BLG 223E - RECITATION 1

Question 1

As a programmer working at a security firm, you are tasked with generating a secure password. To accomplish this task, you are provided with three lists: one containing integers, one containing characters, and one containing strings. Your objective is to retrieve data sequentially from each of these lists, with the number of data items to retrieve determined by an array.

For example, if the given array is [2, 4, 3], you will first retrieve 2 data items from the integer, char, string lists. Subsequently, you will retrieve 4 data items from the lists, followed by 3 data items from the lists. If you reach the end of a list, there is no need to retrieve more data from that list.

Instructions:

1. Implement lists for integers, characters, and strings using template functions.
2. Retrieve data sequentially from each list based on the numbers provided in the array.
3. Delete the retrieved data from each list after it has been used.
4. Ensure that the retrieved data is used in the order specified in the array.
5. If the number of data items to retrieve exceeds the length of a list, only retrieve the available data.
6. Once data retrieval is complete, generate a secure password using the retrieved data.

Example Case

integer List = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15]

char List =[a, b, c, d, e, f, g, h, i, j, k, l, m, n, o]

string List = [“11”, “22”, “30”, “41”, “02”, “10”, “21”, “32”, “40”, “01”, “12”, “20”, “31”, “42”, “00”]

Array to retrieve data = [2, 4, 3]

1. Firstly, retrieve 2 data from all lists:
    a. [1,2, a, b, 11, 22] (ATTENTION: AN ARRAY CANNOT CONTAIN DIFFERENT TYPES)
    b. Delete these data from lists.
2. Then, retrieve 4 data from lists and append these data to previous taken data. Delete 4 data from lists
3. Repeat for 3.

Question 2

You are tasked with developing a library management system. The system should be able to manage a collection of books, allowing users to add, list, search, and delete books. Each book should have attributes such as title, author, and publisher.

Requirements:

1. Implement a doubly linked list to store the books in the library.
2. Provide functionality to add a book to the library. Books should be added alphabetically by title.
3. Implement a function to display all books in the library.
4. Implement a function to search for a book by its title.
5. Implement a function to delete a book from the library.
6. Ensure memory management by deallocating memory appropriately when deleting books or when the program terminates.

Question 3

A restaurant chef constantly prepares recipes in a loop. The chef can add new recipes to the loop. However, these recipes are added to the end of the list. The chef also has the ability to remove a dish from the list. Write functions `add` and `delete` to perform these operations and a `traverse` function to print the current recipe list.

Your program should use a circular linked list to manage the recipes. Each recipe is represented by a node in the list, and the chef can add new recipes to the end of the list or remove existing recipes.

The program should provide the following functionalities:

1. **Add Recipe**: This function allows the chef to add a new recipe to the end of the list.
2. **Delete Recipe**: This function allows the chef to remove a recipe from the list.
3. **Traverse**: This function prints the current list of recipes.

Question 4

You are given an array of integers: {1, 2, 3, 4, 5, 6, 7}. Your task is to create a complete binary tree from this array, where the first element of the array will be the root of the tree. After creating the tree, you need to print the elements using the preorder, inorder, and postorder traversal methods in a recursive manner.

Here are the detailed steps you need to follow:

1. Create a balanced binary tree from the given array.
2. Use the preorder traversal method to print the elements of the tree.
3. Use the inorder traversal method to print the elements of the tree.
4. Use the postorder traversal method to print the elements of the tree.