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CS 260

Assignment 15

Question 1

a) Array D after calling relax(1,4). So u = 1, v = 4

Index	0	1	2	3	4
Value	0	2	1	∞	7

b) Array D after calling relax(2,3). So u=2, v=3

Index	0	1	2	3	4
Value	0	2	1	3	7

c) Array D after calling relax(3,4). So u = 3, v = 4

Index	0	1	2	3	4
Value	0	2	1	3	4

Question 2

a) Node (0,0) has the min distance value
b) Node 1, Node 2 and Node 4
c) New array D

Index	0	1	2	3	4
Value	0	2	1	∞	8

Question 3

a) Node 2 with minimum distance of 1
b) Node 3 is adjacent to Node 2
c) Array D

Index	0	1	2	3	4
Value	0	2	1	3	8

Question 4

a) Node 1 has minimum estimated distance of 2
b) Only Node 4 adjacent to Node 1
c) Array D

Index	0	1	2	3	4
Value	0	2	1	3	7

Question 5

a) Node 3 has minimum estimated distance of 3
b) Node 4 adjacent to Node 3
c) Array D

Index	0	1	2	3	4
Value	0	2	1	3	4

d) Yes. D contains all shortest path distances because the graph doesn't have any negative edge's weight. The shortest distance from node 4 to node 0 is 4 via path (0,2,3,4).

Question 6

Node D has the minimum distance. Nodes E, G, C, F are adjacent to Node D. Updated Array:

Index	A	B	C	D	E	F	G
Distance	0	2	3	1	6	9	5

Node B has the minimum distance. Nodes E, D are adjacent to Node B. Updated Array:

Index	A	B	C	D	E	F	G
Distance	0	2	3	1	6	9	5

Node C has the minimum distance. Nodes A, F are adjacent to Node C. Updated Array:

Index	A	B	C	D	E	F	G
Distance	0	2	3	1	6	8	5

Node G has the minimum distance. Node F is adjacent to Node G. Updated Array:

Index	A	B	C	D	E	F	G
Distance	0	2	3	1	6	6	5

Node E has the minimum distance (tie but smaller index). Node F is adjacent to E. Updated Array:

Index	A	B	C	D	E	F	G
Distance	0	2	3	1	6	6	5

Question 7

a) It will no longer be a tree because the set contains 1 cycle (D,G,F,C)
b) Yes. It will still be a tree because it contains no cycle.
c) No. It will not be a minimum spanning tree because it doesn't have the lowest total weight. (B,D) weight is 3 whereas (A,B) weight is 2

Question 8

a) I would think it's fair because Vojtech Jarnik's discover was more like for Mathematics. Prim rediscovered it for Computer Science.
b) Because it will always add new node to the MST, thus it prevents loops.
c) (A,C) has the lowest weight.

Question 9

The edge that has the lowest weight is (C,F)

Question 10

Edge (F,D) has the lowest weight.

Question 11

Edge (C,B). Because other edges has larger weights or both ends of the edge are known nodes.

Question 12

Edge (B,E).

Question 13

MST(G) = { (5,2), (2,3), (2,0), (3,1), (1,4) }