**National University of Computer and Emerging Sciences**



**Laboratory Manual**

*for*

# Data Structures Lab

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# Department of Computer Science

FAST-NU, Lahore, Pakistan

**Objectives:**

In this lab, students will practice:

1. Stack implementation using linkedlist

# Task1

A diagram of a diagram

Description automatically generated

Implement a template-based stack using a singly linked list. The required member methods are:

1. **int size()**: returns the count of total element stored in the stack.
2. **bool isEmpty()**: returns true if the stack is empty else false.
3. **bool top(T&)**: returns, but does not delete, the topmost element from the stack via the parameter passed by reference. It returns false via a return statement if there is no element in the stack, else it returns true and assigns the top most element to the parameter passed by reference.
4. **void pop()**: deletes the top most element from the stack. If there is no element, return some error.
5. **push(T const& e)**: pushes the element “e” on top of the stack

# Task 2

Delete last element of a stack

Given a stack with push(), pop(), empty() operations, delete the last of it without using any additional data structure.

**Input:** Stack[] = [1, 2, 3, 4, 5]

**Output:** Stack[] = [1, 2, 3, 4]

**Input:** Stack[] = [1, 2, 3, 4, 5, 6]

**Output:** Stack[] = [1, 2, 3, 4, 5]

# Task 3

Write a function that checks whether parentheses in a mathematical expression are balanced or not.

# Task 4

Write a function that converts an expression from infix form to prefix form.

# Task 5

Determine if a given string is a palindrome using a stack.

**Input:** sasas

**Output:** given string is a palindrome