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METCS 526

Module 6 Homework (Problems 1 through 4)

Problem 1 (10 points)
For this graph the <u>DFS, starting at G</u>, is as follows:

G→E→B→A→C→F→D
This is because we choose E over F. From there, since B comes before D and F in the alphabet, that is the node we go to. From B, we go to A, which is the lowest depth. After A, we go back to B and visit C. From C, since E has already been visited, we visit F. Finally, we go to C, then B, then E, then finally we visit D. Thus, we complete the DFS.

<u>Edge Classifications:</u>
Tree Edges: G→E, E→B, B→A, B→C, C→F, E→D
Forward Edges: G→F, E→F
Back Edges: D→G, C→E
Cross Edges: D→A

Problem 2 (10 points).

BFS starting at node I:

I→F→H→E→G→B→C→D→A

Here, we start at I, then the next depth is F, then H. Then, the next depth from F is E and from H is E and G. Since we already visited E, we just go right to G. From E, we visit the next depth in alphabetical order, which is B, then C, then D. The next depth from G is C, but that has already been visited. From here, we go to node B and its next depth, which is just node A. Thus, we finish our BFS.

Problems 3 (10 points each).

3.1: D-values at every iteration

Iteration 0 (S, a, b, c, d, e): [0, infinity, infinity, infinity, infinity, infinity]

Iteration 1 at S: [0, 16, 5, 12, infinity]

Iteration 2 at b: [0, 8, 5, 10, 9, infinity]

Iteration 3 at a: [0, 8, 5, 10, 9, infinity]

Iteration 4 at d: [0, 8, 5, 10, 9, infinity]

Iteration 5 at c: [0, 8, 5, 10, 9, 12]

Iteration 6 at e: [0, 8, 5, 10, 9, 12]

Now that we have visited all the nodes, we have finished.

3.2: Shortest Paths

From S to a: S→b→a

From S to b: S→b

From S to c: S→b→c

From S to d: S→b→d

From S to e: S→b→c→e

Problem 4 (10 points).

4.1: Sequence of Nodes

A→C→B→D→G→F→E

4.2: MST T as a Set of Edges

T = {A→C, C→B, B→D, D→G, D→F, F→E}