CSCI 3104: Algorithms
Homework 4

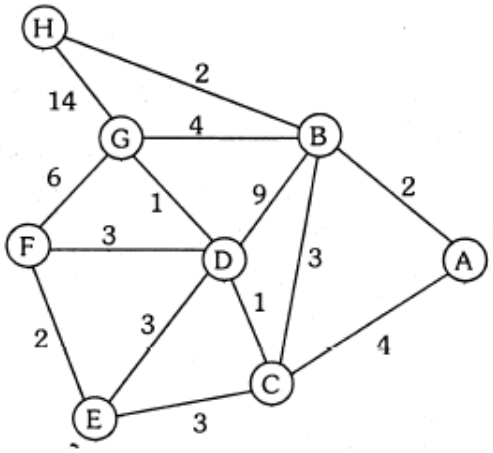
Due at **11:00am on Wednesday, October 7, 2015**. Submit your solutions electronically at moodle (name file as **LastName_FirstName_HW4.pdf**) or submit in paper before class. Make sure to include your name and student ID. Digital submission should also include the Honor Code Pledge (`http://honorcode.colorado.edu/about-honor-code`), and paper submission should include your signature indicating adherence to the Honor Code Pledge.

1. Answer the following questions for the graph shown below:

   (a) Draw the DFS search tree with starting vertex E and break ties alphabetically.

   (b) Assuming unit edge length (i.e., ignore edge weight), draw the BFS search tree with starting vertex E and break ties alphabetically.

   (c) Suppose the Dijkstras algorithm is run on the graph with starting vertex E: (i) draw a table showing the intermediate distance values of all vertices at each iteration of the algorithm; (ii) show the final shortest-path tree.



2. Often there are multiple shortest paths between two nodes of a graph. Give a linear-time algorithm for the following task.

   Input : Undirected graph $G = (V, E)$ with unit edge lengths; nodes $u, v \in V$.

   Output : The number of distinct shortest paths from u to v.

3. You are given a strongly connected directed graph $G = (V, E)$ with positive edge weights along with a particular node $v_0 \in V$. Give an efficient algorithm for finding shortest paths between all pairs of nodes, with the one restriction that these paths must all pass through v_0. Describe your algorithm in words or write down the pseudo code. And analyze its time complexity.