Assignment 3

COMP 4500
Due: February 16, 2024 by 11:59 p.m.
Upload your Word, PDF, or LaTeX file(s) to Blackboard

Exercises from the Textbook (50 points):

Page 188: 2, 3, 5, 8, 9

Additional Exercises (50 points):

1. Use the interval scheduling algorithm from the book to schedule the largest set of compatible intervals from the intervals below. State the intervals that make up this compatible set.

    [23, 39], [44, 64], [42, 46], [31, 42], [64, 72], [97, 102], [30, 48], [12, 22], [8, 20], [43, 59], [9, 17], [47, 54], [99, 100], [96, 114], [76, 86]

2. Make a table listing the shortest distances from node A to all other nodes in the graph below. Include in the table a previous node for each node other than A, allowing someone to reconstruct each shortest path.
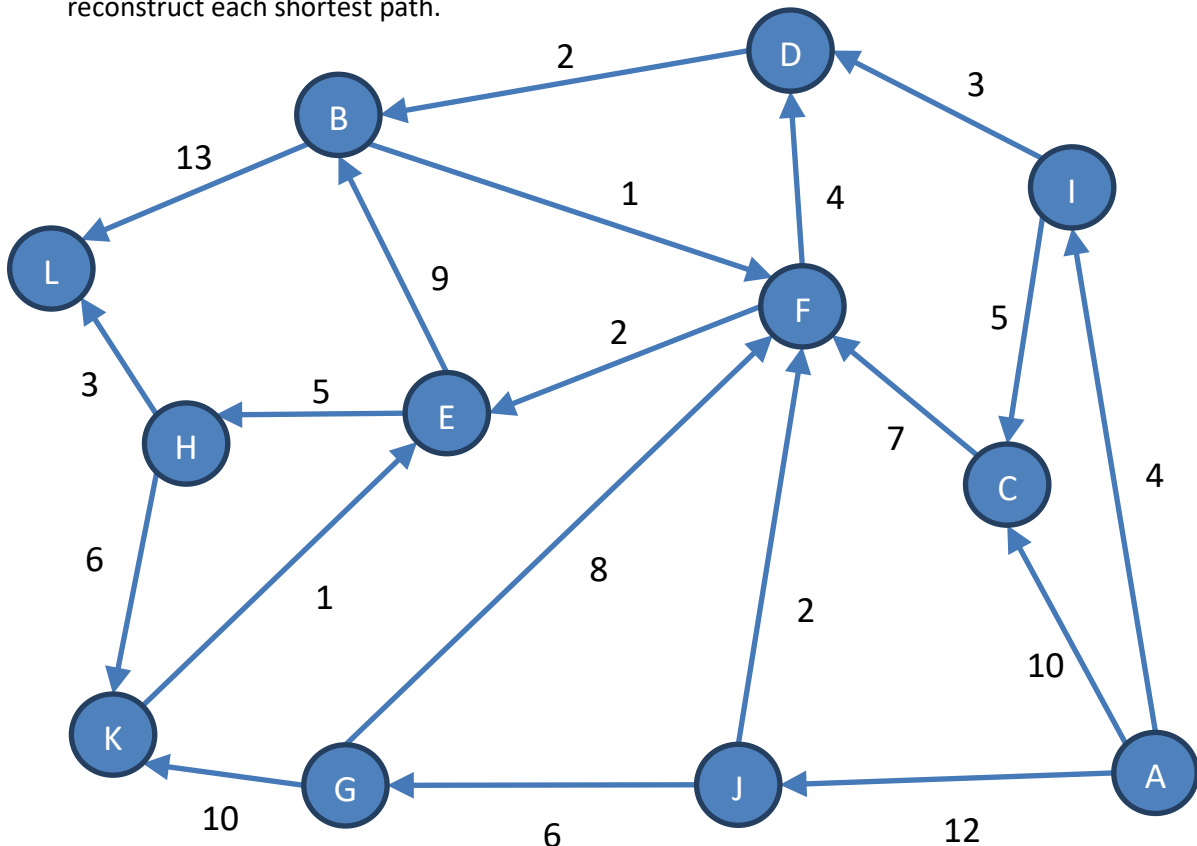
3. Draw a minimum spanning tree (MST) corresponding to the graph below. Please maintain the graph shape.
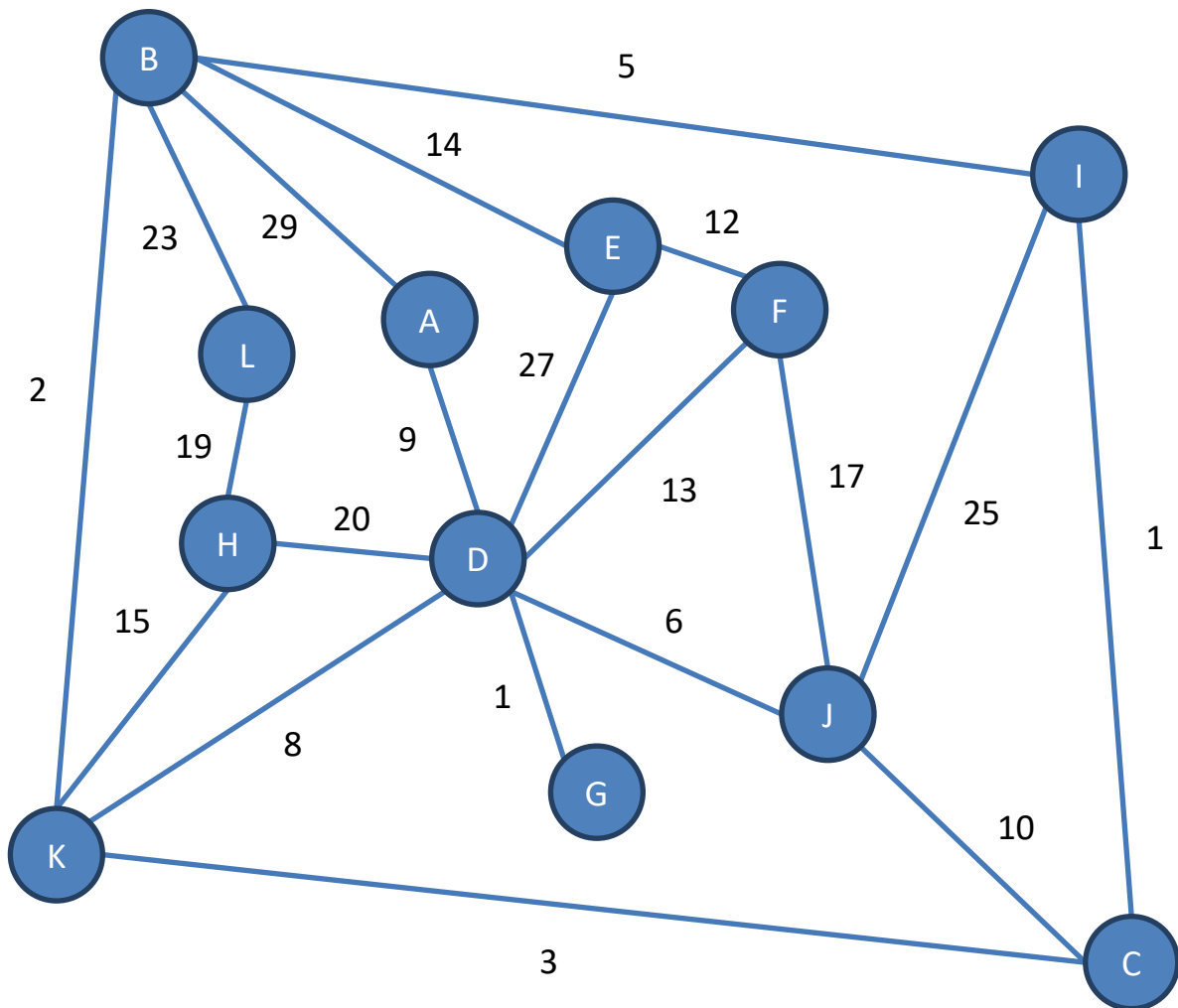
4. You are a cashier making change. Your drawer has an unlimited number of quarters, dimes, and pennies but no other coins. To make change, you follow the greedy algorithm of adding the largest coin less or equal to the amount owed, repeatedly. Does this algorithm make change in the smallest number of coins possible? Prove or give a counterexample.

5. This summer, you plan to make a road trip. Your gas tank holds enough fuel for *m* miles. You have a map of your route with an ordered list of *n* gas stations along the way and the distances they are from your starting point. (Each gas station in the list is further than the previous. The distance between any two consecutive gas stations is always less than *m*; otherwise, the trip would be impossible.) Your goal is to stop at the smallest number of gas stations possible. Give an algorithm to determine which gas stations you should stop at and explain why those are the optimal choices. State the running time of your algorithm in terms of *n*, the number of gas stations.