FAST- National University of Computer and Emerging Sciences, Karachi.
FAST School of Computing
Spring 2022, Quiz- III -- Solution

Course Code: CS3001	Course Name: Computer Networks
Instructor Name: Mr. Shoaib Raza	
Student Roll No:	Section:

Time Allowed: 50 Minutes. **Maximum Points: 40 points**

Question # 1: Consider the following network as shown in Figure 01 with the indicated link costs.

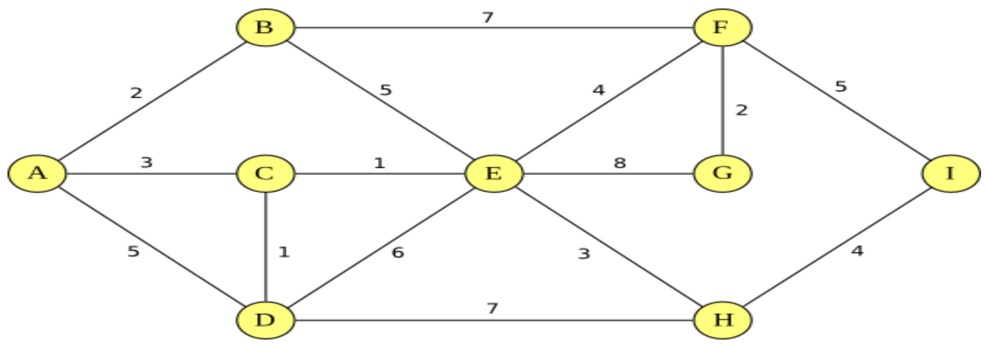


Figure 01

(a) Use Dijkstra's shortest-path algorithm to compute the shortest path from A to all network nodes. State of Initial routing table is shown below.

Step	Node (N')	D(B), p(B)	D(E), p(E)	D(F), p(F)	D(C), p(C)	D(G), p(G)	D(I), p(I)	D(D), p(D)	D(H), p(H)
0	A	∞	∞	∞	∞	∞	∞	∞	∞
1	A	2, A	∞	∞	3, A	∞	∞	5, A	∞
2	AB		7, B	9, B	3, A	∞	∞	5, A	∞
3	ABC		4, C	9, B		∞	∞	4, C	∞
4	ABCD		4, C	9, B		∞	∞		11, D
5	ABCDE			8, E		12, E	∞		7, E
6	ABCDEH			9, E		12, E	11, H		
7	ABCDEHF					10, F	11, H		
Converge at this point									

(b) Recalculate the routing table for Node A if the link between Node C to Node E is failed.

Step	Node (N')	D(B), p(B)	D(E), p(E)	D(F), p(F)	D(C), p(C)	D(G), p(G)	D(I), p(I)	D(D), p(D)	D(H), p(H)
0	A	∞	∞	∞	∞	∞	∞	∞	∞
1	A	2, A	∞	∞	3, A	∞	∞	5, A	∞
2	AB		7, B	9, B	3, A	∞	∞	5, A	∞
3	ABC		7, B	9, B		∞	∞	4, C	∞
4	ABCD		7, B	9, B		∞	∞		11, D
5	ABCDE			9, B		15, E	∞		11, D
6	ABCDEH			9, B		15, E	15, H		
7	ABCDEHF					11, F	14, F		
Converge at this point									

Question 2: Consider the network shown in Figure 02. Suppose AS3 and AS2 are running OSPF for their intra-AS routing protocol. Suppose AS1 and AS4 are running RIP for their intra-AS routing protocol where weight of l1 < l2 both connected to router 1d. Suppose eBGP and iBGP are used for inter-AS routing protocol.

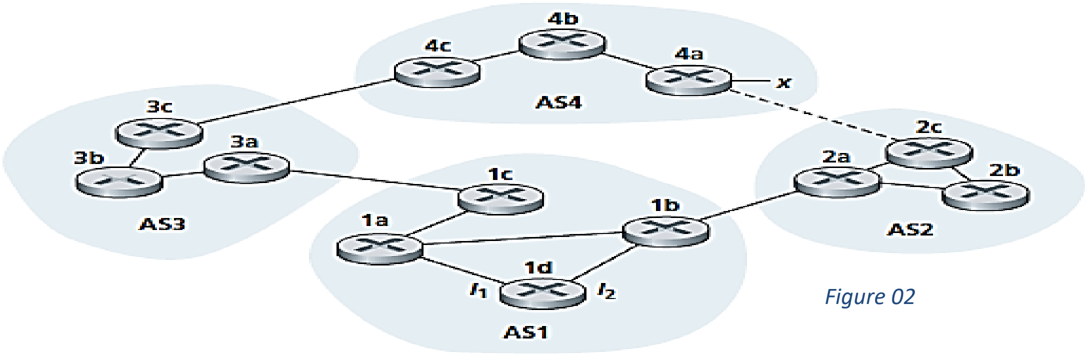


Figure 02

There is no physical link between AS2 and AS4 for part (a) and (b)

(a) Router 3c learns about prefix x from which routing protocol: OSPF, RIP, eBGP, or iBGP?
Answer:
3c learn from 4c (AS4) using eBGP.

(b) Router 3a learns about x from which routing protocol?
Answer:
iBGP running on 3c.

Now suppose that the link between AS2 and AS4 has been restored.
Physical link exists between AS2 and AS4 for part (c) and (d)

(c) Router 1c learns about x from which routing protocol?
Answer:
Learns x from 3a using eBGP. OR Learns x from 1b using iBGP.

(d) Router 1d learns about x from which routing protocol?
Answer:
Learns x from 1b using iBGP. OR Learns x from 1c using iBGP.

Question 3: Assign a class C IP address 220.23.16.0/24 to all interfaces of subnets in the network shown in Figure 03. Assume a maximum host count of 30 or less, which are connected to switches S1, S2, S3 and router interfaces R1, R2, and R3 respectively. Note: Points will only be awarded on showing detail working related to subnet calculations including network and broadcast address.

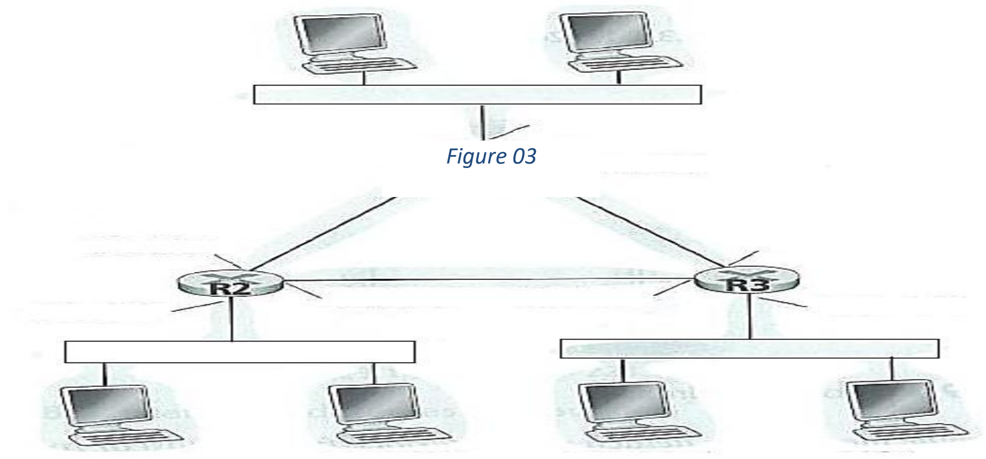
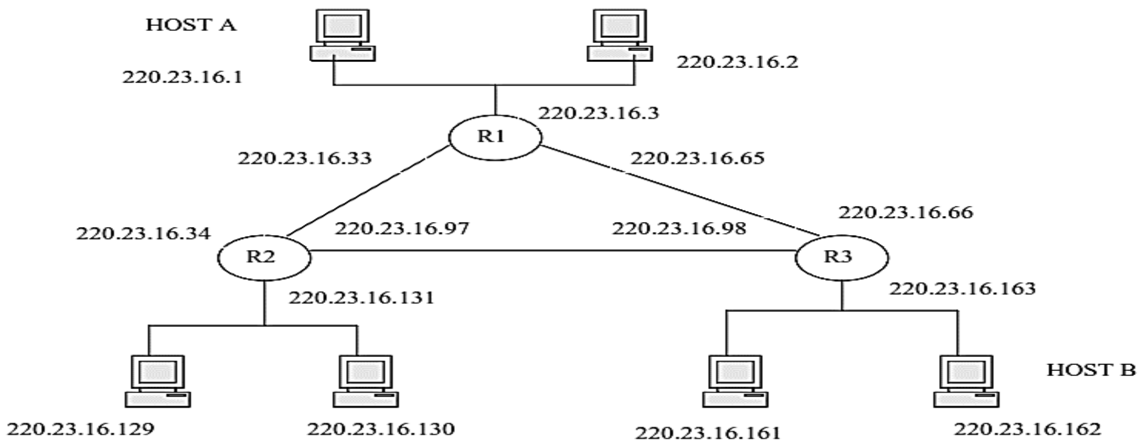


Figure 03

Solution:

Subnet # 1 = 220.23.16.0/27, IP Subnet range: 220.23.16.0 – 220.23.16.31
Subnet # 2 = 220.23.16.32/27, IP Subnet range: 220.23.16.32 – 220.23.16.63
Subnet # 3 = 220.23.16.64/27, IP Subnet range: 220.23.16.64 – 220.23.16.95
Subnet # 4 = 220.23.16.96/27, IP Subnet range: 220.23.16.96 – 220.23.16.127
Subnet # 5 = 220.23.16.128/27, IP Subnet range: 220.23.16.128 – 220.23.16.159
Subnet # 6 = 220.23.16.160/27 IP Subnet range: 220.23.16.160 – 220.23.16.191

Default Subnet Mask: 255.255.255.0
Custom Subnet Mask: 255.255.255.224



Question 4: Consider the scenario in figure 04, in which three hosts, with private IP addresses 10.0.0.1, 10.0.0.2, and 10.0.0.3 are in a local network behind a NATed router that sits between these three hosts and the larger Internet. The IP datagrams being sent from, or destined to, these three hosts must pass through this NAT router. Suppose that the host with IP address 10.0.0.1 sends an IP datagram destined to host 128.119.40.186. The source port is 3345, and the destination port is 80.

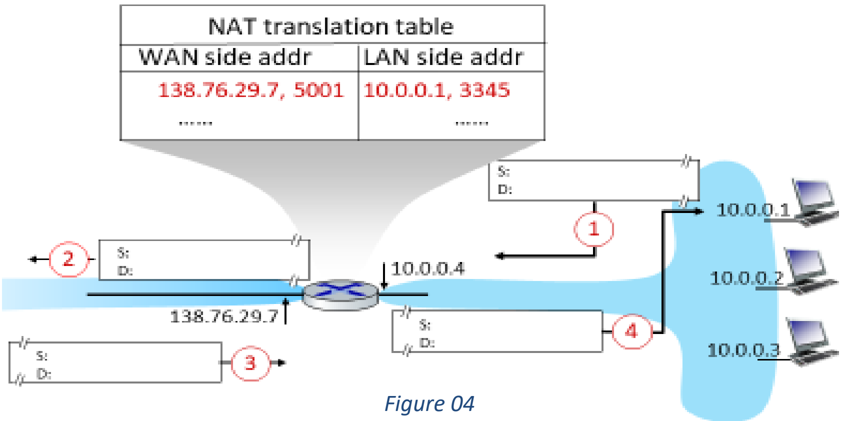


Figure 04

a) Consider the datagram at step 1 in the figure 1, after it has been sent by the host but before it has reached the router. What is the source and destination IP address for this datagram?
Answer:
S: 10.0.0.1, 3345
D: 128.119.40.186, 80

b) At step 2, after the datagram, has been transmitted by the router. What are the source and destination IP addresses for this datagram?
Answer:
S: 138.76.29.7, 5001
D: 128.119.40.186, 80

c) Now consider the datagram at step 3, just before it is received by the router. What are the source and destination IP addresses for this datagram?
Answer:
S: 128.119.40.186, 80
D: 138.76.29.7, 5001

d) At step 4, after the datagram, has been transmitted by the router but before it has been received by the host. What are the source and destination IP addresses for this datagram?
Answer:
S: 128.119.40.186, 80
D: 10.0.0.1, 3345

BEST OF LUCK!