Department of Computer Science
COMP2421 (First Semester – Fall 2024/2025)
Project#4 Due Date: 10 January 2025 (before midnight-by 23:59)

In this project, you will implement a Network packet routing system. This project is an application of Dijkstra's and Breadth First Search (BFS) algorithms of a single source shortest path.

You should read the data from the given file *routers.txt* and then construct the shortest path between a given router (input from the user) and a destination router (input from the user). You should print the full path and the total cost (i.e. latency) using both algorithms.

Specifications:

- Graph
  - Nodes: each node in the graph represents a router in the network (i.e., node).
  - Edges are links between routers in the network.
  - The edges are represented as latencies (in milliseconds).
- Algorithm
  - You should use Dijkstra's algorithm and BFS algorithms to computer the shortest path between given two nodes in the graph.
  - You should use Adjacency Matrix to represent the graph.

Menu:

1. Load routers: loads the file and construct the graph
2. Enter source: read the source router
3. Enter destination: print the full route of the shortest path including the total shortest cost for both algorithms (Dijkstra and BFS)
4. Exit: prints the information of step 3 to a file called shortest_distance.txt and exits the program

Example:

Assume you have the following routers: A, B, C, D, E, F

The input file routers.txt will contain the following: From-To-Latency

A-B-10

A-C-15

B-D-12

B-E-15

B-F-30

C-E-10

D-E-2

D-F-1

E-F-5

Assume the user input is Source: A and Destination: F, then the algorithm should print the following:

Shortest path from A to F is:

Dijkstra: A -> B -> D -> F with a total cost of 23.

BFS: A -> B -> F with a total cost of 40.

Notes and submission instructions:

1. **This is individual work**. It should represent your own efforts. It is fine to discuss your work and to ask your colleagues, but you are not allowed to copy/paste the work of others or give your work to anyone else. You are not allowed to post/copy from other websites and/or social media and this will be considered as cheating.
2. Any **plagiarized** code will not be marked.
3. **Document format**. Please submit only the code file (**c** file) containing the code of your project. Please rename it as follows: "**P4_YourStudentID_FirstNameLastName_SectionNo.c**".
4. **Input/output file name**. Make sure that the input/output file names are the same as in the specifications.
5. Include your full name, student ID, and section number in the beginning of your file.
6. Please do not compress the file, only the C-file is needed.
7. Files not following the naming convention in point 3 will not be marked.