**A.Y:2023-24**

**Lab Code: 20ES3351 Lab Name: Data Structures Lab**

**Faculty Name: K. Raja Sravan Kumar**

**WEEK- 4**

**OBJECTIVE:**

* **PRE-LAB:**

Work student has to complete before coming to the Lab

Learn the following before coming to next lab.

1. What is Queue?
2. Operations on Queue.
3. What is Circular Queue? Differences between Queue to Circular Queue.
4. Operations on Circular Queue.

* **IN-LAB:**

What tasks students has to do in the lab

1. Implementation of possible operations on Queue using arrays.
2. Write a C program to implement a queue using two stacks with either of the following methods:

**Method 1 (Costly enQueue Operation):**

This method ensures that the oldest entered element is always at the top of stack 1, allowing the deQueue operation to pop from stack 1. To achieve this, stack 2 is utilized.

enQueue(q, x):

While stack 1 is not empty, push everything from stack 1 to stack 2.

Push x to stack 1 (assuming an unlimited size for stacks).

Push everything back to stack 1.

deQueue(q):

If stack 1 is empty, throw an error.

Pop an item from stack 1 and return it.

**Method 2 (Costly deQueue Operation):**

In this method, during the enQueue operation, the new element is entered at the top of stack 1. In the deQueue operation, if stack 2 is empty, all elements are moved to stack 2, and finally, the top of stack 2 is returned.

enQueue(q, x):

Push x to stack 1 (assuming an unlimited size for stacks).

Time complexity: O(1)

deQueue(q):

If both stacks are empty, throw an error.

If stack 2 is empty, while stack 1 is not empty, push everything from stack 1 to stack 2.

Pop the element from stack 2 and return it.

Time complexity: O(n)

1. Implementation of possible operations on circular queue using arrays.
2. Simulate a print queue system where print jobs are added to a queue and processed in a first-come, first-served order.
3. Implement the Round Robin scheduling algorithm using a circular queue to allocate CPU time to processes in a cyclic manner.

* **POST-LAB:**

Tasks/work student has to do after completing the lab and before the next lab.

1. Simulate a call center system where incoming customer calls are queued and assigned to available agents.
2. Implement the hot potato game using a queue, where participants pass an object (the "hot potato") around, and the person holding it when the music stops is eliminated.
3. Model a traffic circle simulation where cars enter and exit in a circular manner, utilizing a circular queue to manage the order.