National University of Computer and Emerging Sciences

School of Computing Fall 2022 Islamabad Campus

CS2001: Data Structures (Fall 2022)
Assignment 3
(Deadline: 8th December 2022, 08:00 AM)

Submission: Assignments are to be done individually. Submissions that do not comply with the specifications given in this document will not be marked and a zero grade will be assigned. Write your name and e-mail id in a comment line in on top of each source file. You are required to submit a single zip file containing an archive of your code files on Google Classroom. You should name your zip as i21-XXXX.zip where i21-XXXX represents your student id.

Deadline: Deadline to submit project is **8th December 2022, 08:00 AM**. No submission will be considered for grading outside Google Classroom or after **8th December 2022, 08:00 AM**. Correct and timely submission of project is responsibility of every student; hence no relaxation will be given to anyone.

Plagiarism: -100% marks in the project if any significant part of project is found plagiarized. A code is considered plagiarized if **more than 20%** code is not your own work.

A SIMPLE TRAVEL PLAN CALCULATOR

You have been given an Excel file (GraphData.xlsx) which is an adjacency-matrix representation of a weighted graph of different cities of Pakistan. Each cell of adjacency-matrix has some non-negative number which is distance from one city to other adjacent city if a road(s) segment(s) does exist. Otherwise, there will be zero (0) which means no edge/road-link does exist. You are required to develop an application with features / functionality / options listed below:

Features/Options to be Supported

1. Create graph data structure using the given input. Your application should have the option/feature to add new city/node, add new edge/road-link, drop a city/node, drop an existing edge/road-link etc. [30 marks]
2. Option/feature for computing Shortest and Alternate (2nd shortest) paths from a city chosen by the user to all other cities (given in graph). Output should be displayed in the form of a list/sequence of city/cities names to be visited while travelling on shortest/alternate path from a specified city to other cities. The same output may be displayed in graphical/map form. Shortest and Alternate paths should be displayed at once. [30 marks]
3. Option/feature for computing Shortest and Alternate (2nd shortest) paths from all cities to a specified/given city (selection/input to be given by the user). Output should be in the form as mentioned above (Option / Sr. # 2). [20 marks]
4. Option/feature for computing Shortest and Alternate (2nd shortest) paths from a pair of cities chosen (e.g. Islamabad to Lahore) by the user. Output should be in the form as mentioned above (Option / Sr. # 2). [20 marks]

Good Luck!