National University of Computer and Emerging Sciences

Lab Manual

for

Data Structures

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Lab Manual 04

Objectives:

After performing this lab, students shall be able to revise:

- ✔ iterator
- ✔ Circular doubly link list
- ✔ Circular single link list

Problem 1

1. Implement a Struct 'Node' that contains two data members: A template variable 'data', Node pointer 'next.
2. Now implement a circular doubly linked list class having two private data members Node pointer 'tail' and Node pointer 'head'.
3. Make an iterator class with one private data member Node pointer current. Please note that the iterator class is a nested class of circular doubly-linked list class. **(Note that the iterator class is defined inside the List class)**
4. Now implement the following operations for the iterator class:
    a. default constructor
    b. dereference operator
    c. post-increment operator
    d. pre-increment operator
    e. not equal operator
    f. equal operator
    g. assignment operator
    h. array subscript operator
5. Now implement the following operations for the linked list class:
    a. begin iterator begin() const;
    b. end iterator end() const;
    c. Insert at tail void insertAtTail (T const element);
    d. remove all nodes from the CLL which contain element whose digit sum is even and find sum and product of remaining element

```
input: 9-> 11-> 34-> 6 -> 13 -> 21
output: 9->34->21
sum : 64
product : 6426
```

e. Move all occurrence of an element to end of CLL

void MoveOccurence(T keyvalue);

```
Input: 1 -> 2 -> 2 -> 3
KEY VALUE = 2
Output: 1 -> 3-> 2 -> 2
```

f. Return size of circular link list. int size()const;
g. Return true if TAIL is pointing to NULL otherwise false. bool IsEmpty();
h. Copy Constructor
i. Destructor

Create a suitable main function to test the above functions.

Problem 2

You are the owner of a unique hotel with its rooms arranged in a circle. There are several types of rooms in the order and each has a different capacity of guests it can accommodate. Each node of a link list represents a room. You are required to make a single circular link list that contains the following data members:
Type: room type (single, double, triplet, quad, family, suite)
Capacity: no. of guests a room can accommodate (1, 2, 3,4, 6, 10)
Guests: no. of guests currently living in the room
Filled: if a room is filled or not (Yes/No)
You are assigned the task of the hotel receptionist and are supposed to allocate rooms to the guests according to their requirements. Using the iterator class as the inner class of the circular list you are to traverse the hotel rooms for a perfect match. If a room is filled then you are required to skip it during every traversal.
Starting with the list given below:

Accommodate the following guest:
2 guests for Quad
2 guests for family
1 guest for triplet

5 guests for suite
1 guest for single
Note: After assigning rooms to guests don't forget to change no of the guests in the rooms and its filled status.