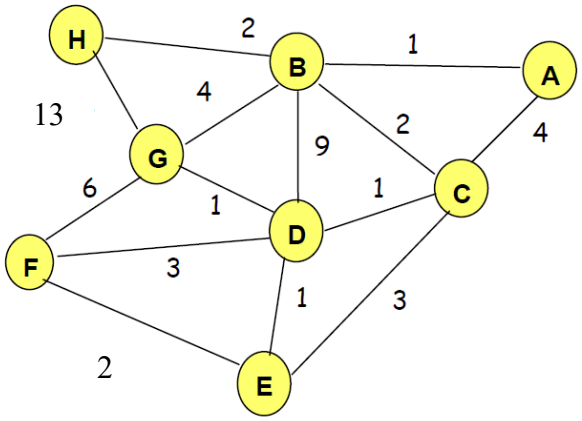
Answer for EE3315 Test 1 2020-2021

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		15, G
E,D,G,F	∞	6, G	2, D				15, G
E,D,G,F,C	6, C	4, C					15, 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 a subnet with routers *A*, *B*, *C*, *D*, and *E*, distance vector routing is used; and the following vectors have just come in to router *C*: from *A* indicating the delay to routers *A*, *B*, *C*, *D*, and *E*: (0,6,3,2,4); from *B*: (6,0,8,11,6); from *D*: (16,2,6,0,7); and from *E*: (8,6,3,4,0). The new measured delays from router *C* to its neighbours *A*, *B*, *D*, and *E*, are 2, 2, 2, and 4, respectively. Assume that *C*'s original routing table indicating the delay to routers *A*, *B*, *C*, *D*, and *E* (1,7,0,4,4) and the next routers to be used (*A*, *B*, –, *D*, *A*). What is *C*'s new routing table? Give both the next router to be used and the expected delay.

[8 marks]

Going via *A* gives (2, 8, 5, 4, 6)
Going via *B* gives (8, 2, 10, 13, 8)
Going via *D* gives (18, 4, 8, 2, 9)
Going via *E* gives (12, 10, 7, 8, 4)
The original table is (1, 7, 0, 4, 4)

C's new routing table indicating the delay (2,2,0,2,4) and the next routers (*A*, *B*, –, *D*, *E*).

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

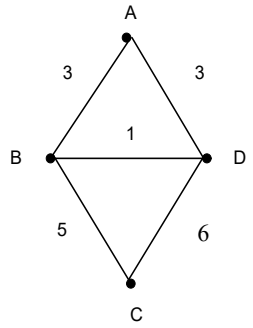


Figure Q.3

i. What distance to C will B report to A? 5
ii. What distance to C will B report to D? 5
iii. What distance to C will A report to B? ∞
iv. What distance to C will D report to B? ∞

Now, suppose link BC goes down.
v. What distance to C will B report to A? ∞
vi. At the same time, what is the distance to C that D reports to A? 6
vii. At the same time, what is the distance to C that A reports to B? ∞
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-D-B-C
x. What does A then tell B about its distance to C? 9
xi. What does A then tell D about its distance to C? ∞
xii. What is B's route to C now? B-A-D-B-C
xiii. What does B then tell D the distance to C? 12

Question 4. **[16 marks]**

Initially, we have the following distance vectors for the network in Figure Q4

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

Distance vector of z: (9, 5, 0)

Now link cost of x-y changes from 4 to 50. Using Distance Vector routing algorithm, write down the steps showing that node y and node z update their distance vectors until the routing algorithm converges (i.e., no further distance vectors exchange).

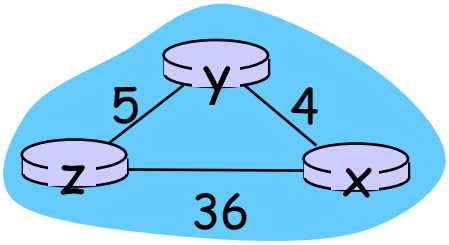


Figure Q.4

Answer for Question 4A:

1. y updates its vector:
   Dist. vector y: (14, 0, 5)
2. z updates its vector:
   Dist. vector z: (19, 5, 0)
3. y updates its vector:
   Dist. vector y: (24, 0, 5)
4. z updates its vector:
   Dist. vector z: (29, 5, 0)
5. y updates its vector:
   Dist. vector y: (34, 0, 5)
6. z updates its vector:
   Dist. vector z: (36, 5, 0)
7. y updates its vector:
   Dist. vector y: (41, 0, 5)
8. z updates its vector:
   Dist. vector z: (36, 5, 0)

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

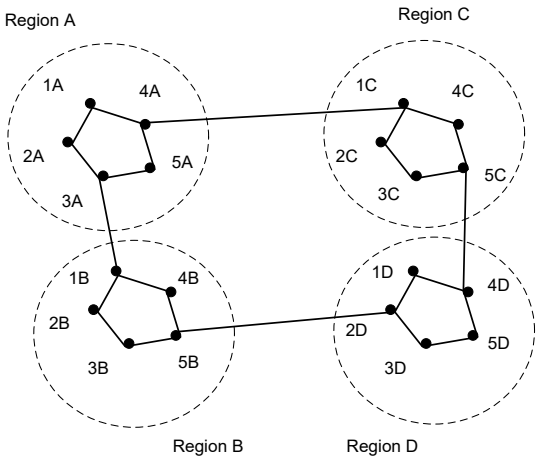
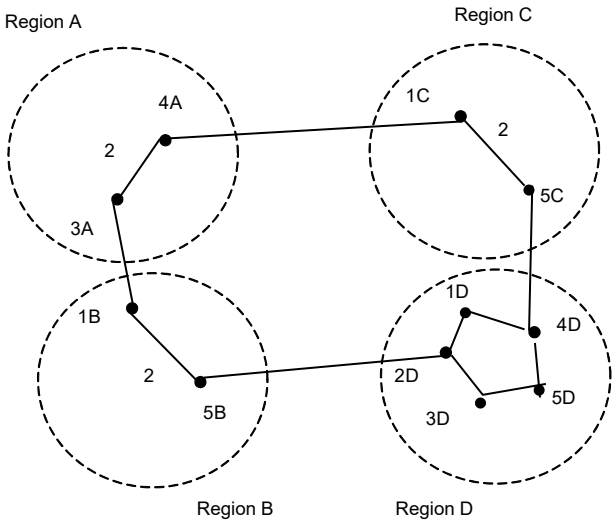


Figure Q5



Routing table for 3D

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

Question 6. Referring to Figure Q6, 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

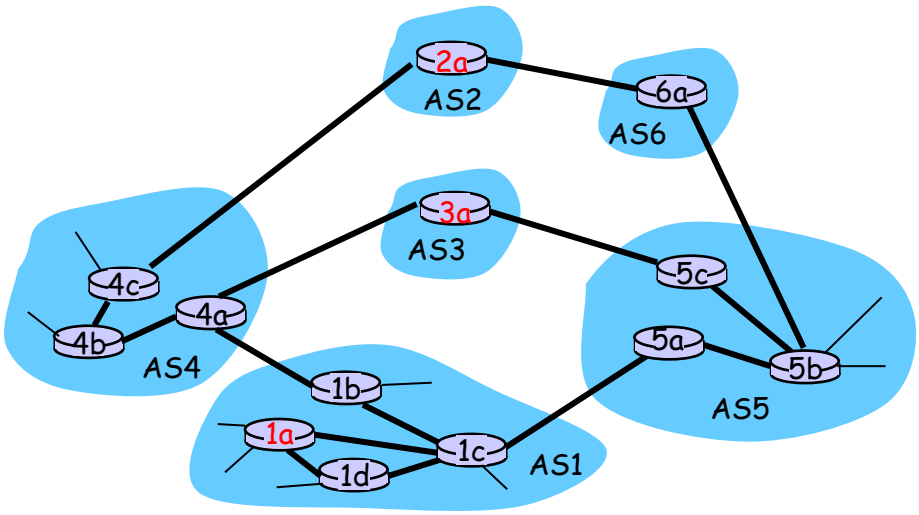


Figure Q6

(a) From 1a to 2a

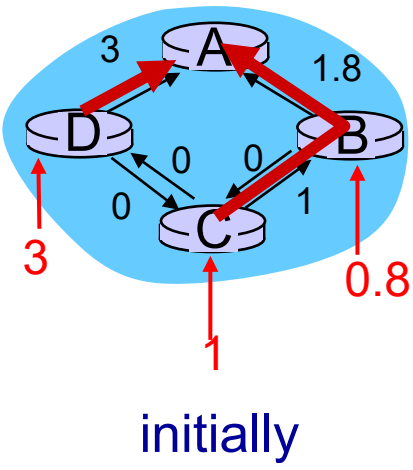
1. 1a-1c-5a-5b-6a-2a
2. 1a-1c-5a-5b-6a-2a
3. 1a-1c-1b-4a-4b-4c-2a

(b) From 1a to 3a

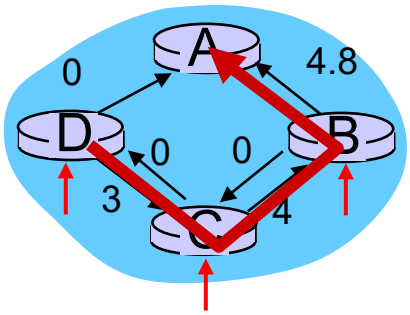
1. 1a-1c-1b-4a-3a
2. 1a-1c-5a-5b-5c-3a
3. 1a-1c-5a-5b-5c-3a

Question 7. **[12 marks]**

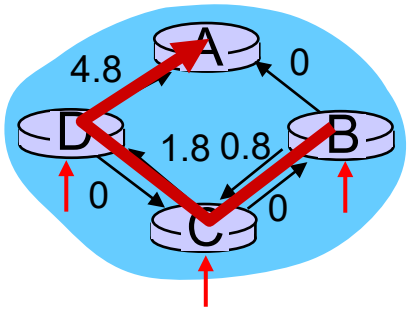
Let link cost be equal to the amount of carried traffic in a link. Let the traffic from node B, node C and node D to node A be 0.8 unit, 1 unit and 3 units, respectively. According to the routing decision initially given by the following figure, draw down three corresponding figures if we use Link State routing algorithm three times to find new shortest paths to node A resulting in new costs.



Answer for Question 7:



given these costs,
find new routing….
resulting in new costs



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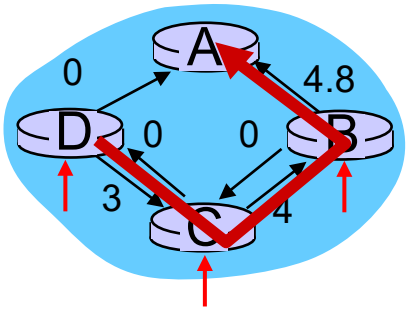

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