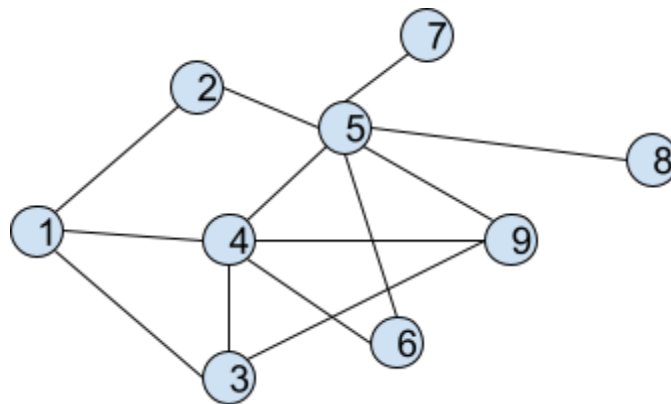


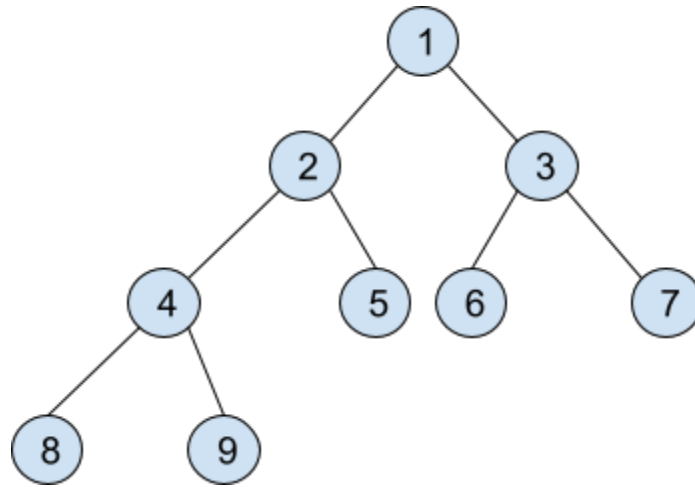
COSC581 - Algorithms
Spring 2023
Homework #5

Due: Tuesday, 03/07/2023, before class.

1. Construct a Huffman tree for the following set of frequencies and show the optimal encoding: {a:25, b:8, c:4, d:3, e:17, f:8, g: 2, h:1, i:30, j:2}
2. Suppose we must make a payment of n cents using only pennies, dimes, and quarters. We want to find the smallest set of coins possible with the total value n .
 - a. Prove that the greedy approach does not always work by finding a counterexample. Give an amount n , the set of coins that the greedy approach yields for this amount, and a smaller set of coins with the same total value.
 - b. Is there a set of coin denominations such that a greedy algorithm always yields an optimal solution? If so, provide such a system with at least three denominations.
3. Describe the graph shown below using each of the four types of graph representations discussed in class (adjacency matrix, adjacency list, incidence matrix, and a simplified DIMACS format). The simplified DIMACS format is as follows: one header line that consists of a tab separated pair of integers representing the number of vertices and edges in the graph, and then a series of lines consisting of (u,v) pairs of tab separated vertex indices that represent an edge between vertices u and v .



4. Given the following graph, show the order in which the nodes will be traversed for both a DFS (depth first search) and BFS (breadth first search).



5. For the following graph, name one algorithm to construct the minimum spanning tree. List the order in which you would add edges to the tree for your chosen algorithm.

