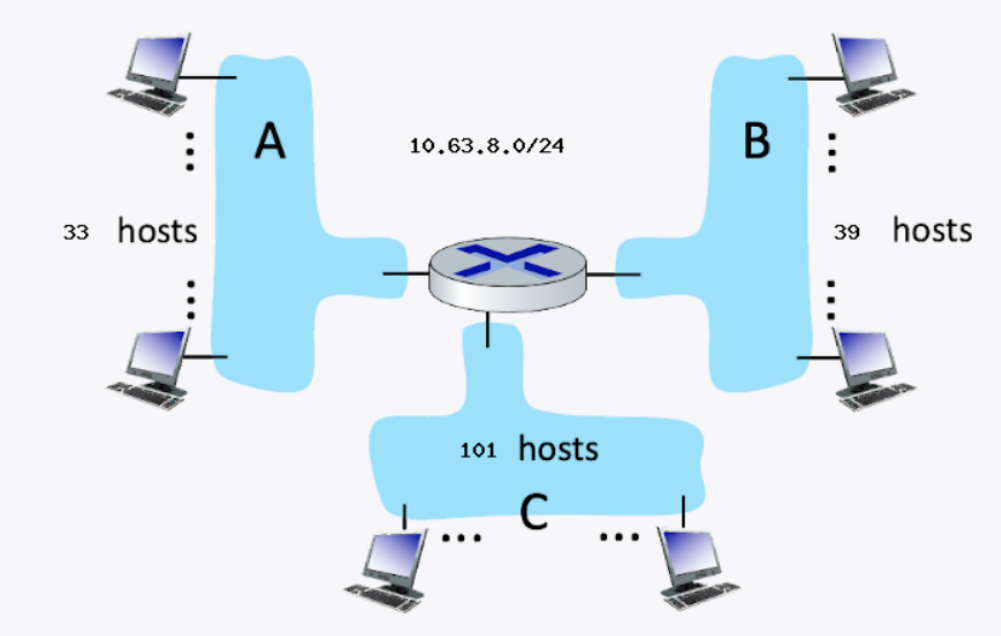
COMPUTER NETWORKS

Question Bank

Unit – 4
Network Layer and Internet Protocol

Sl. No	Question and Answers
1	Consider the router and the three attached subnets below (A, B and C). The number of hosts is also shown below. The subnets share the 24 high-order bits of the address space: 10.63.8.0/24



Assign subnet addresses to each of the subnets (A, B, and C) so that the amount of address space assigned is minimal, and at the same time leaving the largest possible contiguous address space available for assignment if a new subnet were to be added. Then answer the questions below:

Questions

1. Is the address space public or private?

2. How many hosts can there be in this address space?

3. What is the subnet address of subnet A? (CIDR notation)

4. What is the broadcast address of subnet A?

5. What is the starting address of subnet A?

6. What is the ending address of subnet A?

	7. What is the subnet address of subnet B? (CIDR notation) 8. What is the broadcast address of subnet B?
	9. What is the starting address of subnet B? 10. What is the ending address of subnet B? 11. What is the subnet address of subnet C? (CIDR notation) 12. What is the broadcast address of subnet C? 13. What is the starting address of subnet C? 14. What is the ending address of subnet C? SOLUTION 1. The address 10.63.8.0/24 is private. 2. Maximum number of hosts = 2^x - 2 = 2^8 - 2 = 254. The reason we have to subtract 2 from the final number is because there are always 2 addresses allocated for each address block: the subnet ID (the first address) and the broadcast address (the last address); for example, if you have 5 bits for hosts, you can have 30 hosts, because 2 of the addresses are for the subnet ID and the broadcast address which when added equals 32, which is 2^5. 3. Subnet A has 33 hosts, so it will need at least 35 addresses (for the subnet ID and broadcast address). The least number of bits that satisfy this is 6 bits. Knowing that, we take the prior subnet and add 64, the result of which is 10.63.8.192/26 4. The broadcast address of subnet A (10.63.8.192/26) is 10.63.8.255, because it is the last address in the IP range. 5. The first IP address of subnet A (10.63.8.192/26) is 10.63.8.193, found by adding 1 to the subnet address. 6. The last IP address of subnet A (10.63.8.192/26) is 10.63.8.254, found by subtracting 1 from the broadcast address (10.63.8.255). 7. Similar to the prior subnet, subnet B has 39 hosts, so it will need at least 41 addresses (for the subnet ID and broadcast address). The least number of bits that satisfy this is 6 bits. Knowing that, we take the prior subnet and add 64, the result of which is 10.63.8.128/26

8. The broadcast address of subnet B (10.63.8.128/26) is 10.63.8.191, because it is the last address in the IP range.

9. The first IP address of subnet B (10.63.8.128/26) is 10.63.8.129, found by adding 1 to the subnet address.

10. The last IP address of subnet B (10.63.8.128/26) is 10.63.8.190, found by subtracting 1 from the broadcast address (10.63.8.191).

11. Similar to the prior two subnets, subnet C has 101 hosts, so it will need at least 103 addresses (for the subnet ID and broadcast address). The least number of bits that satisfy this is 7 bits. Knowing that, we take the prior subnet and add 128, the result of which is 10.63.8.0/25

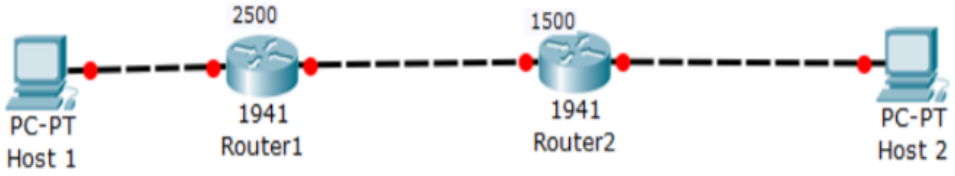
12. The broadcast address of subnet C (10.63.8.0/25) is 10.63.8.127, because it is the last address in the IP range.

13. The first IP address of subnet C (10.63.8.0/25) is 10.63.8.1, found by adding 1 to the subnet address.

14. The last IP address of subnet C (10.63.8.0/25) is 10.63.8.126, found by subtracting 1 from the broadcast address (10.63.8.127).

2

1. Refer the topology given below.



Consider the transport layer segment with size of 4500 bytes, no option and IP header size of 20 bytes. Assume that a packet travels over a link with a MTU of 2500 bytes at router1.

i. Compute the fragmentation table and write in following format.

Fragment	Bytes			MF/Flag	Offset
	Total Bytes	Header Bytes	Data Bytes		
1					

ii. Assume these fragments reach a link with an MTU of 1500 bytes at Router2. Compute the fragmentation table.(In the same format mentioned above)

Ans:

i.

Fragment	Bytes			MF/Flag	Offset
	Total Bytes	Header Bytes	Data Bytes		
1	2500	20	2480	1	0
2	2040	20	2020	0	310

ii. Assume these fragments reach a link with an MTU of 1500 bytes at Router2. Compute the fragmentation table.(In the same format mentioned above)

Fragment	Bytes			MF/Flag	Offset
	Total Bytes	Header Bytes	Data Bytes		
1	1500	20	2480	1	0
2	1020	20	1000	1	185
3	1500	20	1480	1	310
4	1560	20	1540	0	495

3 An organization is granted the block 214.17.160.0/24. The administrator wants to create 8 subnets.

a. Find the subnet mask.

b. Find the number of addresses in each subnet.

c. Find the last addresses in first subnet.

d. Find the first addresses in last subnet.

Solution:

a) log2 8 =3

Extra 1s =3 Mask: /27 (24 + 3)

b.32− 27 = 5, 2^5= 32 addresses per subnet

c. Subnet 1:

the last address, we need to write 00011111 in last byte

it is 214.17.160.00011111 = 214.17.160. 31

d.

last subnet:

214.17.160.11100000 is the last byte

	So first address of last subnet is: 214.17.160.224
4	Show the unabbreviated colon hex notation for the following IPv6 addresses: a. An address with 64 0s followed by 64 1s. b. An address with 128 0s. c. An address with 128 1s. d. An address with 128 alternative 1s and 0s. Solution a. 0000:0000:0000:0000:FFFF:FFFF:FFFF:FFFF b. 0000:0000:0000:0000:0000:0000:0000:0000 c. FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF d. AAAA:AAAA:AAAA:AAAA:AAAA:AAAA:AAAA:AAAA
5	Decompress the following addresses and show the complete unabbreviated IPv6 address: a. 1111::2222 b. :: c. 0:1:: d. AAAA:A:AA::1234 **Solution** a. 1111:0000:0000:0000:0000:0000:0000:2222 b. 0000:0000:0000:0000:0000:0000:0000:0000 c. 0000:0001:0000:0000:0000:0000:0000:0000 d. AAAA:000A:00AA:0000:0000:0000:0000:1234
6	Assume a host with Ethernet address $(F5\text{-}A9\text{-}23\text{-}11\text{-}9B\text{-}E2)_{16}$ has joined the network. What would be its global unicast address if the global unicast prefix of the organization is 3A21:1216:2165 and the subnet identifier is A245:1232. Solution The host first creates its interface identifier as F7A9:23FF:FE11:9BE2 using the Ethernet address read from its card. The host then creates its link-local address as FE80::F7A9:23FF:FF11:9BE2