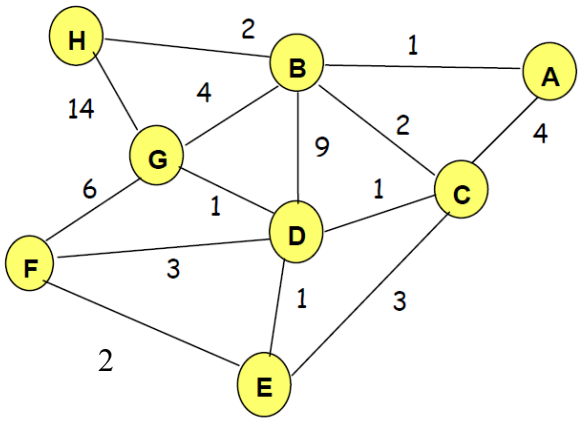
Answer for EE3315 Test 1 2019-2020

Question 1. Consider the following network: **[16 marks]**



The number on each link represents the cost of using this link. In your answer sheet, draw down the network. Using Dijkstra's algorithm, compute the shortest path from **Node E** to all network nodes. If there is a tie, ***break it in favor of rightmost column***. List the shortest paths from Node E to all the other nodes and specify their costs.

N	A	B	C	D	F	G	H
E	∞	∞	3, E	1, E	2, E	∞	∞
E,D	∞	10, D	2, D		2, E	2, D	∞
E,D,G	∞	6, G	2, D		2, E		16, G
E,D,G,F	∞	6, G	2, D				16, G
E,D,G,F,C	6, C	4, C					16, G
E,D,G,F,C,B	5, B						6, B
E,D,G,F,C,B,A							6, B
E,D,G,F,C,B,A,H							

The shortest path from Node E to
A: EDCBA - 5
B: EDCB - 4
C: EDC - 2
D: ED - 1
F: EF - 2
G: EDG - 2
H: EDCBH - 6

Question 2. Consider the Distance-Vector update shown in the Fig. Q.2 below. It shows an existing table (i) in a gateway K, and update message (ii) from another gateway Q. Assuming that the distance between gateways K and Q is 4, write down the changes table (i) due to the update and give the reasons for those changes. **[8 marks]**

Destination	Distance	Route
Net 1	0	Direct
Net 2	0	Direct
Net 4	8	Gate L
Net 18	9	Gate M
Net 24	8	Gate J
Net 30	5	Gate Q
Net 42	4	Gate J

(i) An existing routing table for a gateway K

Destination	Distance
Net 1	2
Net 4	8
Net 17	2
Net 18	4
Net 24	3
Net 30	8
Net 42	2

(ii) An incoming routing update message from gateway Q.

Figure Q.2

Destination	Distance	Route
Net 17	6	Gate Q
Net 18	8	Gate Q
Net 24	7	Gate Q
Net 30	12	Gate Q

Figure Q.2-1

For destination Net 17, it updates that a new route is setup via gateway Q.

For destination Net 18, it updates that a shorter distance resulting from routing via gateway Q.

For destination Net 24, it updates that a shorter distance resulting from routing via gateway Q.

For destination Net 30, it updates that if passing via gateway Q, it will take a longer route.

Question 3. In Figure Q.3, assume that link BC has gone down for a long time. Assume A, B and D use split horizon with Poisoned Reverse. **[26 marks]**

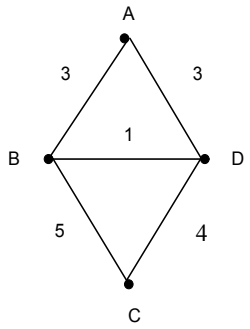


Figure Q.3

i. What distance to C will D report to A? 4
ii. What distance to C will D report to B? 4
iii. What distance to C will A report to D? ∞
iv. What distance to C will B report to D? ∞

Now, suppose link CD goes down.
v. What distance to C will B report to A? 5
vi. At the same time, what is the distance to C that D reports to A? ∞
vii. At the same time, what is the distance to C that A reports to B? 7
viii. At the same time, what is the distance to C that D reports to B? ∞
ix. What does A then think the shortest path to C is? A-B-D-C
x. What does A then tell B about its distance to C? ∞
xi. What does A then tell D about its distance to C? 8
xii. What is D's route to C now? D-A-B-D-C
xiii. What does D then tell B the distance to C? 11

Question 4: Initially, we have the following distance vectors for the network in Figure Q4.

Distance vector of y: (5, 0, 4)
Distance vector of x: (0, 5, 9)

Now link cost of y-z changes from 4 to 40. Using Distance Vector routing algorithm, write down the steps showing that node y and node x update their distance vectors until the routing algorithm converges. **[16 marks]**

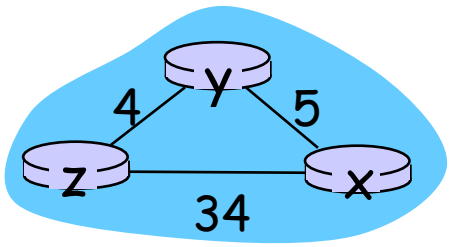


Figure Q.4

Answer for Question 4:

1. y updates its vector:
   Dist. vector y: (5, 0, 14)
2. x updates its vector:
   Dist. vector x: (0, 5, 19)
3. y updates its vector:
   Dist. vector y: (5, 0, 24)
4. x updates its vector:
   Dist. vector x: (0, 5, 29)
5. y updates its vector:
   Dist. vector y: (5, 0, 34)
6. x updates its vector:
   Dist. vector x: (0, 5, 34)
7. y updates its vector:
   Dist. vector y: (5, 0, 39)
8. x updates its vector:
   Dist. vector x: (0, 5, 34)

Question 5: Figure Q5 shows a network using Hierarchical Routing. Draw down the topology of the network from Node 3B's point of view under the use of Hierarchical Routing. Write down the routing table for node 3B under Hierarchical Routing. Note that for each destination, "next hop" and "number of hops" (to that destination) should be included. [16 marks]

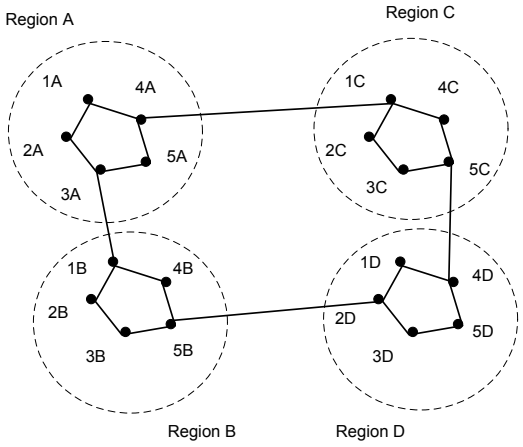
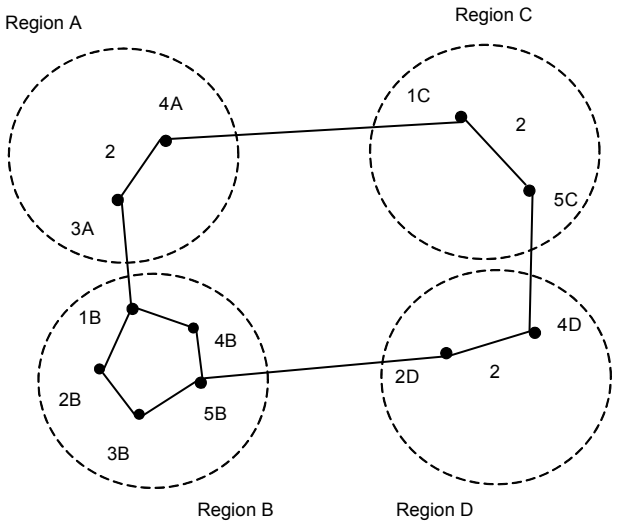


Figure Q5

Answer for Question 5:



Routing table for 3B

Destination	Next Hop	No. of Hops
3B	-	-
1B	2B	2
2B	2B	1
4B	5B	2
5B	5B	1
A	2B	3
C	5B	5
D	5B	2

Question 6. Referring to Figure Q5, what is the path used (a) from 1a to 2a (b) from 1a to 3a, respectively, using the following routing algorithms? [6 marks]

1. The shortest path routing
2. The hot potato routing (with the shortest path routing outside AS1)
3. BGP routing with the elimination rules:
   i. shortest AS-PATH
   ii. shortest path to NEXT-HOP

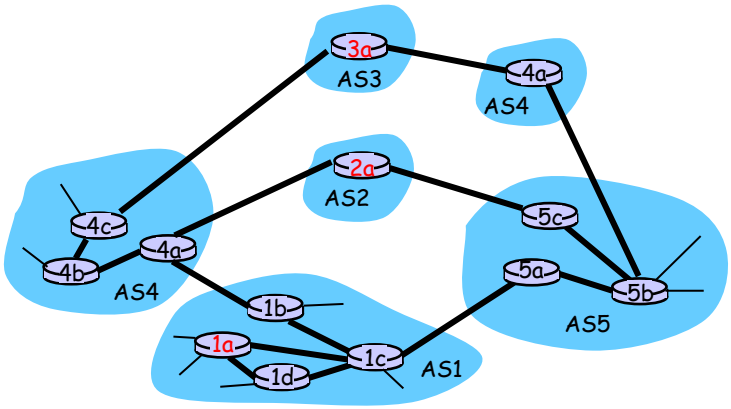


Figure Q6

(a) From 1a to 2a

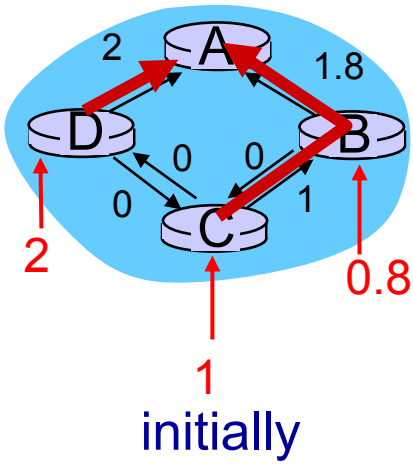
1. 1a-1c-1b-4a-2a
2. 1a-1c-5a-5b-5c-2a
3. 1a-1c-5a-5b-5c-2a

(b) From 1a to 3a

1. 1a-1c-5a-5b-4a-3a
2. 1a-1c-5a-5b-4a-3a
3. 1a-1c-1b-4a-4b-4c-3a

Question 7. [12 marks]

Let link cost be equal to the amount of carried traffic in a link. Let the traffic from node B, node C and node D to node A be 0.8 unit, 1 unit and 2 units, respectively. According to the routing decision initially given by the following figure, draw down three corresponding figures if we use Link State routing algorithm three times to find new shortest paths to node A resulting in new costs.



Answer for Question 7: