Missouri University of Science & Technology

Spring 2023

Department of Computer Science

CS 2500: Algorithms (Sec: 102)

Homework 4: Graph Algorithms: Part I

Instructor: Sid Nadendla Due: April 24, 2023

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  $v_1$  as the start node) on the unweighted, undirected 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 a graph class based on adjacency list representation, and demonstrate it on the example graph shown in Figure 1. (30 points)

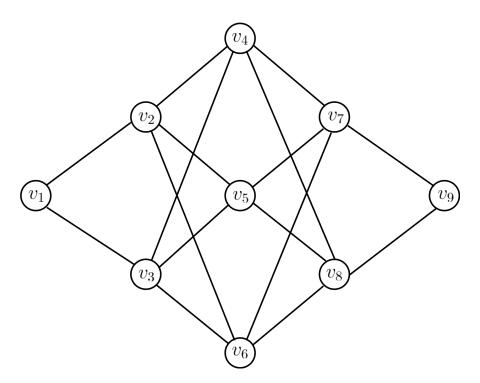


Figure 1: Example Graph for Search Algorithms

## **Problem 2: Minimum Spanning Trees**

50 points

- 1. Demonstrate Prim's algorithm (with vertex  $v_{10}$  as the start node) for the Petersen graph shown in Figure 2. (20 points)
- 2. Implement Prim's algorithm in Python as a method within the graph class built using adjacency matrix representation, and demonstrate it on the Petersen graph shown in Figure 2. (15 points)

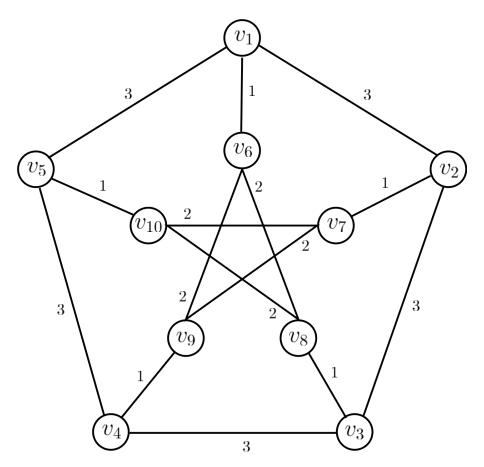


Figure 2: Petersen Graph