CSC-321   Design and Analysis of Algorithms
Section 401
Fall 2019-20

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Assignment #4
(Due November 11)

1. (10 points) Textbook, page 120, exercise 4.2. You only need to show the contents of the table as in Figure 4.14 in the textbook.

2. (10 points) Textbook, page 121, exercise 4.8.

3. (10 points) Textbook, page 121, exercise 4.11. (**Hint.** Consult the running time table on page 114 for Dijkstra's algorithm for different implementations, and the discussion below it.)

4. (70 points) Implement Dijkstra's algorithm for computing a shortest path from a designated vertex (A) to a designated vertex (B) in a directed graph. Your implementation should use a minimum heap as a supporting data structure. Please follow the instructions below.

   - **Programming languages.** You can use any standard programming language such as **C**, **C++**, **Visual C++**, **C#**, **Java**, or **Python**.

   - **Program requirements.** Your program should read the graph from a text file (assumed to be in the same folder as the source code) that **has the same format** as the input files uploaded on D2L (in the same folder as the assignment). Each input file starts with a line containing the number of vertices in the graph. The vertices are assumed to be numbered alphabetically starting with

vertex A. Each subsequent line in the input file contains the tail of an edge followed by a space, the head of the edge followed by a space, and the weight of the edge, respectively. Your program should output the weight of a shortest path from vertex A to vertex B in the graph and the sequence of vertices on a shortest path from A to B; the format of the output should match the format of the solution files uploaded on D2L (same folder).

- **Material to be submitted.** The files containing your source code. Make sure that the files compile and run. The grader will test your programs on the uploaded test files (text files). So make sure that your programs run on the uploaded files.

Please create a single ".zip" file containing all your answers to the problems on this assignment (i.e., source code as well as your solutions to the first 3 problems) and upload it on D2L. Your solutions to the first 3 problems should be provided as a separate document than your source code, but in the same zipped file.