SET A

United International University

Department of Computer Science and Engineering

Final Examination Spring 2024

Course Code: **CSE 1112** Course Title: **Structured Programming Language Laboratory**

Date: May 19, 2024 Time: 11:30 AM – 12:30 AM (1 hour) Full marks: 25

Name: Student ID:

Write down C programs for the following problems in Code Blocks (or any C compiler you prefer), and present the code to your instructor after the time is up. You can make rough calculations in this paper.

Problem 1 (Marks: 12)

The Atbash cipher swaps each letter of the alphabet with its counterpart from the opposite end. For instance, 'A' becomes 'Z', 'B' becomes 'Y', and so on. Uppercase and lowercase are preserved. Special characters are replaced by spaces. For example, `"!@#Hello!@)World"` transforms into `"  Svool  Dliow"`. Your task is to write a C program that takes a string as input, applies the Atbash cipher to it and displays the output.

It must consist of the following functions: **[Cannot use string.h functions]**

1. **`void removeSpecialCharacters(char str[])`**: This function takes a pointer to a string and replaces all the special characters with a space ‘ ’.
2. **`char changeAlphabet(char alphabet)`**: The function accepts a single character and determines its counterpart in the Atbash cipher if it is an alphabetic character (either uppercase or lowercase) and returns it.
3. **`void encoder(char *p)`**: This function takes the text to encrypt. Then applying the Atbash cipher, it transforms the text into its encrypted version. Note that this function must make use of the above two functions.

In the main function, take the input string from the user and call the encoder function to encode the message and finally prints the encoded message.

Sample Input	**Sample Output**
`!@#Hello!@)World`	`  Svool  Dliow`
`ABCDEFG#hijklmnop#QRSTUV)wxyz)`	`ZYXWVUT srqponmlk JIHGFE dcba`

Problem 2 (Marks: 13)

Suppose, you are developing a ticket management system for Bangladesh Railway, where several trains are used for local transportation, and each train has specific details and limited tickets assigned to it.

Every train of Bangladesh Railway has the following details:

- Name of the train (a string)
- Total tickets (an integer)
- Ratings (a float)

You have to create a structure named `Train` to store the above details of each train. You also have to implement the following functions:

1. **`addTrain(struct Train listOfTrains[], int numOfTrains)`**: This function takes an array of Train structures and the total number of trains currently available in the system as input, and adds a new train to the system.
2. **`mostPopularTrain(struct Train listOfTrains[], int numOfTrains)`**: This function prints the name of the most popular train **using recursion**. The Most Popular Train is the one that has the highest capacity (total number of tickets). *[You are allowed to find the highest number of total tickets from this function and then, get the train name from the main function]*.
3. **`displayAllTrains(struct Train listOfTrains[], int numOfTrains)`**: This function prints the details of all the trains listed in the system.

In the main function, create an array of `Train` structure, and provide a menu for management to add trains, find the most popular train, and display all available trains in the system.

Sample Input/Output (**bold** -> user input, regular text -> console print)

```
1. Add a train
2. Most Popular Train
3. List of the trains
4. Exit

Enter your choice: 1
Name of the train: Shuborno Express
Total tickets: 150
Ratings: 4.5

1. Add a train
2. Most Popular Train
3. List of the trains
4. Exit

Enter your choice: 1
Name of the train: Mohanagar Provati
Total tickets: 200
Ratings: 4.3

1. Add a train
2. Most Popular Train
3. List of the trains
4. Exit

Enter your choice: 2
Name of the Most Popular Train:
Mohanagar Provati

1. Add a train
2. Most Popular Train
3. List of the trains
4. Exit

Enter your choice: 3
Name of the train: Shuborno Express
Total tickets: 150
Ratings: 4.5

Name of the train: Mohanagar Provati
Total tickets: 200
Ratings: 4.3
```