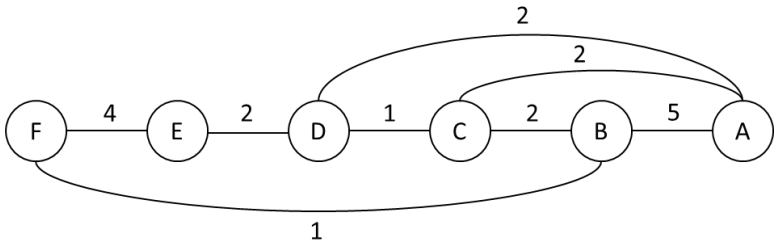
Cpr E 489 Spring 2020
Homework #5 Solution

1. (50 points) Consider the network shown below. Suppose all nodes run **the Link State routing protocol and the Dijkstra's algorithm**. *Assume that the tie-breaker goes to the node with a smaller ID in the alphabetical order (e.g., A is smaller than C, and E is smaller than F, and so on.)*



a) (30 points) Show step by step (as we did in class) how node B computes its shortest paths to all other nodes in the network.

Answer:

Iteration	N	H_{BA}; D_{BA}	H_{BC}; D_{BC}	H_{BD}; D_{BD}	H_{BE}; D_{BE}	H_{BF}; D_{BF}
Initial	{B}	A; 5	C; 2	D; ∞	E; ∞	***F; 1***
1	{B, F}	A; 5	***C; 2***	D; ∞	F; 5	F; 1
2	{B, F, C}	C; 4	C; 2	***C; 3***	F; 5	F; 1
3	{B, F, C, D}	***C; 4***	C; 2	C; 3	C; 5	F; 1
4	{B, F, C, D, A}	C; 4	C; 2	C; 3	***C; 5***	F; 1
5	{B, F, C, D, A, E}	C; 4	C; 2	C; 3	C; 5	F; 1

b) (20 points) After the network stabilizes, show node B's routing table.

Answer:

Dest j	H_{Bj}	D_{Bj}	C_{Bj}
A	C	4	5
B	B	0	0
C	C	2	2
D	C	3	∞
E	C	5	∞
F	F	1	1

2. (50 points) Consider the same network shown in the previous problem. Suppose all nodes instead run the Distance Vector routing protocol with SHPR (Split Horizon with Poisoned Reverse). *Again, assume that the tie-breaker goes to the node with a smaller ID in the alphabetical order.*

   a) (20 points) Show step by step (as we did in class) how to find the shortest path from each node to destination node D, by completing the following iteration table.

   Answer:

	Iteration	A	B	C	E	F
Destination node D	Initial	(-, ∞)	(-, ∞)	(-, ∞)	(-, ∞)	(-, ∞)
	1	***(D, 2)***	(-, ∞)	***(D, 1)***	***(D, 2)***	(-, ∞)
	2	(D, 2)	***(C, 3)***	(D, 1)	(D, 2)	***(E, 6)***
	3	(D, 2)	(C, 3)	(D, 1)	(D, 2)	***(B, 4)***
	4	(D, 2)	(C, 3)	(D, 1)	(D, 2)	(B, 4)

   b) (30 points) After the protocol converges, (i) what is the Distance Vector report that A sends to B? (ii) what is the Distance Vector report that C sends to D? (iii) what is the Distance Vector report that F sends to E? Justify your answers.

   Answer:

DV report A sends to B:

j	D_{Aj}
A	0
B	4
C	2
D	2
E	4
F	5

DV report C sends to D:

j	D_{Cj}
A	2
B	2
C	0
D	∞
E	∞
F	3

DV report F sends to E:

j	D_{Fj}
A	5
B	1
C	3
D	4
E	∞
F	0