**CMPSC 412 – Lab-8** (50 points)

**Graph - Basics**

**Due date: 11/01/2022**

**Lab Exercises:** Implementing Graphs, BFS, DFS and Dijkstra’s algorithm

**Exercise-1:**

Write a class for graph data structure containing the following functions:

1. Function to generate the list of all edges

**#def** generate\_edges(graph):

1. Function to calculate isolated nodes of a given graph

**#def** find\_isolated\_nodes(graph):

1. Function to find a path from a start vertex to an end vertex

**#def** find\_path(start\_vertex, end\_vertex, path=None):

1. Function to find all the paths between a start vertex to an end vertex

**#def** find\_all\_paths(start\_vertex, end\_vertex, path=[]):

1. Function to check if a graph is a connected graph.

**#def** is\_connected(vertices\_encountered=**None**,start\_vertex=**None**):

Note: each function should take a graph as a parameter along with other required parameters. Check each function with an example. You might require more examples (test examples (minimum: 2)) for the completion of this assignment. Some functions in the file might not take graph as an input parameter. Explain each function in 2-3 lines.

Attach the code and screenshots of your results here.

**Exercise-2:**

Draw the graph corresponding to the following adjacency matrix. Attach the screenshot of the image here (if drawn on a paper)

Text, table

Description automatically generated

Attach the code and screenshots of your results here.

**Exercise-3:**

Implement the graph corresponding to the following list of edges

Table

Description automatically generated

1. Ignoring the weights, (program) implement/perform a breadth first search on the graph from the previous question.
2. (Program) Implement/Perform a depth first search for the above graph.
3. (Program) Implement Dijkstra’s algorithm to the graph shown above.

Attach the code and screenshots of your results here.

Deliverables: Report, codes and the demonstration video (~3 minutes)

For video demonstration, answer the following questions:

1. In exercise-1, explain how Function to find all the paths between a start vertex to an end vertex works?
2. Explain the program for BFS, DFS and Dijkstra’s algorithm?