Department of ICT
Faculty of Technology
University of Ruhuna

Data Structures and Algorithms – ICT2113 **Level 2- Semester 1 | 2023**

Laboratory Assignment 5

Objectives:

This practical is designed to implement stack and queue data structures using linked list.

1. A linked list is a data structure that consists of a sequence of nodes each of which contains a reference (i.e., a link) to the next node in the sequence. Linked lists are among the simplest and most common data structures.

   A Linked list is a chain of structures or records called **ListNodes**. Create a **Node** with two members. One to hold the data and the other points to the next Node in the list.

   i. Implement a stack using a linked list. Use following declarations.
   ii. Write type definitions to a **Node. Node** should have a data element and a next reference.

```
struct Node
{
        char Data;
        struct Node * Next;
};
```

   iii. Implement a stack structure with a **top** which is a reference to the top node of the stack.
   iv. Write initialization function called **void initialized(stack *s).**
   v. Write a function **void push (stack *s, char x)** to insert an element into the stack.
   vi. Write a function **int pop (stack *s)** which deletes a node in the list.
   vii. Write a function called **int isEmpty (stack *).**
   viii. Write a function named **void display (stack *)**
   ix. Test your stack with your own test data.

2. Reverse the implemented stack using reverse (stack *s).

3. Implement a queue using a linked list. Use following declarations.

Write type definitions to a Node. Node should have a data element and a next reference.

```
struct node {

int data;

struct node * next;

 };
```

i. Implement a queue structure with a two members (front and rear).
ii. Write initialization function called **void initialized (queue *q).**
iii. Write a function called **isEmpty(queue *q**).
iv. Write a function void **enqueue (queue *q, int a)** to insert an element into the queue.
v. Write a function **int dequeue (queue *s)** which remove a node in the list.
vi. Write a function named **void display (node *head)**
vii. Test your queue with your own test data.