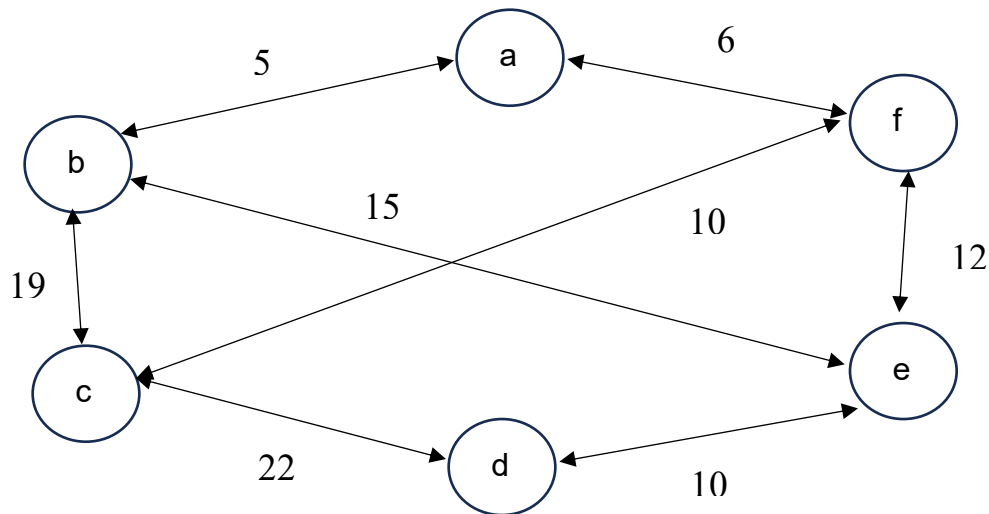


CS3613 - Assignment 1

Deadline – 10th November 2024 11.59 PM.

Imagine you are the manager of a courier service responsible for delivering packages within a busy city. Your objective is to optimize the delivery routes to minimize delivery time. Each package has a specific delivery address, and the delivery trucks have limited capacities and must visit multiple locations in a single trip. The city map is a graph with delivery locations as nodes and roads as edges. The time to travel between two nodes is proportional to the distance between two nodes, as indicated on the map. Always, the node “a” represents the courier service station, which is the starting point. For example, consider the map given below. The trucks should start from node (a) and deliver assigned items to different delivery locations by following the map. Trucks are allowed to go on the same roads if it is needed.



Your task in this assignment:

You are given an input file named “input.txt”. The first n lines of this file contain the city map as $n \times n$ matrix (elements in the rows are separated by comma), where n is the number of delivery locations + courier service station. Each cell value of the matrix represents the distance between the nodes. “N” means there is no road between the nodes. $n+1$ line onwards, you are given the information about the trucks that belong to the courier service in the format “truck_<<number>>#<<capacity>>”. Check the given input.txt file. For example, in the given input file, there are two trucks, truck_1 with capacity 3 and truck_2 with capacity 2. Each truck makes a number of deliveries similar to its capacity.

Write a Python script to find out the delivery sequence of each truck using the Hill-Climbing algorithm. Your script should read the input.txt file to obtain the map of the city, number of trucks and capacity of each truck. After applying your algorithm, the result should be written to the <<Your Index Number>>.txt file where each line shows truck_<<number>>#<<delivery sequence (comma separated)>> followed by the total distance travelled by all trucks. For example, for the given scenario, the output file can be as follows:

```
truck_1#b,c
truck_2#f,e,d
52
```

Check the file named 123456A.txt. Note that the output file may not contain the optimal solution.

In evaluation, a different scenario will be input into your algorithm and checked for output.

You may use any variation of the Hill-climbing algorithm.

Use Python 3.8 for the implementation. Upload your script renamed with <<Your Index Number>.py to Moodle by the deadline.

This assignment is graded automatically. Therefore, ensure your script runs without errors and adheres to the description. Note that your submission will be checked using Turnitin for plagiarism. The maximum acceptable similarity score is 20%. For each exceeding 10%, a penalty of 10% will be applied to your mark. For example, if you obtain 60 for the assignment and the similarity score is 30%, your final grade will be 54.

If you have any questions, email sandarekaw@cse.mrt.ac.lk.