National University of Computer and Emerging Sciences

Laboratory Manual

for

Data Structures Lab

Department of Computer Science FAST-NU, Lahore,

Pakistan

Objectives:

In this lab, students will practice:

1. Circular Linked List with Iterators

2. Queue using Circular Array

Question 1

Write C++ code to implement the following functionality in Singly Circular linked list. **Nodeanditerator classes should be implemented as nested classes.**

1. Constructor/ Copy Constructor/ Destructor.

2. Inserts a new node at the beginning of the list: Void insert_at_beginning(node)

3. Inserts a new node at the end of the list. Void insert_at_end(node)

4. Deletes the first node from the list. Void delete_from_beginning(node) **5.** Deletes the last node from the list. Void delete_from_end(node)

6. Deletes a given node from the list. Void delete_node(node)

7. Write a function DeleteNext(iterator ptr) that takes an iterator ptr and delete the element next tothe one pointed by ptr.

8. Search a given integer in list. Void Search_list(int)

9. Print the data in the middle element of the list. Void Mid_list()

10. Prints the contents of the list to the console. Void Traverse_list():

11. Write a Global Function MergeLISTs that takes two sorted circular lists as input and merge them in sorted order. As it is a global function so it will be implemented using Iterators Void merge_list()

Main of Question 1(1-11)

Create a circular list of type **int** that has following elements: **2->3->4->5->6**

1. Constructor/ Destructor
2. Insert 19 and 1 at start of list and Print the list
3. Insert 7,8 and 9 at end of the list and Print the list
4. Delete 19 from start and Print the list
5. Delete 9 from end and Print the list
6. Delete 5 and Print the list
7. Delete the next and print the list
8. Search 3 and Print the element
9. Search and print middle element of list

10. Print the list
11. Merge two circular linked lists and print it

Circular list 1 = 10->30->50->80
Circular list 2 = 20->40->60->70

12. Print the merged list by appending list 2 after list 1 Circular list 1 = 100->200->300->400 Circular list 2= 500->600->700->800

13. Check if the list is circular or not Print YES or NO.

Question 2

Implement a template-based queue using a fixed-sized array. The required member methods are:

int size() : returns the count of total element stored in the queue.
bool isEmpty(): returns true if the queue is empty else false.
bool front(T&): returns, but does not delete, the front element from the queue via the parameter passed by reference. It returns false if there is no element in the queue, else it returns true and assigns the front element of the queue to the parameter passed by reference.
void dequeue(): deletes the front element from the queue. If there is no element, return some error.
void enqueue(T const& e): inserts the element "e" at the back of the queue if there is some space available. Otherwise it returns some error.

Submission

1. Code

2. Output screenshot