Missouri University of Science & Technology — Department of Computer Science

Fall 2018 — **CS 2500: Algorithms**

Homework 4: Graph Algorithms: Part I

Instructor: *Sid Nadendla* — **Due:** *November 11, 2018*

In this homework, we will focus our attention to searching on graphs and finding minimum spanning trees.

Problem 1: Graph Traversal *50 points*

1. Demonstrate both breadth-first search (BFS) and depth-first search (DFS) algorithms (with v_5 as the start node) on the graph shown in Figure 1. Clearly show how each node-attribute (including frontier) changes in each iteration in both the algorithms. (*20 points*)

2. Implement both BFS and DFS algorithms in Python, using an adjacency list representation for the graph shown in Figure 1. (*30 points*)

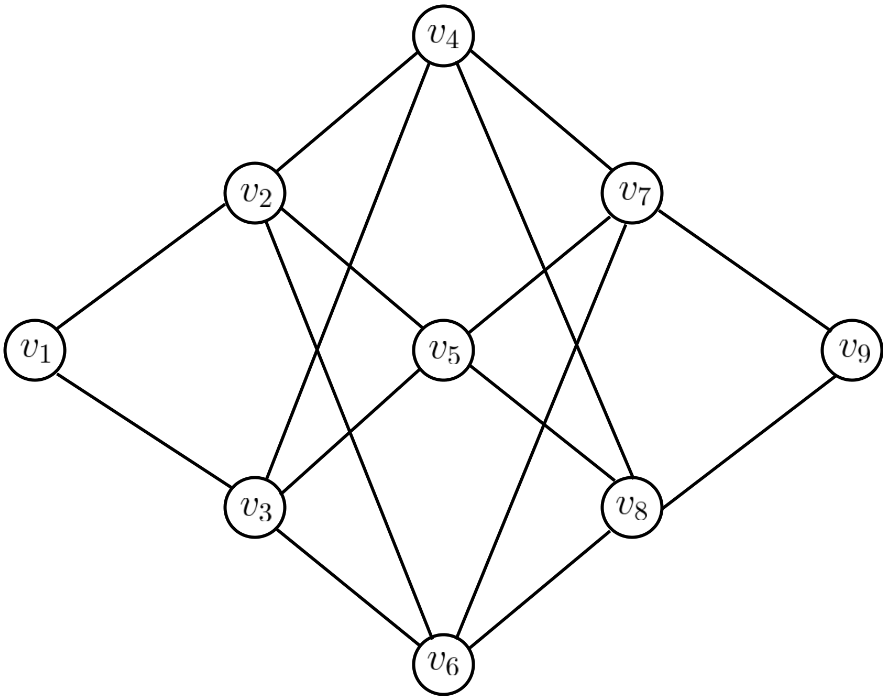

Figure 1: Example Graph for Search Algorithms

Problem 2: Minimum Spanning Trees *50 points*

1. Demonstrate both Kruskal's and Prim's algorithm (with vertex v_1 as the start node) for the petersen graph shown in Figure 2. (*20 points*)
2. Implement Prim's algorithm in Python, using an adjacency matrix representation for the graph in Figure 2. (*15 points*)

Bonus Problem (10 points):

- Implement Kruskal's algorithm in Python with the disjoint set data structure discussed in the class, using an adjacency matrix representation for the graph in Figure 2.

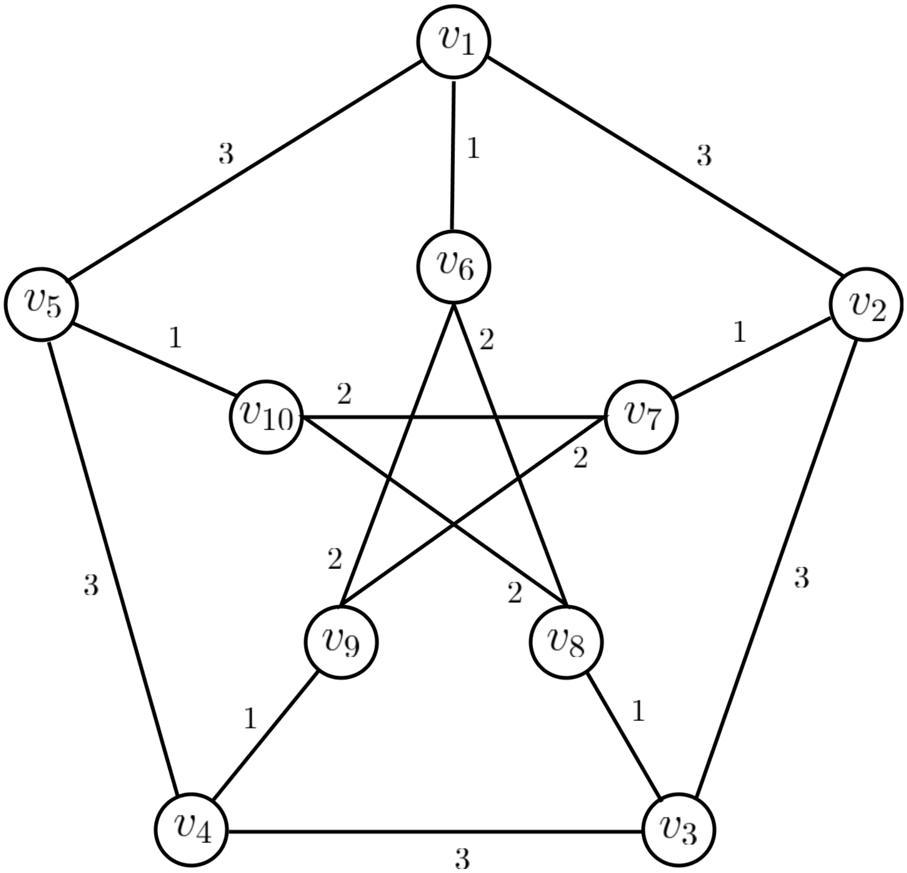

Figure 2: Petersen Graph