Graphic Era Hill University, Dehradun
DS Course Project Due on 31, December 2022

In public intracity transport system (like UKTC in Dehradun), the pick-up and drop-off locations are determined by the service provider, not by the passenger. On the other hand, a taxi (like ola, uber cabs) is a small vehicle with a driver, used by individual (or a small group of people) to travel between locations of their choice. The taxi service is the most comfortable, but the costliest mode of transport, whereas the public/bus system is the cheapest, but least comfortable. Dial-a-ride is a form of public transport system which tries to achieve the comfort level of a taxi service at low cost. It is characterized by flexible routing and scheduling of small vehicles operating in shared-ride mode (there will be others who will share the vehicle with you during the journey) between pick-up and drop-off locations as requested by passengers. There are many variants of this problem, we will consider one such (simple) variant for this project.

A typical passenger request in Dial a ride problem will look like,

<Clock tower, Graphic Era Hill University, Dehradun, (10:40AM, 11:15AM) >

meaning the passenger wants to go from Clock tower to Graphic Era Hill University, Dehradun (GEHU) and he would like to be picked up in Clock tower between 10:40 AM and 11:15 AM. Such requests are generally registered though telephone or Internet. It is not necessary that vehicle will take the shortest route, it might deviate from the shortest route to pick some other passenger, but the passenger will be charged based on the shortest distance between the locations that he is travelling. The main objective of the project is to schedule the cabs, in such a way as to maximize the revenue.

You are given n(100) main locations of the city and distances to from each location to some of its neighboring locations. You can compute the shortest distance from this data (you may assume that every location is reachable from every other location). The amount of money that a passenger will pay to go from location A to B is proportional to the shortest distance from A to B. You can assume that the base rate is Rs.1 per KM.

You are given N (25) vehicles, each of capacity c(5). You can assume that the average speed of these vehicle is 2 minutes per KM. You are also given the location of these vehicles at midnight. You are given R (5000) passenger requests. A request is of the form A, B, t1, t2 implying that the passenger would like to picked up at location A between time t1 and t2 , and he should be dropped at location B. For simplicity, you can assume that all the locations are integers between 1 and n and the time is in minutes between 0 and 1440, with midnight as reference point. 10:40AM will be noted as 640.

You must write a program to schedule the N vehicles in such a way as to maximize the revenue. You can decide to reject a passenger request (it may not be possible to meet all the requests).

The input will be given in the following format

nN cR

n * n matrix indicating the distances to nearest locations.

A sequence of N locations - indicating where the vehicle is at midnight.

A sequence of R requests.

Expected output of the program is schedule for each vehicle and the total revenue generated.

For example the input can be

5 10 5 20
-1 10 -1 -1 -1
10 -1 25 10 -1
-1 25 -1 20 30
-1 10 20 -1 -1
-1 -1 28 -1 -1
1123445521

```
1 4 600 645
5 1 610 623
2 5 639 672
1 2 619 623
1 5 640 720
2 5 647 723
4 2 625 739
1 4 700 745
4 1 239 839
2 4 739 752
1 3 719 923
2 5 654 729
4 5 704 723
4 2 625 739
2 5 645 725
2 1 647 723
4 3 655 739
1 4 720 745
4 2 239 539
2 4 390 752
```

Do's
• This project is to be done individually, but you can consult and discuss the project with anyone, including your classmates.
• Each student should submit the code and a report. Report should contain the details of the data structures and algorithms used and reasons for the choice. It should also contain the list of classmates with whom you have discussed this project and document, paper, webpages from where you have got your ideas from.
• Students are expected to write the code and the report starting with a blank page, not use copy/paste at any point later!

Don'ts
• Copying the code/report for your classmate, making changes to it and submitting.
• Joint work Group of people work on different aspects of the project, put them together, try to make different copies for each (looking differently of everyone).