CS 315: Algorithm Design and Analysis	**Spring 2013**

Homework 5

Assigned: March 26, 2013	*Due: April 4, 2013*

1. (10') Problem 4.1

2. (10') Binary heap for priority queue. Show the process.

   a. Starting with the heap in Figure 4.11(h) on page 116, if we insert a key of value 5, what will happen?

   b. Then we decreasekey on 15 to change it to 4, what will happen?

   c. Then we perform deletemin on the resulting tree, what will happen?

3. (10') Problem 4.2

4. (10') Suppose the shortest path algorithm for dags is run on the graph in problem 4.2, with the edge from node H to node G removed.

   a. Show the linearization of the graph.

   b. Show the result of each update.

5. (40') Implement Dijkstra's shortest-path algorithm. The graph will be given in a text file. We make several assumptions to simplify the implementation. A graph containing n vertexes uses first n capital letters in the alphabet as the names of these vertexes. The file for a graph with n vertexes contains n lines, one for each vertex and the edges starting from that vertex. Each edge is represented by the name of the destination vertex and its length, which is an integer. The names of vertexes and lengths are separated by one or more spaces only. For example, the graph in Figure 4.9 can be represented as

   ```
   A  B 4    C  2
   B  D 2    C 3  E 3
   C  B 1    D 4  E 5
   D
   E D 1
   ```

   Your program will run as `your_program_name file_name`, where `file_name` is the name of the text file containing the graph. Your program will ask the user to input the source node and the destination node. It will print out the shortest distance between them and the path from the source node to the destination node. You do not have to implement priority queue for this assignment.

   You should submit your program through the CS Web Portal at `https://www.cs.uky.edu/csportal`