**Assignment No: 03**

**Title: Implement Circular Queue using array**

**Course Outcome**: **CO1(C214447.1):** Analyze algorithms and to determine algorithm correctness and time efficiency class.

**CO2(C214447.2):** Implement abstract data type (ADT) and data structures for given application.

**CO3(C214447.3):** Design algorithms based on techniques like brute -force, divide and conquer, greedy, etc).

**CO5(C214447.5):** Analyze of algorithms with respect to time and space complexity.

**Date of Completion: 22/11/2021**

**Assessment Grade / Marks:**

**Assessor’s Sign with Date:**

**Assignment No: 03**

**Title:** Implement Circular Queue using array

**Aim:** Perform Insert, Delete, Display operation on Circular Queue using array.

**Objective:** Perform Insert, Delete, Display operation on Circular Queue using array.

**Problem Statement:** Implement Circular Queue using Array. Perform following

operations on it.

a) Insertion (Enqueue)

b) Deletion (Dequeue)

c) Display

**Course Outcome:** CO Number: Applicable CO : Blooms Taxonomy Category

**Requirements:** (Components / Digital Kits / Platform / Software / Hardware)

**Platform :-** Online GDB Compiler

**Theory / Procedure / Diagrams / Circuits:**

**Circular Queue:-**Circular Queue is a linear data structure in which the operations are performed based on FIFO (First In First Out) principle and the last position is connected back to the first position to make a circle. It is also called ‘Ring Buffer’.

**Operations on Circular Queue:**

• Front: Get the front item from queue.

• Rear: Get the last item from queue.

• EnQueue(value):This function is used to insert an element into the circular queue. In a circular queue, the new element is always inserted at Rear position. Check whether queue is Full – Check ((rear == SIZE-1 && front == 0) || (rear == front-1)).If it is full then display Queue is full. If queue is not full then, check if (rear == SIZE – 1 && front != 0) if it is true then set rear=0 and insert element.

• DeQueue():This function is used to delete an element from the circular queue. In a circular queue, the element is always deleted from front position.Check whether queue is Empty means check (front==-1).If it is empty then display Queue is empty. If queue is not empty then step 3 Check if (front==rear) if it is true then set front=rear= -1 else check if (front==size-1), if it is true then set front=0 and return the element.

**Algorithm / Methods / Steps: (if applicable):**

Main Function()

STEP 1:START

STEP 2:CREATE Class Circular Queue

STEP 3: INT Queue[];

STEP 4: INT Front ,INT Rear

Function Circular Queue()

STEP 1:START

STEP 2:INITIALIZE Front AND Rear = -1

STEP 3: FOR(int i=0;i<5;i++)

STEP 4: GET QUEUE[i]=0

STEP 5: END FOR

STEP 6:END

Function IsFull()

STEP 1:START

STEP 2:IF (Rear+1)%5==Front THEN Return TRUE

STEP 3:ELSE Return FALSE

STEP 4:END

Function IsEmpty()

STEP 1:START

STEP 2:IF Front AND Rear = -1 THEN Return TRUE

STEP 3:ELSE Return FALSE

STEP 4:END

INSERT FUNCTION(INT Key)

STEP 1: IF (IsFull)

STEP 2:DISPLAY “QUEUE is Full ”

STEP 3: RETURN

STEP 4: END OF IF

STEP 5: ELSE IF Front = 0 and Rear = 0

STEP 6: GET Queue[Rear] = Key;

STEP 7: END OF ELSE IF

STEP 8: ELSE

STEP 9: GET Rear = (Rear + 1) % 5;

STEP 10: GET Queue[Rear] = Key;

STEP 11: END

DELETE FUNCTION()

STEP 1: INITIALIZE x=0;

STEP 2: IF (Is Empty)

STEP 3: DISPLAY “Queue is Empty”

STEP 4:RETURN x

STEP 5: END OF IF

STEP 6: ELSE IF (Rear==Front)

STEP 7: x = Queue[Rear];

STEP 8: Rear = -1;

STEP 9: Front= -1;

STEP 10: RETURN x;

STEP 11: ELSE

STEP 12: DISPLAY “Dequeued front value index”

STEP 13: x = Queue[Front];

STEP 14: Queue[Front] = 0;

STEP 15: Front = (Front + 1) % 5;

STEP 16: Return x;

STEP 17: END

DISPLAY FUNCTION()

STEP 1: IF (ISEmpty)

STEP 2: DISPLAY “Queue is Empty”

STEP 3: RETURN

STEP 4: END OF IF

STEP 5: ELSE

STEP 6: INT i=Front;

STEP 7: DISPLAY “Elements in Circular Queue are”

STEP 8: WHILE (i!=Rear)

STEP 9: GET Queue[f];

STEP 10: i=(i+1)%5;

STEP 11: GET Queue[f];

STEP 12: END

Input: (Test Cases / Data sets / Database Links):

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

Output: (Results / Visualization):

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

1

===================================================================

Enter an value to Enqueue in the Circular Queue :

14

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

1

===================================================================

Enter an value to Enqueue in the Circular Queue :

54

====================================================================

Circular Queue Operations

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

1

====================================================================

Enter an value to Enqueue in the Circular Queue :

32

====================================================================

Circular Queue Operations

===================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

1

====================================================================

Enter an value to Enqueue in the Circular Queue :

78

===================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

1

====================================================================

Enter an value to Enqueue in the Circular Queue :

10

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

3

====================================================================

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

2

====================================================================

Dequeued value in the Circular Queue is : Dequeued front value index: 0

14

===================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

2

====================================================================

Dequeued value in the Circular Queue is : Dequeued front value index: 1

54

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

3

===================================================================

Display the Circular Queue

Elements in Circular Queue are :

32 78 10

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

2

====================================================================

Dequeued value in the Circular Queue is : Dequeued front value index: 2

32

===================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

2

====================================================================

Dequeued value in the Circular Queue is : Dequeued front value index: 3

78

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

2

===================================================================

Dequeued value in the Circular Queue is : 10

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

3

====================================================================

Display the Circular Queue

Queue is Empty

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

1

====================================================================

Enter an value to Enqueue in the Circular Queue :

24

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

1

====================================================================

Enter an value to Enqueue in the Circular Queue :

39

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

3

====================================================================

Display the Circular Queue

Elements in Circular Queue are :

24 39

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

1

====================================================================

Enter an value to Enqueue in the Circular Queue :

44

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

1

====================================================================

Enter an value to Enqueue in the Circular Queue :

21

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

1

====================================================================

Enter an value to Enqueue in the Circular Queue :

98

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

3

===================================================================

Display the Circular Queue

Elements in Circular Queue are :

24 39 44 21 98

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

1

====================================================================

=================

Enter an value to Enqueue in the Circular Queue :

54

Queue is full

====================================================================

Circular Queue Operations

====================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

3

Display the Circular Queue

Elements in Circular Queue are :

24 39 44 21 98

====================================================================

Circular Queue Operations

===================================================================

Choose one of the following operations :

1. Enqueue(Insert)

2. Dequeue(Delete)

3. Display

4. Exit

Enter your choice :

4

====================================================================

**Inference:** Hence we have studied the implementation of Circular Queue using Array.