

University of Engineering and Technology Lahore
Data Structures and Algorithms
Semester Project

Submission Deadline: 10-08-2020

Problem Statement

In this project, you are asked to store and manage the records of a postal service company, *FXL*. You are free to choose the data structure of your choice, keeping in mind the efficiency of different functions to be implemented.

Problem Detail

The postal service wants to maintain a system to

1. Store, update and access records of its employees
2. Allow its customers to order different delivery services

1. Employee Record System

Employee Record: Each Employee has the following attributes.

- Name
- Unique Service ID
- City
- Service Type

You are required to implement the following functions for this task, use a data structure of your choice and mention the time complexity for each function.

- a. Create:** This function shall create and initialize the Employee records (ERecord). A file containing records of Employees is already given. You have to read and store data from the file at the start of the program. The function can be thought as a sequence of multiple insertions. You can reuse the code from Programming Assignment 1 for reading the file.
- b. RetrieveData:** This function shall search for the employee records based on their unique service IDs. It will take user input for the ID to be searched and display the entire record of the employee if found.
- c. NewEmployee:** This function shall add a new employee in ERecord. It will take user input for all the employee attributes and add it into the system.
- d. UpdateData:** This function update an attribute of an employee. It will take user input for the ID whose record needs to be updated and then update the required record in the system.

2. Delivery Services

In this task you will allow a customer to order a delivery service, by selecting the service type, their current city and the city the where the parcel should be delivered. Your program should output the delivery cost, time and employee name after finding the suitable match. The details of different service types are listed below.

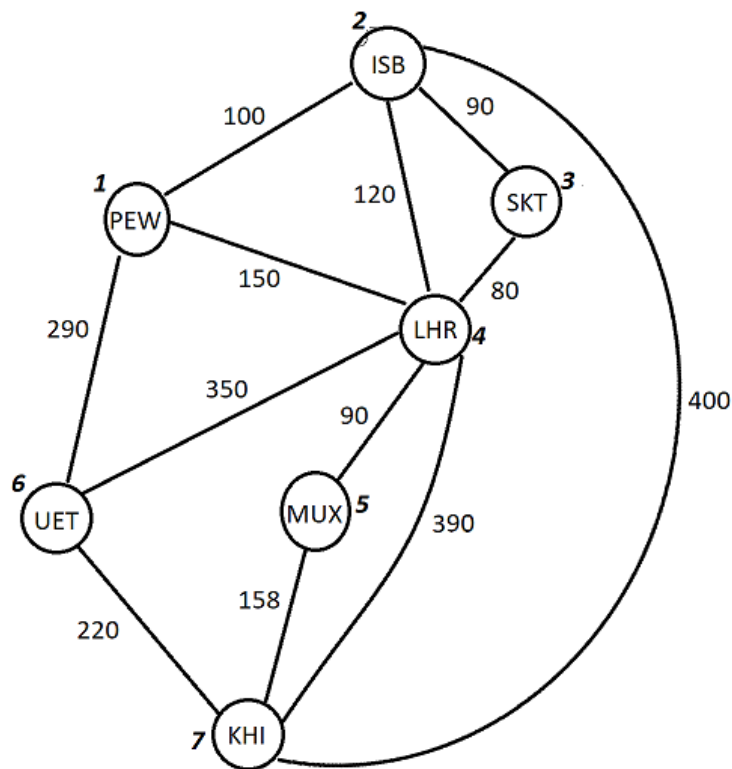
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Service Type	Time	Charges
Express	0.005 days/km	2.5 rs/km
Priority	0.025 days/km	1.5 rs/km
Standard	0.055 days/km	0.65 rs/km

You are required to implement the following function to find the most suitable match.

- a. **FindRoute:** This function will find the shortest route between the two given cities. This function needs to be generic, such that given any change in routes it can still find the shortest path. The graph below shows a sample map of the cities with their distances. You can implement this function at the start and store results for shortest path between cities or you can find it each time an order is placed.
- b. **Cost:** Once the shortest route is found, the cost and delivery time can be calculated and displayed based on the customer's service preference. For the delivery time display the days to nearest (round up) integer.
- c. **FindEmployee:** This function will find and display employee based on the current city and service type. If more than one employee matches print the first one.



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Project Deliverables:

1. You will implement a main menu for the user to access all the functions detailed above. At the start the program will ask the user if they want to access as company or customer. The company will be given the options to add new employee, retrieve and update existing employee data. The customer will be given option to select service type and add city information.
2. Sample files for employee records and city maps are given to you however, the code should be generic and should work even if the given data, specifically city distances are changed.
3. Your report should have the following sections
 - a. Project Design
 - i. Data Structure: In this you will clearly state the reasons for choosing a data structure for implementing Task 1 and clearly show the time complexity for each function for your implemented data structure. (1 page)
 - ii. Pseudo Code: In the task you will add brief hand written pseudo code for all the functions of task 1 and 2. Code logic for **FindRoute** function should be discussed in detail. (3 pages)
 - b. Code implementation
 - i. Functions: Add screenshots of all the functions you have made. Comments should be added in the functions.
 - ii. Output: Add screenshot of the output of each function for various inputs.
4. Add all the code files in the zipped folder and submit it along the project report in pdf format. Rename the folder and report as Proj_Rollnumber.

Grading Breakdown:

Task	Marks	Total
Task 1		
Data structure choice	2	2
Code logic and time complexity	0.5 per function	2
Functions C code implementation	1 per function	4
Task 2		
FindRoute pseudo code	2	2
FindRoute C code implementation	3	3
Cost Function C code	1	1
FindEmployee Function C code implementation	1	1
Total		15