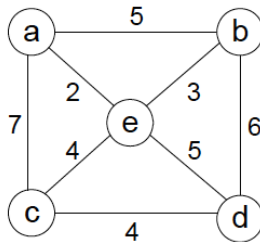


CPSC 5031 Algorithms
HW #7 (15 pts)

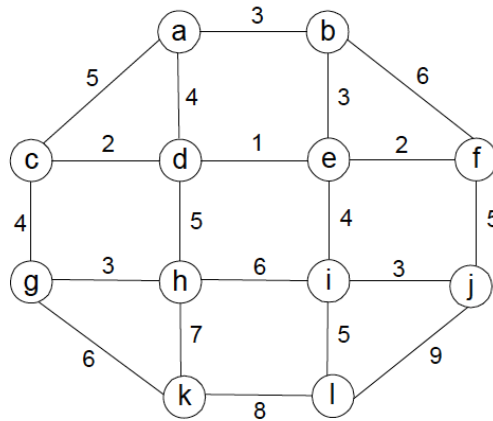
Problems (all problems may be found in the Levitin textbook):

Exercise 9.1 #9 (4 points)

9. a. Apply Prim's algorithm to the following graph. Include in the priority queue all the vertices not already in the tree.



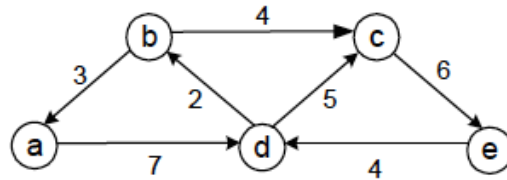
- b. Apply Prim's algorithm to the following graph. Include in the priority queue only the fringe vertices (the vertices not in the current tree which are adjacent to at least one tree vertex).



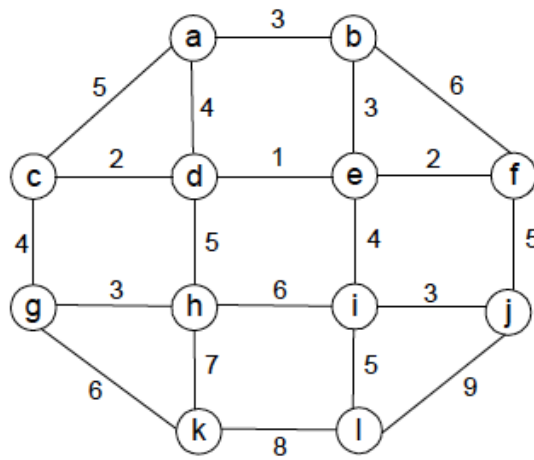
Exercise 9.3 #2 (4 points)

2. Solve the following instances of the single-source shortest-paths problem with vertex *a* as the source:

a.



b.



Exercises 8.4 #1 (2 points)

1. Apply Warshall's algorithm to find the transitive closure of the digraph defined by the following adjacency matrix:

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Exercise 8.4 #2a (1 points)

2. a. Prove that the time efficiency of Warshall's algorithm is cubic.

Exercise 8.4 #7 (2 points)

7. Solve the all-pairs shortest path problem for the digraph with the following weight matrix:

$$\begin{bmatrix} 0 & 2 & \infty & 1 & 8 \\ 6 & 0 & 3 & 2 & \infty \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & \infty & \infty & \infty & 0 \end{bmatrix}$$

Exercise 9.4 #1 (2 points)

1. a. Construct a Huffman code for the following data:

character	A	B	C	D	
probability	0.4	0.1	0.2	0.15	0.15

- b. Encode the text ABACABAD using the code of question a.
- c. Decode the text whose encoding is 100010111001010 in the code of question a.

Note(s):

- All problems may be found in the Levitin textbook.

Submission:

- Deadline: Monday, 5/29/2023, 11:59pm
- Submit your solutions on Canvas as a single PDF under HW #7