Homework #8

Grading policy: Only P1-P5 will be graded. The others are for your practice.

P1: Give an adjacency-list representation for a complete binary tree on 7 vertices. Give an equivalent adjacency matrix representation. Assume that vertices are numbered from 1 to 7 as in a binary heap. Assume the edges between a parent and its child is bidirectional.

P2: Show the d and π values that result from running breadth-first search on the directed graph Fig 1, using vertex 3 as the source.

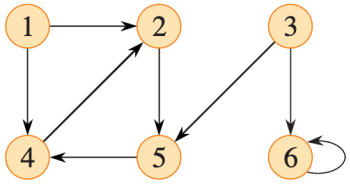

Figure 1: Problem 2.

P3: Show how depth-first search works on the graph of Fig. 2. Assume the for loops and adjacency discovery in the DFS procedure consider the vertices in a order ascending index. Show the discovery and finishing time for each vertex and show the classification of each edge.

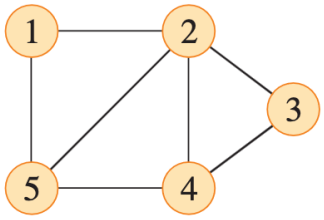

Figure 2: Problem 3.

P4: (1) Does Figure 1 have a topological order? (2) Remove the edges $(4, 2)$ and $(6, 6)$, use the topological sorting algorithm with DFS find a topological sorting of this graph. Using the assumptions from Problem 3 to decide the orders of vertices. (3) Can you find another valid topological sorting for the graph?

P5: Modify the pseudocode for depth-first search so that it prints out every edge in the directed graph G, together with its type (T, F, B, C).

P6: Leetcode 207. Course Schedule

P7: Leetcode 785. Is Graph Bipartite?

P8: Leetcode 1334. Find the City With the Smallest Number of Neighbors at a Threshold Distance

P9: Leetcode 2959. Number of possible sets of closing branches

P10: Leetcode 1584. Min Cost to Connect All Points