Bahria University
Discovering Knowledge

Spring 2023
Department of Computer Science
Bahria University, Karachi Campus

NAME: MADEEHA TALIB
ENROLLMENT NO: 02-235221-010
COURSE: DSA (CCP)

ASSIGNMENT No. 3

Complex Computing Problem

Maximum Marks: 10

Instructions

1. **This assignment is a complex computing problem which will be performed individually.**
2. **Assignment should be submitted in hardcopy and will also be uploaded on LMS**
3. **Deadline will not be extended for any reason.**
4. **Viva will be conducted at the time of assignment submission**
5. **Copied assignments would have zero marks.**
6. **Individual efforts would be appreciated.**
7. **Name, class, section, department and roll number on the sheets must be mentioned correctly.**
8. **Make a single PDF file as both soft copies and hard copy are mandatory.**

Attribute	Problem Solving description
Depth of analysis required	Has no obvious solution, and requires conceptual thinking and innovative analysis to formulate suitable abstract models
Depth of knowledge required	A solution requires the use of in-depth knowledge of data structures and an analytical approach that is based on well-founded principles.
Level of problem	A solution is efficient in terms of complexity

Solution must be designed by applying the following attributes/characteristics

Design an efficient programming solution for the given computing problem. Utilize all concepts of data structures and algorithms and apply appropriate data structure which you have studied in the theory and lab sessions.

(CLO4, PLO4, C6)

Bahria University
Discovering Knowledge

Spring 2023
Department of Computer Science
Bahria University, Karachi Campus

NAME: MADEEHA TALIB
ENROLLMENT NO: 02-235221-010
COURSE: DSA (CCP)

CASE STUDY:

Daewoo Bus Services is actively working towards enhancing the efficiency of their system for their users. To cater to their passengers, they aim to develop a user-friendly application that enables users to easily search for buses. By simply entering the departure location, arrival location, and desired date of travel, users will be presented with a list of scheduled buses. Each bus will display its status, total seats, available seats, departure time, and arrival time. Upon selecting a bus, users will be shown only the available seats for booking. Additionally, each bus has 5 reserved seats, which can be utilized for standby passengers or last-minute bookings. Standby passengers will be allocated seats based on their booking timings, prioritizing those who have been waiting for an extended period.

These are the facilities provided to the passengers. Another module needs to be implemented specifically for the bus captains. Each bus captain will have access to a comprehensive route map, detailing all locations and terminals between the departure and arrival points. This map will assist captains in selecting the most efficient route, particularly in the event of unexpected circumstances.

Furthermore, Daewoo Bus Services also offers cargo services. Each bus reserves a weight capacity of approximately 200kg for cargo shipments. When a staff member enters the weight and Profit for each parcel, the system will provide an optimal strategy for shipping the products on the morning shift buses. The strategy prioritizes selecting parcels that yield higher profitability and can be accommodated within the weight constraints.

Q1 **Design** an efficient solution for the given scenario using appropriate data structures. [Mention your assumptions where necessary]

- Passengers have the ability to search for available buses. When booking a bus, only the seats that are currently available will be displayed. Passengers who wish to book seats

NAME: MADEEHA TALIB
ENROLLMENT NO: 02-235221-010
COURSE: DSA (CCP)

for the standby list will be managed separately. Staff members can select passengers from the standby list based on their priority.

- For the captain, upon starting the trip, they can access the best possible routes. For example, when traveling from Karachi to Sukkur, Daewoo buses will encounter 3 terminals and pass through 8 cities along the normal route. The routes will be presented sequentially, providing the source and destination for each route. (Assume distances between cities and terminals based on your discretion.)

- For cargo, System will show the best possible approach for parcels selection.
  Attach all the outputs in your report. Provide reasons for the data structures you have used for each module along with its complexity.

Evaluation: Students will be evaluated on the following criteria:

• Design and Implementation: 70% (efficiency 20%+ implementation 50%)

• Correct output achieved: 30%

Complex Computing Outcome (Summary):

Counseling sessions with students forced students to identify the problem and list down the requirements. Programing code implementation provide students a chance to go through the in-depth computing knowledge to solve the problem and analyze in an effective way.

REASON:

In the admin module, I used a map data structure for finding efficient routs because it is easy to map source and destination and find the shortest path for rout. I used vector data structure in admin because it has no fixed limit to store the data which provide you unlimited space. In cargo shipment, I used bubble sort algorithm for function “cargo shipments”. Bubble sort works by repeatedly swapping adjacent elements if they are in the wrong order.
In passenger module, I used selection sort in function “select from standby list” Selection sort works by repeatedly finding the minimum element from the unsorted part of the list and swapping it with the element at the beginning of the unsorted part. In cargo shipment, I used bubble sort algorithm for function “cargo shipments”. Bubble sort works by repeatedly swapping adjacent elements if they are in the wrong order.

STEPS:

1. **ADMIN**

Spring 2023
Department of Computer Science
Bahria University, Karachi Campus

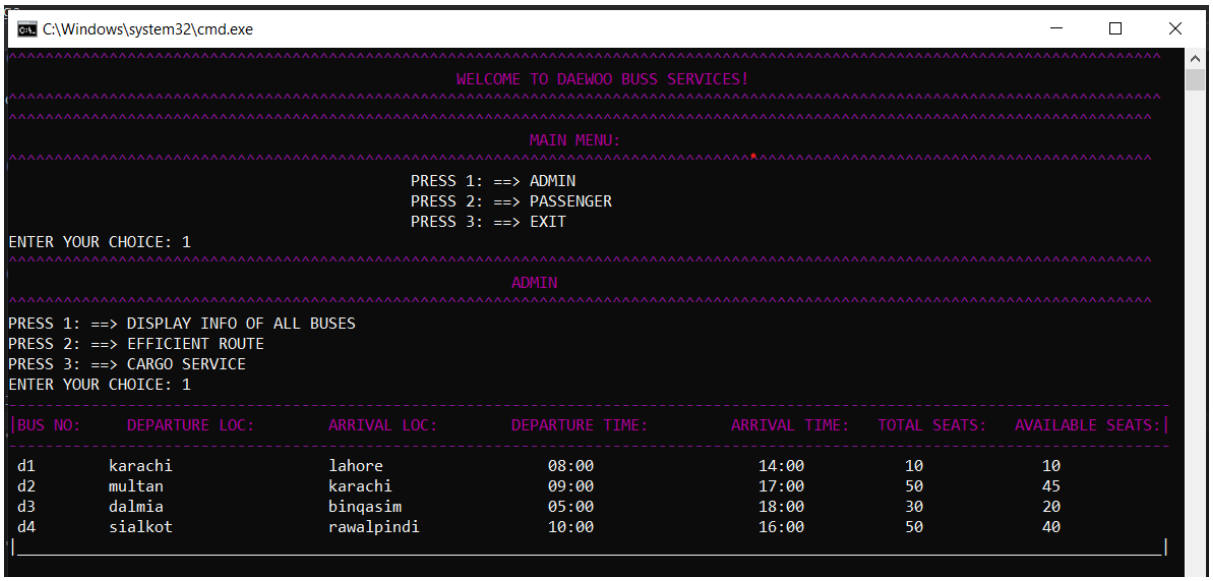
NAME: MADEEHA TALIB
ENROLLMENT NO: 02-235221-010
COURSE: DSA (CCP)

2. PASSENGER

ADMIN SUBPARTS:

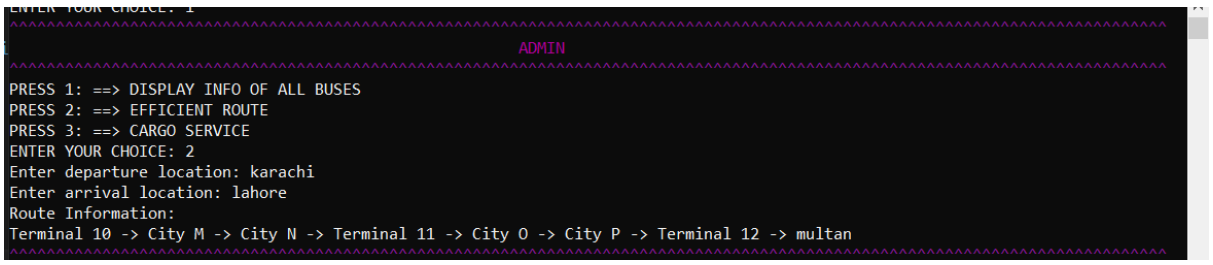
1. DISPLAY ALL BUSES:

Time complexity: O(n)



2. EFFECENT ROUTES:

Time complexity: O(n)



3. CRAGO SERVICES:

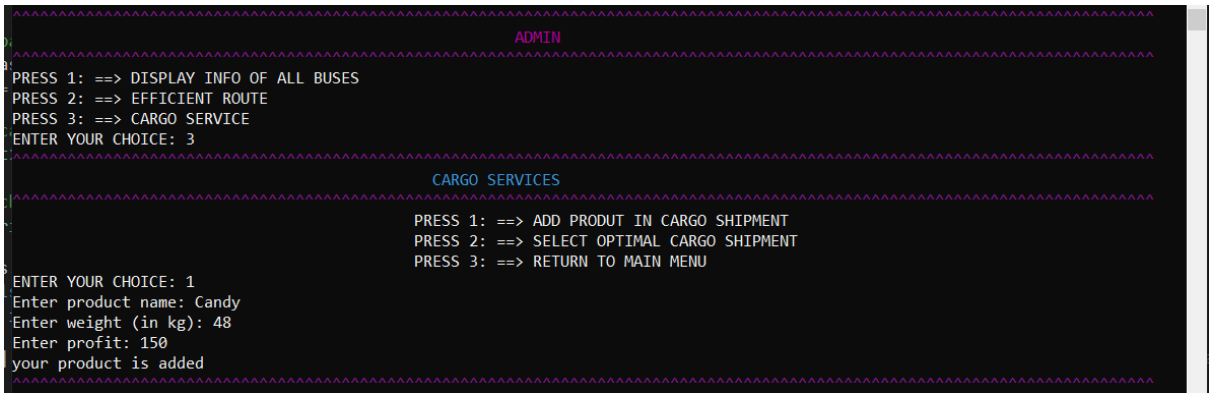
Time complexity: O(n)

1. ADD YOUR PRODUCT

Time complexity: O(1)

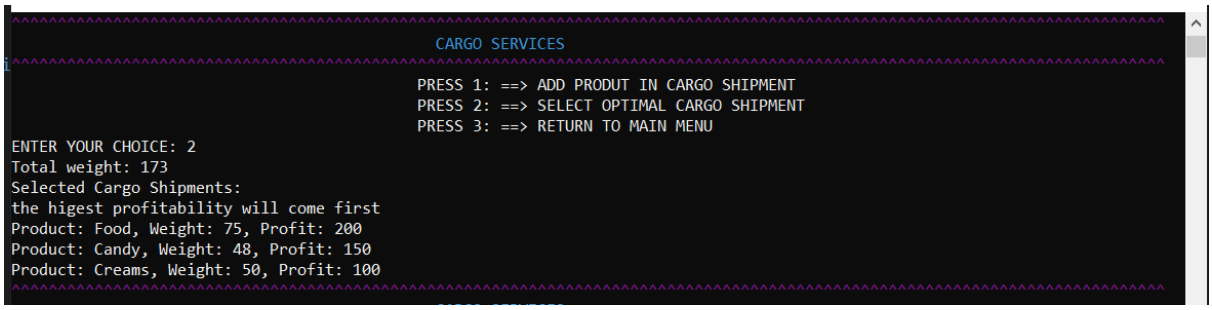
Spring 2023
Department of Computer Science
Bahria University, Karachi Campus

NAME: MADEEHA TALIB
ENROLLMENT NO: 02-235221-010
COURSE: DSA (CCP)

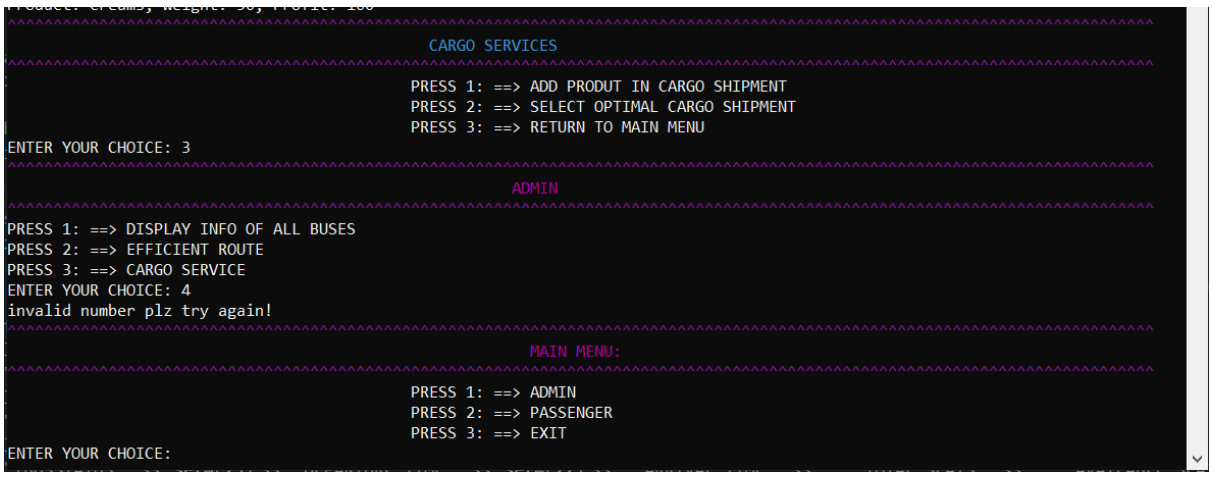


2. SELECT FROM OPTIMAL CARGO SHIPMENT

Time complexity: $O(n^2)$



3. GOTO MAIN MENU



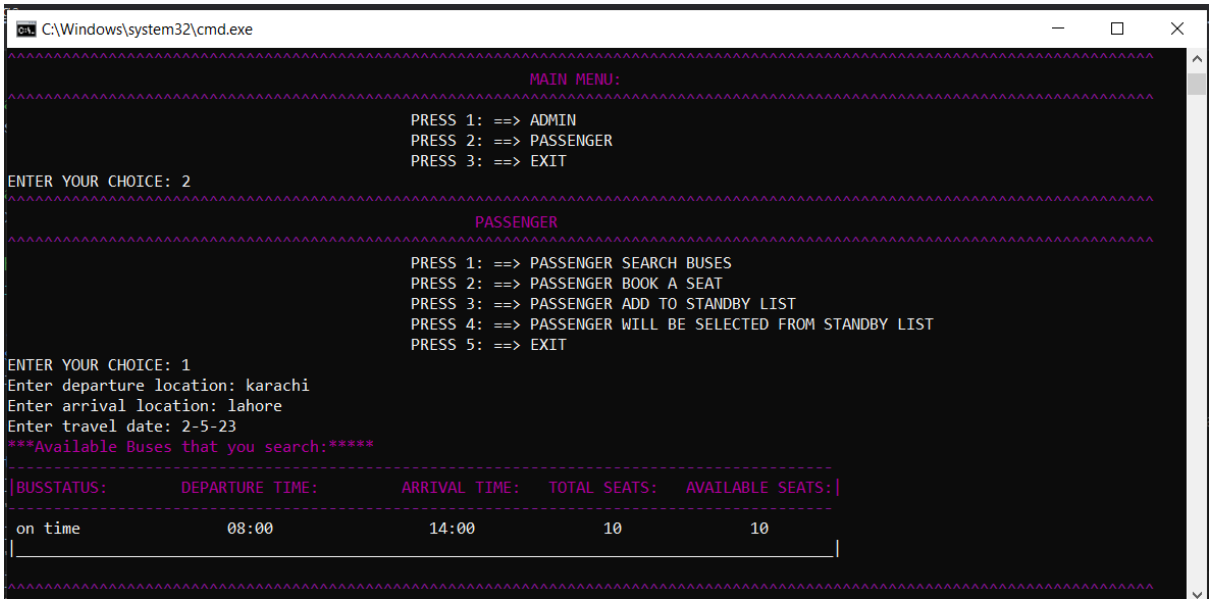
PASSENGER SUBPARTS:

Spring 2023
Department of Computer Science
Bahria University, Karachi Campus

NAME: MADEEHA TALIB
ENROLLMENT NO: 02-235221-010
COURSE: DSA (CCP)

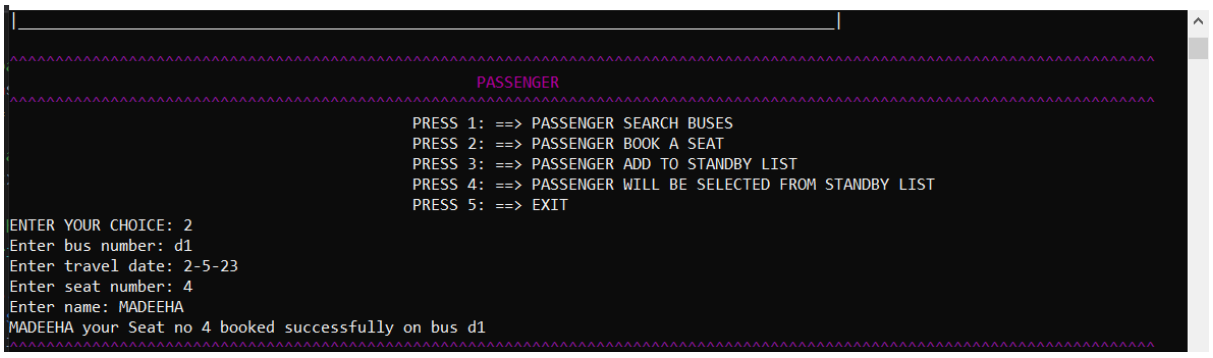
PASSENGER CAN SEARCH A BUSES:

Time complexity: O(n)



PASSENGER BOOK A SEAT:

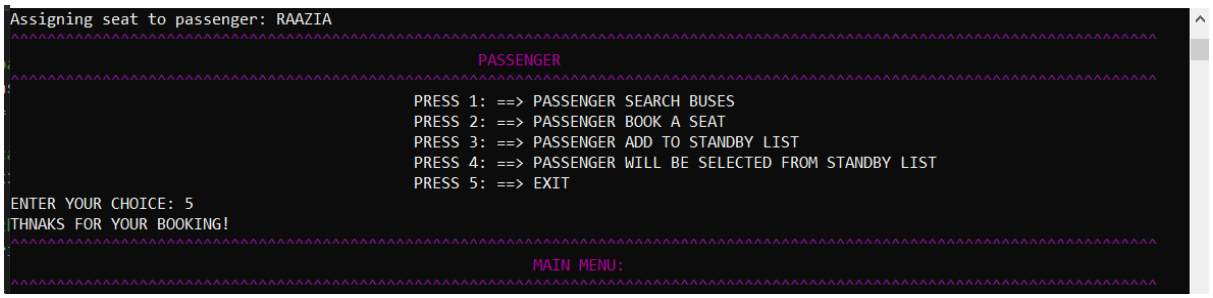
Time complexity: O(n)



CHECK YOUR BOOKING:

NAME: MADEEHA TALIB
ENROLLMENT NO: 02-235221-010
COURSE: DSA (CCP)

```
Passenger RAAZIA added to standby list
^^^
```

Spring 2023
Department of Computer Science
Bahria University, Karachi Campus

NAME: MADEEHA TALIB
ENROLLMENT NO: 02-235221-010
COURSE: DSA (CCP)