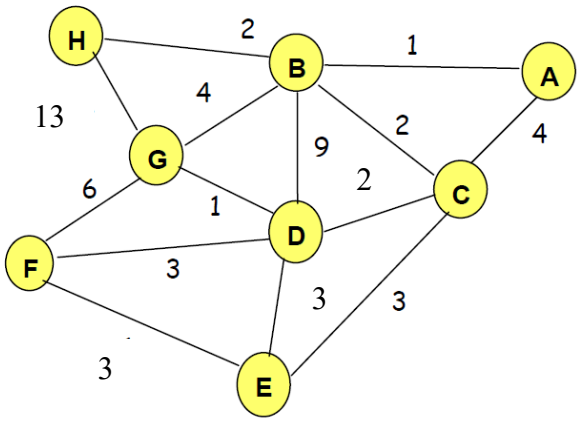
Assignment 1 of EE3315 2022-2023 Semester B

Question 1. Consider the following network: **[20 marks]**



The number on each link represents the cost of using this link. 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 leftmost column***. List the shortest paths from Node E to all the other nodes and specify their costs. Let

- $D(v)$: cost of the least-cost path from source to destination v.
- $P(v)$: previous node (neighbour of v) along the current least-cost path
- N: v is in N if the least-cost path from source to v is known.

N	D(A),P(A)	D(B),P(B)	D(C),P(C)	D(D),P(D)	D(F),P(F)	D(G),P(G)	D(H),P(H)

Question 2. In Figure Q.2, assume that link CD has gone down for a long time. Assume A, B and D use split horizon with Poisoned Reverse. **[26 marks]**

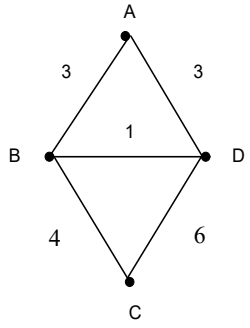


Figure Q.2

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

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

Question 3. Figure Q3 shows a network using Hierarchical Routing. Draw down the topology of the network from Node 2D's point of view under the use of Hierarchical Routing. Write down the routing table for node 2D under Hierarchical Routing. Note that for each destination, "next hop" and "number of hops" (to that destination) should be included. **[18 marks]**

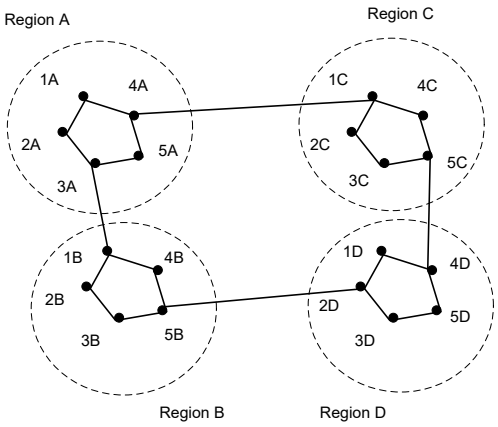


Figure Q3

Question 4. **[16 marks]**

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

Distance vector of x: (0, 11, 5)

Distance vector of z: (5, 6, 0)

Now link cost of y-z changes from 6 to 40. Using Distance Vector routing algorithm, write down the steps showing that node x and node z update their distance vectors until the routing algorithm converges.

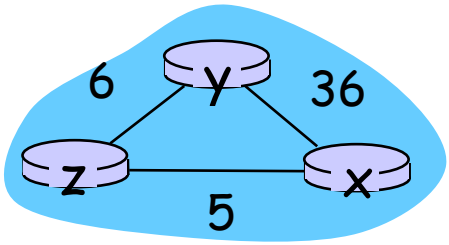


Figure Q.4

Question 5. **[8 marks]**

In Figure Q.5, we assume that A, B, C are provider networks and X, W, Y are customers of provider networks. In addition, Border Gateway Protocol (BGP) is used between networks. State whether the following statements are true or false. Explain your answer.

i) A is not willing to advertise to C the path AY.
ii) A is not willing to advertise to B the path AY.
iii) B is not willing to advertise to X the path BAY.
iv) B is not willing to advertise to C the path BAY.

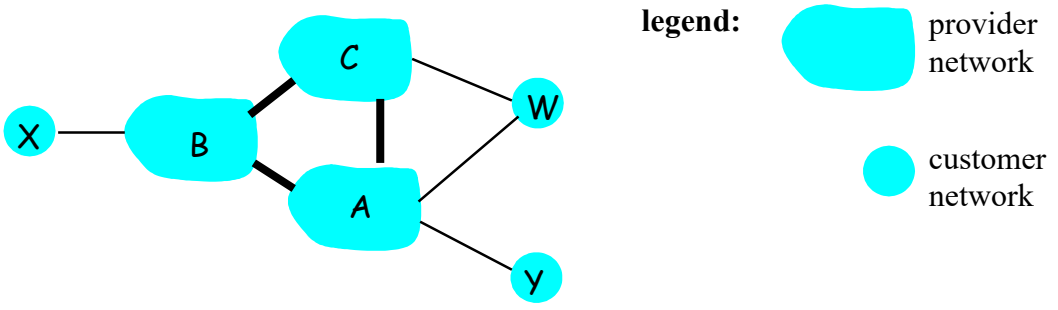
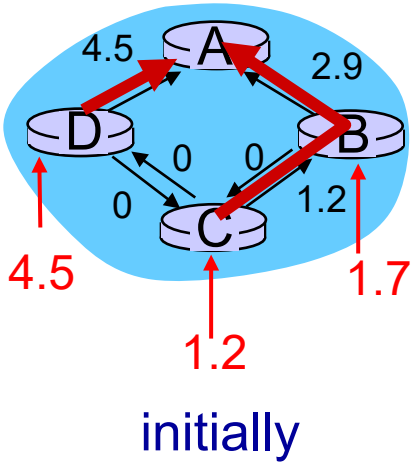


Figure Q.5 : A simple BGP scenario

Question 6. **[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 1.7 unit, 1.2 unit and 4.5 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.



initially