**National University of Computer and Emerging Sciences**



**Laboratory Manual**

*for*

# Data Structures Lab

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| Section | BCS-3H |
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# Department of Computer Science

FAST-NU, Lahore, Pakistan

**Objectives:**

In this lab, students will practice:

1. Singly Linked List
2. Doubly LinkedList

# Question 1

# Flatten a Multilevel Singly Linked List Implement a function to flatten a linked list that can have multiple levels. Each node in this linked list can have either a next pointer to the next node at the same level or a child pointer to another linked list. The goal is to flatten this structure into a singly linked list where all nodes are in a single level.

# Example:

# 1 -> 2 -> 3 -> 4

# |

# 5 -> 6

# |

# 7 -> 8

# The Flatten List should be:

# 1 -> 2 -> 5 -> 7 -> 6 -> 8 -> 3 -> 4

# Your task is to implement an algorithm that can efficiently flatten such a multilevel linked list while preserving the order of elements.

# Question 2

Implement a Doubly linked list using template and friend classes which supports the following operations:

a) Insert at start void insertAtHead(T const element);

b) Insert at end void insertAtTail (T const element);

c) Print void print() const;

d) Print the linked list in reverse order void printReverse() const;

e) Delete at Start void deleteAtStart ();

f) Delete at End void deleteAtTail();

g) Delete at Position void deleteAtPosition(int k) // it will delete element at kth position

h) Destructor Create a main function to test all the operations