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. Singly Linked List

Question 1

1. Create a class for Singly linked list class that contains a nested struct 'Node'. The struct Nodecontains two data members: A template variable 'data' and a Node pointer 'next'. Youmaydefine any member functions, if required, for the template class. In addition, SinglyLinkedlist class contains members

a. Head pointer

b. Tail pointer

c. size

2. Implement the following functions in a singly linked list (some are already done inclassa-i)a. Insert at start `void insertAtStart(Tconst element);`

b. Insert at end `void insertAtEnd(Tconst element);`

c. Print `void print() const;`

d. Search an element `bool search(T const& element) const;` e. Check whether the list is `empty bool isEmpty() const;`

f. Constructor

g. Destructor

h. Delete from Start `void DeleteStart();`
i. Delete from End `void DeleteEnd();`
j. Insert value v2 after the value v1 `bool insertAfter(T const v1, T const v2);` k. Delete all occurrences of a given value `void deleteAll(T const value)` l. Remove all duplicates from the list. `void removeDuplicates()` m. Determine if the given linked list is sorted or not. The function returns true if thelist isinsorted order and false otherwise.
`void isSorted(list<T> * l1)`
n. Merge two sorted singly linked list given as input. Think of this function prototype. Yourfunction should return the merged list.
o. Reverse-Print, print the list in reverse without reversing it

3. Create a main function which has the following instructions:
a. Define a linked list object of type int.
b. Insert 2, 6, and 7 at start
c. Insert 9 at the end.
d. Now insert 7, 8, and 9 at start.
e. Delete all occurrences of 7.
f. Now print the linked list.
g. Search for 2, 9 and 10.
h. Now delete from Start and print the linked list.
i. Input two link list and merge the lists

Question 2

Write a Time Complexity of Each function in term of Big-O.