

Assignment 3 (15% of total marks)

Due date: 24th August 2019, Saturday by 2359 hours

Scope:

The tasks in this exercise consist of activities in the areas of **Data Structures and Algorithms, in particular, algorithm design strategies – Greedy Algorithm, Branch and Bound, backtracking and Divide and Conquer**. The exercises cover the topics discussed in topics 5, 6, and 7.

Marks:

Total mark: 100

Weightage: 15% of total subject mark

Assessment criteria:

Marks will be awarded for:

- Correct,
- Comprehensive, and
- Appropriate

application of the materials covered in this subject.

Assignment Specification:

Part A: (20.0 marks)

Question 1 (20.0 marks)

Draw an **adjacency list** and an **adjacency matrix** representation of the undirected graph shown in Figure G-1. **(20.0 marks)**

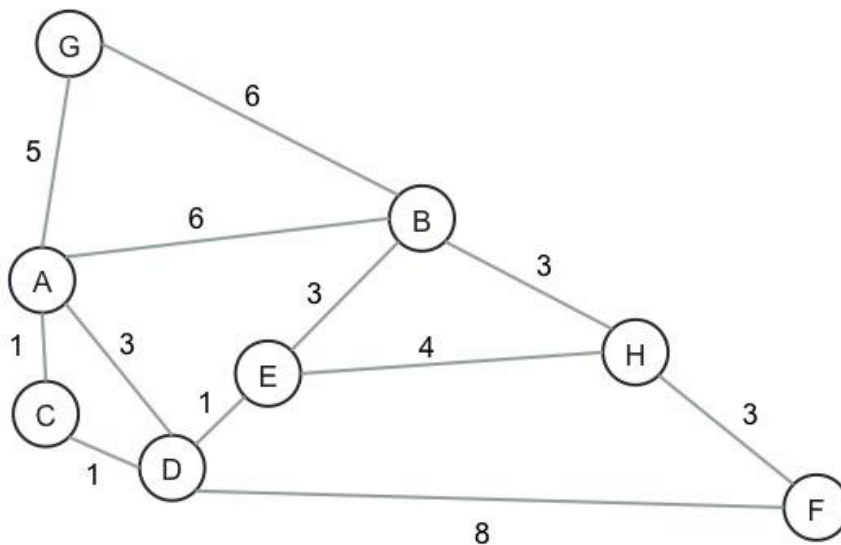


Figure G-1.

Part B: (80.0 marks)

You are engaged to develop an application that helps a manager to determine the shortest route a delivery vehicle needs to use between cities. Having studied CSCI203 - Data Structure and Algorithms, you recognize that this is an application for Dijkstra's shortest path algorithm. To prepare for your proposal, you decide to implement it on your computer.

The requirements are listed below.

Note that marks are also awarded for presentation of your program output.

Requirement 1 – Representation of the map in Figure 1

Represent the city-distance information shown in the map in Figure 1 with a weighted graph using adjacency matrix or link-list.

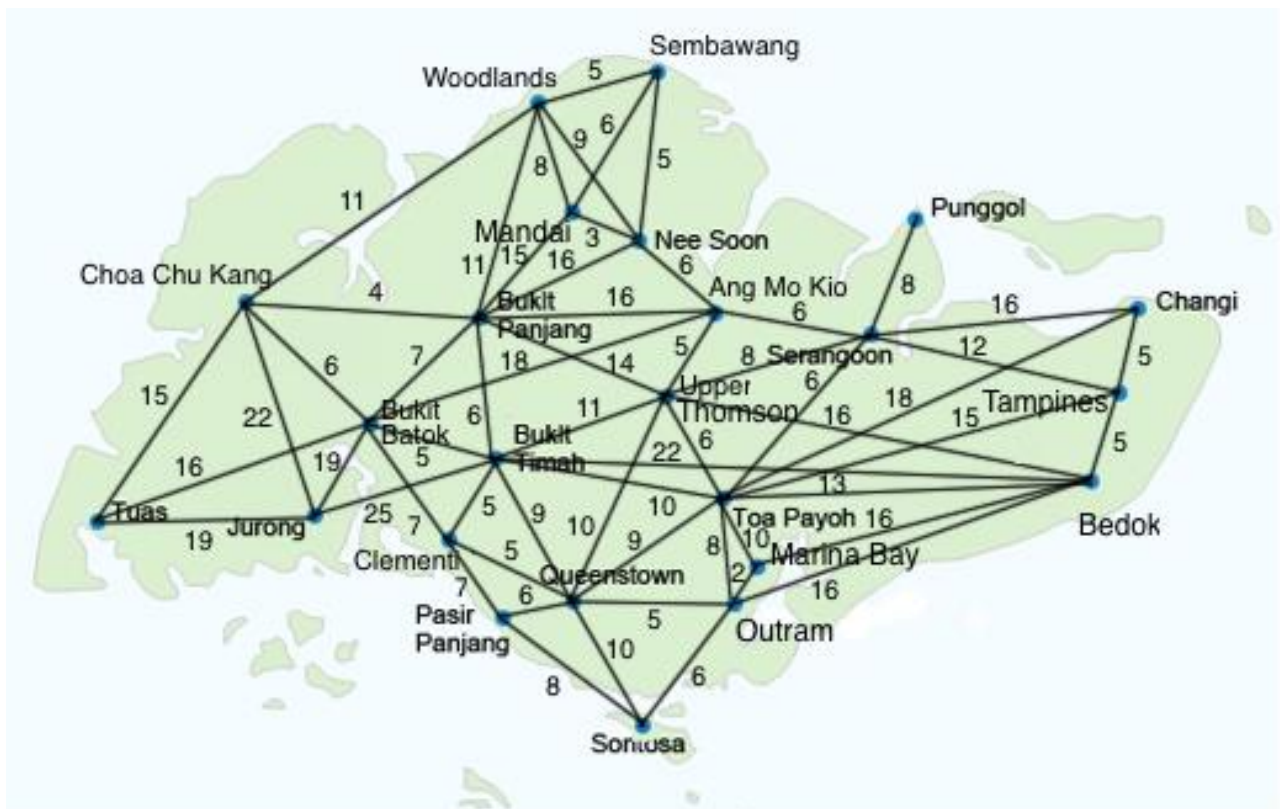


Figure 1

Requirement 2 – Implementation

Write an interactive program that given the start and destination cities, will determine the shortest route between them and its total distance. It is all right to have 0 distance; i.e., start and end at the same city. You can assume that the roads are all bi-direction; i.e., vehicle can travel in both directions. The output of your program may look something similar as follow:

Start from: Changi
To: Choa Chu Kang
Path: Changi -> Toa Payoh -> Bukit Timah -> Bukit Batok -> Choa Chu Kang
Total distance: 39 Km.

Requirement 3 – Test run

Test your program by determining the following routes:

- Changi to Choa Chu Kang
- Bedok to Bukit Batok
- Marina Bay to Woodlands
- Sembawang to Bukit Timah
- Upper Thomson to Outram
- Bukit Batok to Tampines

Requirement 4 – Program Complexity

Derive the program running time complexity of your algorithm using Big-O notation. State clearly how you arrive at the Big-O notation. Partial marks will be awarded only for stating without showing the work in arriving at your conclusion.

Others (optional) – Additional features or tasks will be considered and awarded marks. For example, originated from and terminated on the same city ☺ How about alternative route? Etc.

Submissions

This assignment is due by 24th August 2019 at 2359 hours Singapore time.

- For Part A, type your answer for each question in a MS Word or equivalent document format and save it in a pdf formatted file, name your file as YourName-A3-SolPartA.pdf
- For Part B, the name of your program should be greedyAlgo.cpp or greedyAlgo.java, depending on the programming language that you use to develop your program. Execute your program with the test data provided, that is, A3Data.txt and **screen capture** your output. Next, zip your source code, libraries, readme.txt together with your screen capture and name your file as YourName-A3-SolPartB.zip.
- Zip together YourName-A3-SolPartA.pdf and YourName-A3-SolPartB.zip and name your file as YourName-A3.zip. Do not use your own filename.
- All assignments that do not satisfy the submission requirements listed above will not be evaluated and will be returned to the students with 0 marks.

Submit the files **YourName-A3.zip** through Moodle in the following way:

- 1) Access Moodle at **<http://moodle.uowplatform.edu.au/>**
- 2) To login use a Login link located in the right upper corner the Web page or in the middle of the bottom of the Web page
- 3) When successfully logged in, select a site **CSCI203 (SP319) Algorithms and Data Structures**
- 4) Scroll down to a section Submissions of Assignments
- 5) Click at Submit your Assignment 3 here link.
- 6) Click at a button Add Submission
- 7) Move a file, for example, **YourName-A3.zip** into an area. You can drag and drop files here to add them. You can also use a link *Add...*
- 8) Click at a button Save changes,
- 9) Click at a button Submit assignment,
- 10) Click at the checkbox with a text attached: By checking this box, I confirm that this submission is my own work, ... in order to confirm authorship of your submission,
- 11) Click at a button Continue.

A policy regarding late submissions is included in the subject outline.

Only one submission per student is accepted.

Assignment 3 is an individual assignment and it is expected that all its tasks will be solved individually without any cooperation with the other students. Plagiarism is treated seriously. Students involved will likely receive zero. If you have any doubts, questions, etc. please consult your lecturer or tutor during lab classes or over e-mail.

***** End of Assignment Specification *****