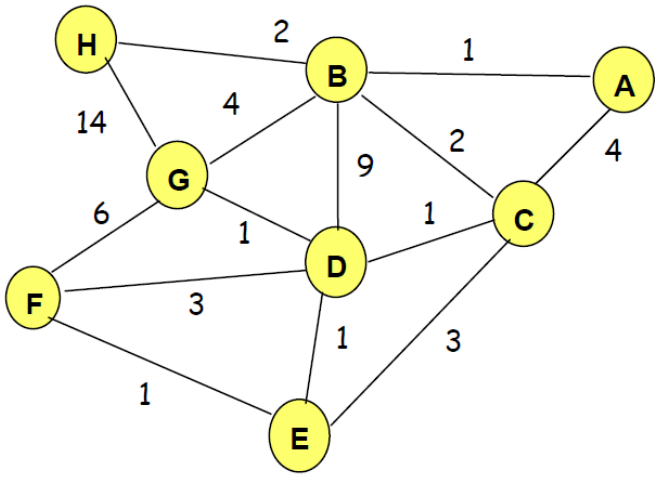
EE 3315 Tutorial: IP Routing

1. 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 *B* indicating the delay to routers *A*, *B*, *C*, *D*, and *E*: (5,0,8,12,6); from *D*: (16,12,6,0,9); and from *E*: (7,6,3,9,0). The measured delays from router *C* to its neighbours *B*, *D*, and *E*, are 8, 3, and 5, respectively. What is *C*'s new routing table? Give both the next router to be used and the expected delay.

   Going via *B* gives (13, 8, 16, 20, 14)
   Going via *D* gives (19, 15, 9, 3, 12)
   Going via *E* gives (12, 11, 8, 14, 5)

   Taking the minimum for each destination except *C* gives (12,8,0,3,5). The next routers are (*E*, *B*, –, *D*, *E*).

2. Consider the following network:



   a) Using Dijkstra's algorithm, compute the shortest path from B to all network nodes. Show your work in table form below. If there is a tie, ***break it in favor of leftmost column***.
      - *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	A	C	D	E	F	G	H
B	1, B	2, B	9, B	∞	∞	4, B	2, B
BA		2, B	9, B	∞	∞	4, B	2, B
BAC			3, C	5, C	∞	4, B	2, B
BACH			3, C	5, C	∞	4, B	
BACHD				4, D	6, D	4, B	
BACHDE					5, E	4, B	
BACHDEG					5, E		
BACHDEGF							

b) Present the shortest path from node B to all other nodes as an ordered list of nodes along that path.

B → A: BA
B → C: BC
B → D: BCD
B → E: BCDE
B → F: BCDEF
B → G: BG
B → H: BH

3. Consider the Vector-Distance update shown in the Fig. Q3 below. It shows an existing table (i) in a gateway K, and update message (ii) from another gateway J. Write down the changes in the table and give the reasons for those changes. Assume that the distance between gateway K and J is 2.

Destination	Distance	Route
Net 1	0	Direct
Net 2	0	Direct
Net 4	8	Gate L
Net 17	5	Gate M
Net 24	3	Gate J
Net 30	2	Gate Q
Net 42	4	Gate J

(i) An existing routing table for a gateway K

Destination	Distance
Net 1	2
Net 3	4
Net 4	9
Net 17	1
Net 24	2
Net 30	10
Net 42	2

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

Figure Q3

Destination	Distance	Route
Net 3	6	Gate J
Net 17	3	Gate J
Net 24	4	Gate J

Figure Q3-1

For destination Net 3, it updates that a new route is setup via gateway J.

For destination Net 17, it updates that a shorter distance of 3 resulting from routing via gateway J.

For destination Net 24, it updates that if passing via gateway J, it will take longer route.

4. Figure Q. 4 shows a network using Hierarchical Routing. Write down the routing table for node 5E. Note that for each destination, "next hop" and "number of hops" (to that destination) should be included.

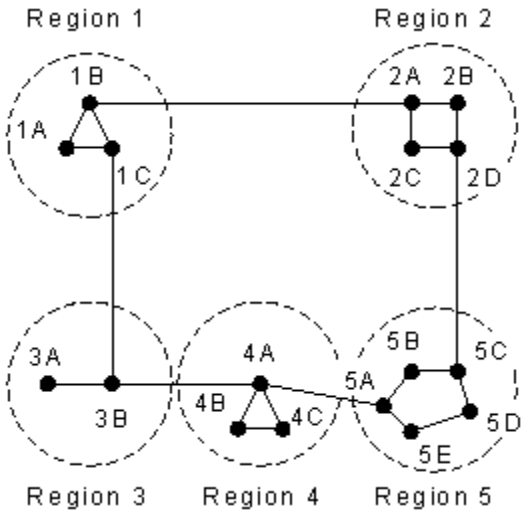
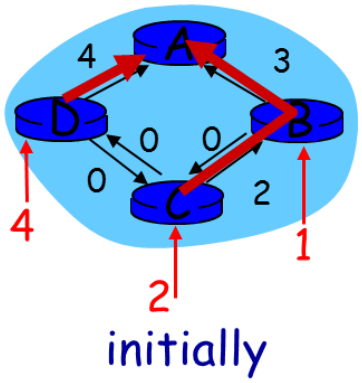


Figure Q. 4

Routing table for 5E

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

5. 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 unit, 2 units and 4 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 the shortest paths to node A.



Answer for Question 5: