

**WEEK-END ASSIGNMENT-04**  
Computer Networking Workshop (CSE 4541)

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### **Course Outcome: CO**

#### **Program Outcome: PO<sub>1</sub>, PO<sub>2</sub>**

Submission on: 11-03-2024

#### Learning Level: L

Configuration, verification and troubleshooting IPv4 addressing and subnetting

1. You have a network that needs 29 subnets while maximizing the number of host addresses available on each subnet. How many bits must you borrow from the host field to provide the correct subnet mask?

Answer	Remark
(D) 5	<input type="checkbox"/>

Justification:

$2^n \geq$  number of subnets  
 $2^5 = 32$   
 what we required.

2. Compute the subnetwork address for a host with the IP address 200.10.5.68/28?

- (A) 200.10.5.56
- (B) 200.10.5.32
- (C) 200.10.5.64
- (D) 200.10.5.0

Answer	Remark
(C) 200.10.5.64	□

3. The network address of 172.16.0.0/19 provides how many subnets and hosts?

- (A) 7 subnets, 30 hosts each
- (B) 7 subnets, 2,046 hosts each
- (C) 7 subnets, 8,190 hosts each
- (D) 8 subnets, 30 hosts each
- (E) 8 subnets, 2,046 hosts each
- (F) 8 subnets, 8,190 hosts each

**Answer** (F) 8 subnets, 8190 hosts each

Show the calculation:

$32 - 19 = 13$  bits for host portion

$2^n$ ,  $n = 19 - 16 = 3$

$2^3 = 8$  subnets

$2^m - 2$ ,  $m = 13$

$2^{13} - 2 = 8190$  hosts

4. Which mask should you use on point-to-point links in order to reduce the waste of IP addresses?

(A) /27  
 (B) /28  
 (C) /29  
 (D) /30  
 (E) /31

Answer	Remark
(D) 30	<input type="checkbox"/>

5. 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? [GATE 2003]

- (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

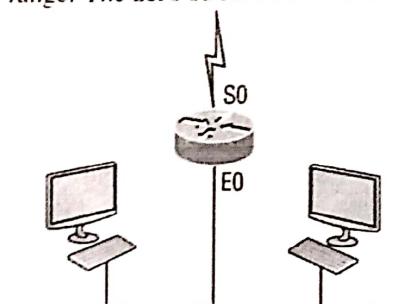
Answer	Remark
(D) 128.8.129.43 and 128.8.161.55	<input type="checkbox"/>
<u>Justification:</u>	
128.8.129.43 AND 255.255.31.0 = 128.8.1.0	
128.8.161.55 AND 255.255.31.0 = 128.8.1.0	
Therefore the pair is (D)	

6. You have an interface on a router with the IP address of 192.168.192.10/29. Including the router interface, how many hosts can have IP addresses on the LAN attached to the router interface?

- (A) 6
- (B) 8
- (C) 30
- (D) 62

Answer	Remark
(A) 6	<input type="checkbox"/>
<u>Show the computation:</u>	
$32 - 2^3 = 3$	
$2^3 - 2 = 8 - 2 = 6$	

7. Using the following illustration, what would be the IP address of E0 if you were using the eighth subnet? The network ID is 192.168.10.0/28 and you need to use the last available IP address in the range. The zero subnet should not be considered valid for this question.



- (A) 192.168.10.142
- (B) 192.168.10.66
- (C) 192.168.10.254
- (D) 192.168.10.143
- (E) 192.168.10.126

Answer	Remark
(A) 192.168.10.142	<input type="checkbox"/>
<u>Show the detailed computation of all subnets:</u>	
/28 means 4 bits for the host portion	
Usable IP addresses in each subnet range from	
192.168.10.1 to 192.168.10.14	
So, the eighth subnet falls between net IDs 192.168.10.128 and 192.168.10.143	
Therefore, the IP addresses of E0 in the eighth subnet is 192.168.10.142	

8. You have a network in your data center that needs 310 hosts. Which mask should you use so you waste the least amount of addresses?

- (A) 255.255.255.0
- (B) 255.255.254.0
- (C) 255.255.252.0
- (D) 255.255.248.0

Answer	Remark
(B) 255.255.254.0	<input type="checkbox"/>
Justification:	
(A) $2^8 - 2 = 256$ (B) $2^9 - 2 = 512$ (C) $2^{10} - 2 = 1024$ (D) $2^{11} - 2 = 2048$	

9. Your router has the following IP address on Ethernet0: 172.16.2.1/23. Which of the following can be valid host IDs on the LAN interface attached to the router? (Choose two.)

- (A) 172.16.0.5
- (B) 172.16.1.100
- (C) 172.16.1.198
- (D) 172.16.2.255
- (E) 172.16.3.0
- (F) 172.16.3.255

Answer	Remark
(D) 172.16.2.255 & (E) 172.16.3.0	<input type="checkbox"/>
Justification: Ethernet0 : 172.16.2.1/23 Range : 172.16.2.0 to 172.16.3.255 Valid Host IP address: 172.16.2.1 to 172.16.3.254	

10. Given an IP address 172.16.28.252 with a subnet mask of 255.255.240.0, find the correct network address.

- (A) 172.16.16.0
- (B) 172.16.0.0
- (C) 172.16.24.0
- (D) 172.16.28.0

Answer	Remark
(A) 172.16.16.0	<input type="checkbox"/>
Justification: 10101100.00010000.0001100.1111100 1111111.1111111.1110000.0000000 10101100.00010000.00010000.0000000	

11. Which two statements describe the IP address 10.16.3.65/23? (Choose two.)

- (A) The subnet address is 10.16.3.0  
255.255.254.0.
- (B) The lowest host address in the subnet  
is 10.16.2.1 255.255.254.0.
- (C) The last valid host address in the subnet  
is 10.16.2.254 255.255.254.0.
- (D) The broadcast address of the subnet is  
10.16.3.255 255.255.254.0.
- (E) The network is not subnetted.

Answer	Remark
(A) & (D)	<input type="checkbox"/>
Justification: The statement (A) & (D) are true rest are false.	

12. You need to configure a server that is on the subnet 192.168.19.24/29. The router has the first available host address. Which of the following should you assign to the server?

- (A) 192.168.19.0 255.255.255.0
- (B) 192.168.19.33 255.255.255.240
- (C) 192.168.19.26 255.255.255.248
- (D) 192.168.19.31 255.255.255.248
- (E) 192.168.19.34 255.255.255.240

Answer	Remark
(C) 192.168.19.26 255.255.255.248	<p>Show calculation: <math>2^3 - 2 = 6</math> usable host first available host address 192.168.19.25 range 192.168.19.25 to 192.168.19.30</p>

13. You have an interface on a router with the IP address of 192.168.192.10/29. What is the broadcast address the hosts will use on this LAN?

- (A) 192.168.192.15
- (B) 192.168.192.31
- (C) 192.168.192.63
- (D) 192.168.192.127
- (E) 192.168.192.255

Answer	Remark
(A) 192.168.192.15	<p>Show calculation: /29 means <math>2^3 = 8</math> possible host Network address: 11000000.10101000.11000000.0000 1000 Broadcast address: 11000000.10101000.11000000.0000 1111</p>

14. You need to subnet a network that has 5 subnets, each with at least 16 hosts. Which classful subnet mask would you use?

- (A) 255.255.255.192
- (B) 255.255.255.224
- (C) 255.255.255.240
- (D) 255.255.255.248

Answer	Remark
(B) 255.255.255.224	<p>Justification: <math>2^5 - 2 = 32 - 2 = 30</math> Usable host per subnet</p>

- 15\*. You configure a router interface with the IP address 192.168.10.62 255.255.255.192 and receive the following error: **Bad mask /26 for address 192.168.10.62**  
Why did you receive this error?

- (A) You typed this mask on a WAN link and that is not allowed.
- (B) This is not a valid host and subnet mask combination.
- (C) **ip subnet-zero** is not enabled on the router.
- (D) The router does not support IP.

Answer	Remark
(B) This is not a valid host and subnet mask combination	<p>Justification: The subnet mask does not align with the network address range for this IP address.</p>

16. If an Ethernet port on a router were assigned an IP address of 172.16.112.1/25, what would be the valid subnet address of this interface?

- (A) 172.16.112.0
- (B) 172.16.0.0
- (C) 172.16.96.0
- (D) 172.16.255.0
- (E) 172.16.128.0

Answer	Remark
(A) 172.16.112.0	<input type="checkbox"/>
Justification: 10101100.00010000.01110000.00000001 11111111.11111111.11111111.10000000 10101100.00010000.01110000.00000000	

17. You have a network with a host address of 172.16.17.0/22. From the following options, which is another valid host address in the same subnet?

- (A) 172.16.17.1 - 255.255.255.252
- (B) 172.16.0.1 - 255.255.240.0
- (C) 172.16.20.1 - 255.255.254.0
- (D) 172.16.16.1 - 255.255.255.240
- (E) 172.16.18.255 - 255.255.252.0
- (F) 172.16.0.1 - 255.255.255.0

18. To test the IP stack on your local host, which IP address would you ping

- (A) 172.0.0.1
- (B) 1.0.0.127
- (C) 127.0.0.1
- (D) 127.255.255.255
- (E) 255.255.255.255

Answer	Remark
(E) 172.16.18.255 - 255.255.252.0	<input type="checkbox"/>
Justification: This option falls within the valid range of IP addresses for the given subnet. So, It is a valid host addresses in the same subnet.	

### Subnet Practice Written Lab #4.1:

Complete the following based on the decimal IP address.

Decimal IP Address	Address Class	Number of Subnet and Host Bits	Number of Subnets ( $2^x$ )	Number of Hosts ( $2^y - 2$ )
10.25.66.154/23	A	15-19	32768	510
172.31.254.12/24	B	16-24	256	254
192.168.20.123/28	C	20-28	16	14
63.24.89.21/18	A	2-18	16384	16382
128.1.1.254/20	A	4-20	1024	1024
208.100.54.209/30	C	30	4	2

## Subnet Practice Written Lab #4.2:

Given a Class B network and the net bits identified (CIDR), complete the following table to identify the subnet mask and the number of host addresses possible for each mask.

Classful Address	Subnet Mask	Number of Hosts per Subnet ( $2^r - 2$ )
/16	255.255.0.0	$2^{16} - 2 = 65534$
/17	255.255.128.0	$2^{15} - 2 = 32766$
/18	255.255.192.0	$2^{14} - 2 = 16382$
/19	255.255.224.0	$2^{13} - 2 = 8190$
/20	255.255.240.0	$2^{12} - 2 = 4094$
/21	255.255.248.0	$2^{11} - 2 = 2046$
/22	255.255.252.0	$2^{10} - 2 = 1022$
/23	255.255.254.0	$2^9 - 2 = 510$
/24	255.255.255.0	$2^8 - 2 = 254$
/25	255.255.255.128	$2^7 - 2 = 126$
/26	255.255.255.192	$2^6 - 2 = 62$
/27	255.255.255.224	$2^5 - 2 = 30$
/28	255.255.255.240	$2^4 - 2 = 14$
/29	255.255.255.248	$2^3 - 2 = 6$
/30	255.255.255.252	$2^2 - 2 = 2$

## Subnet Practice Written Lab #4.3:

- Write the subnet, broadcast address (DBA & LBA), and a valid host range for the given address 192.168.100.25/30. (Hint: The IP 192.168.100.25 belongs to one of the host address in a particular subnet).

Answer	Remark
Subnet: 192.168.100.24/30	
<u>First Host:</u> 192.168.100.25	
<u>Last Host:</u> 192.168.100.26	
Broadcast(DBA): 192.168.100.27	
Broadcast(LBA): 192.168.100.31	
Subnetmask: 255.255.255.252	

2. Write the subnet, broadcast address(DBA & LBA), and a valid host range for the given address 192.168.100.99/25.

**Answer**

Subnet:

192 . 168 . 100 . 0 /25

**Remark**

First Host:

: 192 . 168 . 100 . 1

Last Host:

192 . 168 . 100 . 126

Broadcast(DBA):

192 . 168 . 100 . 127

Broadcast(LBA):

192 . 168 . 100 . 255

Subnetmask: 255 . 255 . 255 . 128

3. Write the subnet, broadcast address (DBA & LBA), and a valid host range for the given address 192.168.100.66/27.

**Answer**

Subnet:

192 . 168 . 100 . 64 /27

**Remark**

First Host:

: 192 . 168 . 100 . 65

Last Host:

192 . 168 . 100 . 94

Broadcast(DBA):

192 . 168 . 100 . 95

Broadcast(LBA):

192 . 168 . 100 . 127

Subnetmask:

255 . 255 . 255 . 224

4. Write the subnet, broadcast address (DBA & LBA), and a valid host range for the given address 192.168.100.99/26.

Answer	Remark
<b>Subnet:</b> 192.168.100.96/26	
<b>First Host:</b> 192.168.100.97	
<b>Last Host:</b> 192.168.100.126	
<b>Broadcast(DBA):</b> 192.168.100.127	
<b>Broadcast(LBA):</b> 192.168.100.191	
<b>Subnetmask:</b> 255.255.255.192	

### Experiment with Cisco Packet Tracer (CPT)

**Problem Statement:** Design a physical topology using Cisco packet tracer to interconnect 4 subnetworks for the given class C IP address 200.1.2.0. Additionally mention the subnetwork address and subnet mask of each subnetwork in the physical topology. All the valid IP addresses related to each of the subnets must be configured for the hosts.

## Subnetwork Configuration

Details of Each Subnet				
Subnet:	0	64	128	192
First Host:	200.1.2.1	200.1.2.65	200.1.2.97	200.1.2.113
Last Host:	200.1.2.62	200.1.2.94	200.1.2.110	200.1.2.126
Broadcast(DBA):	200.1.2.63	200.1.2.95	200.1.2.111	200.1.2.127
Broadcast(LBA):	200.1.2.63	200.1.2.95	200.1.2.111	200.1.2.127
Subnetmask:	255.255.255.192	255.255.255.224	255.255.255.240	255.255.255.240

## Devices used in the Simulation

- Number of Switch(es)
- Number of Router(s)
- Number of connecting cables
- Type of cable used
- Number of Router interfaces

### Answer

- 4 Switches
- 1 Router
- 12 Connecting cables
- Fiber, Copper Straight-through
- 1 Router Interfaces

## Routing Table Information

Display the routing table at each of the router used in the simulation. [ Command to display routing table:  
**Router# show ip route** ]

### Routing Table

200.1.2.0/24 is variably subnetted, 4 Subnets, 3 mask  
 200.1.2.0/26 is directly connected, FastEthernet 0/0  
 200.1.2.64/27 is directly connected, FastEthernet 5/0  
 200.1.2.96/28 is directly connected, FastEthernet 4/0  
 200.1.2.112/28 is directly connected, FastEthernet 1/0

## IP address Configuration

Representation of Logical Views				
Router Interface IP:	0 200.1.2.62	64 200.1.2.94	128 200.1.2.110	192 200.1.2.126
One IP from Subnetwork 0:				
200.1.2.1				It's default gateway 200.1.2.62
One IP from Subnetwork 1:				
200.1.2.65				It's default gateway 200.1.2.94
One IP from Subnetwork 2:				
200.1.2.97				It's default gateway 200.1.2.110
One IP from Subnetwork 3:				
200.1.2.113				It's default gateway 200.1.2.126

## Simulation Testing

- Send packet with in the same subnet
- Send packet from one subnet to other subnet
- Local network Broadcast
- Distant network broadcast

Status
Successful
Successful
Successful
Successful

## Show the Simulation of Broadcasting

Paste your Diagram

WEA04-11

## Troubleshoot IP address Problems

- (a) Change the configuration of host address present in the subnet 2. Start sending packet to that host from subnet 0. State your observations from the simulation.

### Observation

- If the configuration is successful, the packets will reach the modified host in Subnet 2.
- If there are any issues the packets will be dropped.

- (b) Change one of the Router Interface IP and forward packet from one subnet to other using that interface.

### Observation

- If the configuration is successful the packets will be forwarded b/w the subnets via the modified router interface.
- If there are any issues (misconfiguring routing, or interface problems) the packets will be dropped.

- (c) Change the IP address of one of the host in subnet 0 to a different IP not belonging to that subnet. Select an ARP packet and forward from any host of subnet 0.

### Observation

- When the modified host sends an ARP request for the new IP address, it will not receive a valid ARP reply. The ARP Table on the router or switch will not have a valid MAC address entry for the modified host's new IP address. As a result, the packets from the modified host may not be forwarded correctly.