Department of CIS

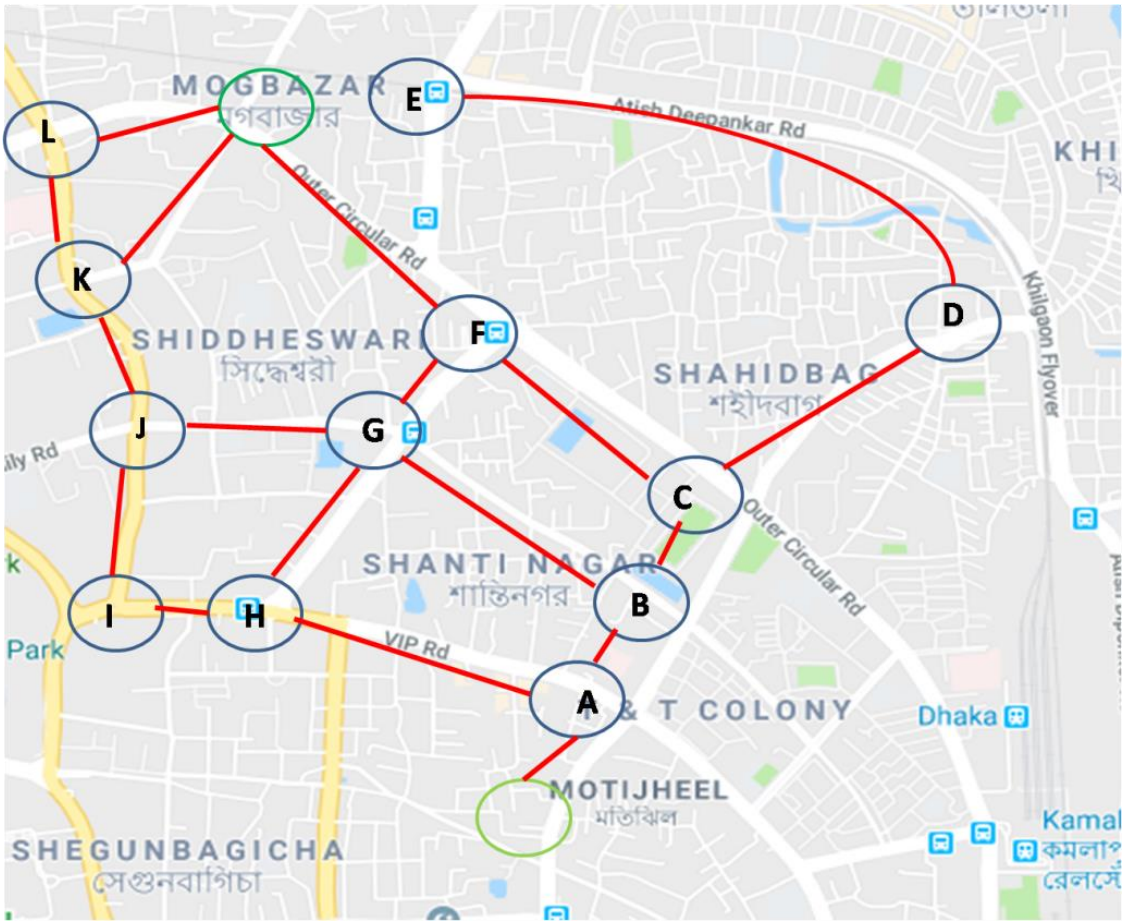
Subject: Algorithm
Spring 2021

Question

A portion of the map of Dhaka is given in the picture.

There are 2 mother nodes **Motijheel**, which is the source, and **Moghbazar** the destination**. The other nodes from A to L represent intersections**. There are **multiple routes** to reach from source to destination. The table below shows the weights of each route which represent **the level of traffic**. **The higher the value, higher the traffic**.

Vertex 1	Vertex 2	Traffic Level
Motijheel	A	4
A	B	3
A	H	2
B	G	6
H	I	7
B	C	5
C	F	3
C	D	7
D	E	2
F	G	1
F	MOGHBAZAR	3
G	H	4
G	J	7
I	J	1
J	K	4
K	L	6
K	MOGHBAZAR	7
L	MOGHBAZAR	2



Theory Part (35 Marks) -

Task 1 (Design): 15 marks

a) Design an algorithm to find the best route for the problem above. Your algorithm should not manually check every edge in the graph, rather it should opt for a greedy approach.

b) If you were to visit all the intersections in the graph by crossing the least amount of traffic instead of finding the shortest route, which algorithm could you use?

Task 2 (Simulation): 15 marks

a) Simulate the algorithm you have written for the given test case to find the shortest route from Motijheel to Mogbazar.

b) Simulate the second algorithm that visits all the nodes with the least cost.

Task 3 (Critical Evaluation): 5 marks

a) Mention any alternate algorithms that might be used to solve the shortest route problem without resorting to a greedy approach and compare its time complexity with the algorithm that you used.

Lab Part (25 Marks) –

Task 1 (15 Marks):

Write the Java Code for the problem based on your algorithm.

Task 2 (7 Marks):

a) BFS is an algorithm that also gives the shortest path between source and destination. Run BFS on the given graph and show the output.

b) Explain why BFS is not guaranteed provide the shortest route in most cases?

Task 3 (3 Marks):

If you were to change some of the edge costs in your given graph to negative values, the greedy approach to the shortest path algorithm would not work. Why would that be? Explain briefly.

Submission Guidelines:

- Your submission should be in the form of a single word-processed document **(.doc or .docx)** that includes any necessary diagrams.
- Naming of the file as **example:** 183-16-315.docx
- **Marks will be deduced accordingly if any plagiarism of work is provided.**

DEADLINE: 15th April 2021