**National University of Computer and Emerging Sciences**



Laboratory Manual 04

for

Data Structures Lab

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**Objectives:**

In this lab, students will practice:

1. Iterators
2. Circular Linked List

**Question 1:**

Implement a class LisIterator<type> in Singly Linked List(using template). It contains a private data member ‘current’ of type Node<type>\*. At all times, current points to a node of list L.

define the following functions in this class,

* 1. **NotNull() //checks that the current element in the list is non-null**
  2. **NextNotNull() // check that the next element in the list is non-null**
  3. **First()// returns a pointer to the first element of the list**
  4. **Next()//return a pointer to the next element of the list**

**Using this iterator, perform the following operations of the singly-linked-list.**

1. Insert a element void insert(T const element);
2. Print void print()
3. Print data of Nth node void printNth(int index)
4. Search an element bool search(T const&amp; element)
5. Delete at Start void deleteAtStart ()
6. Destructor
7. **int sum() //computes the sum of the elements of the linked list**

Now create a main function to test all the operations.

**Question 2:**

A linked list in which the last node points to the first node is called a circular linked list. Implement the operations on a circular list are as follows:

1. Initialize the list (to an empty state)
2. Determine if the list is empty
3. Destroy the list
4. Print the list.
5. Find the length of the list
6. Search the list for a given item
7. Insert an item in the list
   1. in start
   2. at a given position
   3. in the end
8. Delete an item from the list
   1. from start
   2. at a given position
   3. from the end
9. Copy the list.

you have to design a generic class to implement a circular linked list.

**Question 3:**

Write a program that prompts the user to input a string and then outputs the string in the Latin form.

The rules for converting a string into Latin form are as follows:

1. If the string begins with a vowel, add the string "-way" at the end of the string. For example, the Latin form of the string "eye" is "eye-way".
2. If the string does not begin with a vowel, first add "-" at the end of the string. Then rotate the string one character at a time; that is, move the first character of the string to the end of the string until the first character of the string becomes a vowel. Then add the string "ay" at the end. For example, the Latin form of the string "There" is "ere-Thay".
3. Strings such as "by" contain no vowels. In cases like this, the letter y can be considered a vowel. So, for this program the vowels are a, e, i, o, u, y, A, E, I, O, U, and Y. Therefore, the Latin form of "by" is "y-bay".
4. Strings such as "1234" contain no vowels. The Latin form of the string "1234" is "1234-way". That is, the Latin form of a string that has no vowels in it is the string followed by the string "-way".

Your program must store the characters of a string into a circular linked list and use the function rotate, to rotate the string.

void rotate(); //Function to remove the first node of a circular linked list and put it //at the end of the linked list.