU 2000 IP's are needed so $\log_2(2000)$ = 11 bits should be available as host ID part. You have to do it by verifying solutions instead of trying to solve it on your own.

In given options, A. 192.168.12.0/21 → 192.168.61.255/21

192 .168.0000 1100.0000 0000 → 192.168.0011 1101.11111111

Underline bits are used to do subnetting.

192.168.0.0/19 → 192.168.55.255/19 ⇒ PU(8192 possible host IP's)

192.168.8.0/20 → 192.168.59.255/20 ⇒ HU(4096 possible host IP's)

192.168.12.0/21 → 192.168.61.255/21 ⇒ BU(2048 possible host IP's)

192.168.14.0/22 → 192.168.62.255/22 ⇒ DU(1024 possible host IP's)

192.168.15.0/23 → 192.168.63.127/23 ⇒ CU(512 possible host IP's)

B.192.168.48.0/21 → 192.168.55.255/21

192 . 168 .00110000.00000000 → 192 .168 .00110111.11111111

Underline bits are used to do subnetting.

192.168.0.0/19 → 192.168.31.255/19 ⇒ PU(8192 possible host IP's)

192.168.32.0/20 → 192.168.47.255/20 ⇒ HU(4096 possible host IP's)

192.168.48.0/21 → 192.168.55.255/21 ⇒ BU(2048 possible host IP's)

192.168.56.0/22 → 192.168.59.255/22 ⇒ DU(1024 possible host IP's)

192.168.60.0/23 → 192.168.61.255/23 ⇒ CU(512 possible host IP's)

So both options (A) and (B) are possible.

31. An organization is granted the block 151.36.0.0/16.The administrator wants to create 512 subnets. Find the number of hosts in each subnet.

A. 128 B. 127 **C. 126** D.125

Answer: Option C
Explanation:

Given 151.36.0.0/16 and we need to create 512 subnets. So we require 9 bits to be borrowed from host id and we are left with 7 bits in host part. So, practically we have
2^7-2 = 126 hosts per subnet.

33. Consider the population of various continents as follows:
Africa - 900 Million; Asia - 3700 Million; North America - 400 Million;
South America - 500 Million; Europe - 700 Million
Suppose each person in each continent requires one IP address.
Then which of the following statements is true?

A. The above requirement can be fulfilled by IPV4 addressing.
B. The above requirement can be fulfilled by IPV6 addressing.

C. The above requirement can be fulfilled by both IPV4 and IPV6 addressing.
D. None

Answer: Option B

Explanation:

The total population = 6200 Million = 6.2×10^9
IPV4 is a 32 bit address and using 32 bits 2^{32} addresses are possible.
$2^{32} = 4 \times 10^9$ (approximately).
So IPV4 is not possible.
IPV6 is a 128 bit address and the requirement can be fulfilled.

33. Match the following List – I with List – II.

List-I	**List-II**	
A. Unicast address	(i)	20.0.0.0
B. Limited broadcast	(ii)	20.1.2.3
C. Directed broadcast	(iii)	11.255.255.255
D. Network address	(iv)	127.0.0.1
	(v)	255.255.255.255
	(vi)	0.0.0.0

Codes:

	A	**B**	**C**	**D**
a.	i	iii	v	vi
b.	ii	iii	v	i
c.	**ii**	**v**	**iii**	**i**
d.	i	v	iii	iv

Answer: Option C

34. Consider the address 141.14.196.46 and subnet mask 255.255.192.0. Find the subnet id?

(A) 141.14.1.46 **(B) 141.14.192.0**
(C) 255.255.192.0 (D) None of these

Answer: Option B
Explanation:

Address id - 10001101.00001110.11000100.00101110
Subnet Mask - 11111111.11111111.11000000.00000000
……...
Subnet Id - 10001101.00001110.1100000.00000000

35. In the IPv4 addressing format, the number of networks allowed under Class C addresses is

(A) 2^{14} (B) 2^{7} (C) 2^{21} (D) 2^{24}

Answer: Option C
Explanation:

In class C, 8 bits are reserved for the host id and 24 bits are reserved for network id. Out of these 24 bits, leading 3 bits are fixed as 110. So remaining 21 bits can be used for different networks.

36. The number of networks allowed under class A address in IPv4 addressing format is _____.

A. 127 B. 128 **C. 126** D. 125

Answer: Option C
Explanation:

In class A 8 network bits.

127 · X · Y · Z and 0 · X · Y · Z can't be used up network address and 1 bit is used to identify the class

$2^7 - 2 = 128 - 2 = 126$ networks allowed.
Here 2 is subtracted from number of networks because they are reserved for special purpose.

38. Match the following groups

Group-1 (Address Range)	**Group-2 (Purpose)**
A. 0.0.0.0	1. Unknown network/default
B. 10.0.0.0 - 10.255.255.255	2. Limited broadcast
C. 127.0.0.0 - 127.255.255.255	3. Reserved for Loopback/local address
D. 255.255.255.255	4. Reserved for private use

Codes:

	A	B	C	D
(a)	1	2	3	4
(b)	4	2	3	1
(c)	**1**	**4**	**3**	**2**
(d)	4	1	3	2

Answer: Option C
Explanation:

0.0.0.0 is default address

10.0.0.0 – 10.255.255.255 is reserved for private use
127.0.0.0 – 127.255.255.255 is loopback address
255.255.255.255 is limited broadcast

39. For a class C network if IP address of a computer is 200.99.39.112 and subnet mask is 255.255.255.224 the first host of first subnet (represent last octet) is _____.

A. 200.99.39.33 B. 200.99.39.112
C. 200.99.39.96 D. 200.99.39.224

Answer: Option A
Explanation:

Computer IP 200.99.39.112 (200.99.39.01110000)
Subnet mask 255.255.255.224 (255.255.255.11100000)
200.99.39.96 (200.99.39.01100000) (represent 6^{th} subnet)

with 3 bits possible subnets : 001(first),010,011,100,101,110(sixth)
But we have to find first subnet with first host that is
200.99.39.00100001 = 200.99.39.33

40. For a class C network if subnet mask is 255.255.255.224. What is the maximum number of hosts including all subnets?

A. 180 B. 170 C. 175 D. 185

Answer : Option A
Explanation :

Since it is a class C network subnet mask, only last octel bits can be borrowed for subnetting "11100000" is the last octel and leading 3 bits are subnet bits and remaining 5 bits are host bits.

$\therefore$ Number of subnets = $2^3 - 2 = 6$

Number of hosts = $2^5 - 2 = 30$

∴ 6 × 30 = 180 hosts.