Sairam INSTITUTIONS

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YEAR II | SEM III

CS8391

DATA STRUCTURES
(Common to CSE & IT)

UNIT No. 2

LINEAR DATA STRUCTURES-STACKS,QUEUES

2.4 CIRCULAR QUEUE

Version: 1.XX

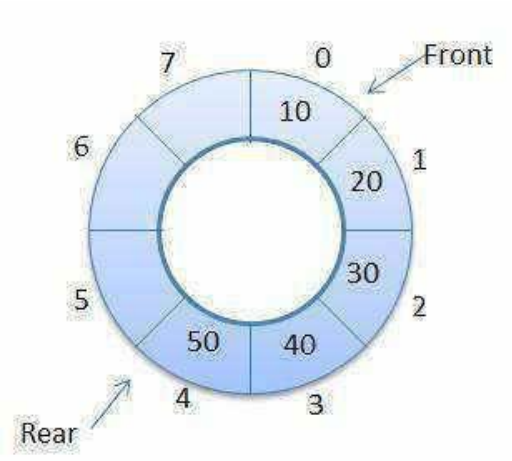
UNIT II LINEAR DATA STRUCTURES- CIRCULAR QUEUE

CIRCULAR QUEUE

In Circular Queue, the insertion of a new element is performed at the very first location of the queue if the last location of the queue is full, in which the first element comes just after the last element.A circular queue is an abstract data type that contains a collection of data which allows addition of data at the end of the queue and removal of data at the beginning of the queue.

- Circular queues have a fixed size.
- Circular queue follows FIFO principle.

Queue items are added at the rear end and the items are deleted at front end of the circular queue.Here the Queue space is utilized fully by inserting the element at the Front end if the rear end is full.



Operations on Circular Queue

Fundamental operations performed on the Circular Queue are

- Circular Queue Enqueue
- Circular Queue Dequeue

Formula to be used in Circular Queue

For Enqueue **Rear = (Rear + 1) % ArraySize**

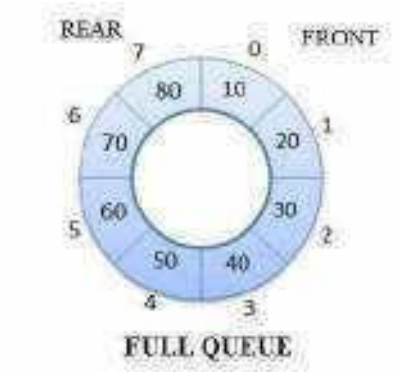
For Dequeue **Front = (Front + 1) % ArraySize**

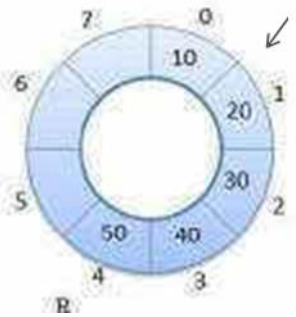
(i) Circular Queue Enqueue Operation

- It is same as Linear Queue EnQueue Operation (i.e) Inserting the element at the Rear end.
- First check for full Queue
- If the circular queue is full, then insertion is not possible
- Otherwise check for the rear end.
- If the Rear end is full, the elements start getting inserted from the Front end.

Routine to Enqueue an element in circular queue

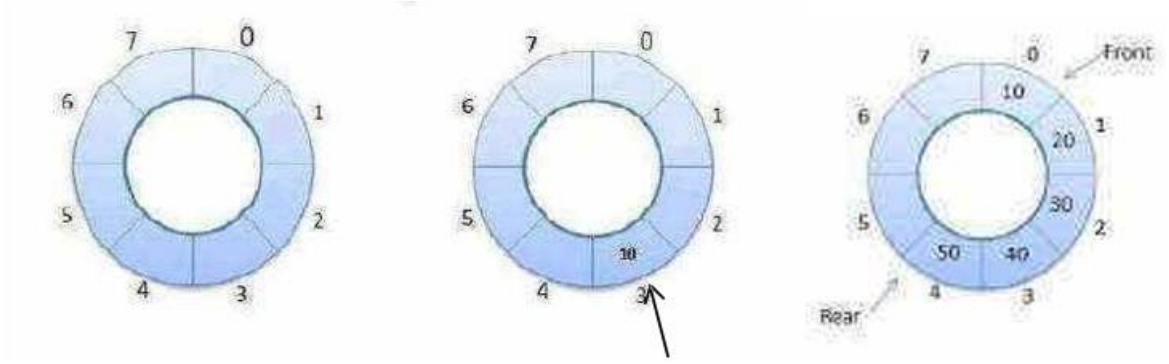
```
void Enqueue ( int X, CircularQueue CQ )
{
if( Front = = ( Rear + 1 ) % ArraySize)
Error( “Queue is full!!Insertion not possible” );
else if( Rear = = -1 )
{
Front = Front + 1;
Rear = Rear + 1;
CQ[ Rear ] = X;

else
{
Rear = ( Rear + 1 ) % Arraysize;
CQ[ Rear ] = X;
}
}
```





Circular Queue DeQueue Operation

- It is same as Linear Queue DeQueue operation (i.e) deleting the front element.
- First check for Empty Queue.
- If the Circular Queue is empty, then deletion is not possible.
- If the Circular Queue has only one element, then the element is deleted and Front and Rear
- pointer is initialized to - 1 to represent Empty Queue.
- Otherwise, Front element is deleted and the Front pointer is made to point to next element in the Circular Queue.



F= -1,R= --1

Routine To DeQueue An Element In Circular Queue

```
void DeQueue (CircularQueue CQ)
{
if(Front== - 1)
Empty("Empty Queue!");
else if(Front==rear)
{
X=CQ[Front];
Front=-1; Rear=-1;
}
else
{
X=CQ[Front];
Front=(Front+1)%Arraysize;
}}
```

Implementation of Circular Queue

```
#include<stdio.h>
#include<conio.h>
#define max 3
void insert();   void delet();    void display();
int q[10],front=0,rear=-1;
void main()
{ int ch;
clrscr();
printf("\nCircular Queue operations\n"); printf("1.insert\n2.delete\n3.display\n4.exit\n");
while(1)
{
printf("Enter your choice:");
scanf("%d",&ch);
switch(ch)
{
case 1:
insert();            break;
case 2:
delet();             break;
case 3:
display();        break;
case 4:
exit();
default:
printf("Invalid option\n");
}}}

void insert()
{
int x;
if((front==0&&rear==max-1)||(front>0&&rear==front-1))
```

```
printf("Queue is overflow\n");
else
{
printf("Enter element to be insert:");
scanf("%d",&x);
if(rear==max-1&&front>0)
{ rear=0;
q[rear]=x;
}
else
{
if((front==0&&rear==-1)||(rear!=front-1))
q[++rear]=x;
} }}
void delet()
{
int a;
if((front==0)&&(rear==-1))
printf("Queue is underflow\n");
if(front==rear)
{ a=q[front]; rear=-1; front=0;
}
else if(front==max-1)
{
a=q[front];
front=0;
}
else
a=q[front++];
printf("Deleted element is:%d\n",a);
}
void display()
{
int i,j; if(front==0&&rear==-1)
```

```
printf("Queue is underflow\n"); if(front>rear) { for(i=0;i<=rear;i++) printf("\t%d",q[i]);
for(j=front;j<=max-1;j++) printf("\t%d",q[j]);
printf("\nrear is at %d\n",q[rear]); printf("\nfront is at %d\n",q[front]); } else
{
for(i=front;i<=rear;i++)
printf("\t%d",q[i]); printf("\nrear is at %d\n",q[rear]); printf("\nfront is at %d\n",q[front]);
}
printf("\n");
}
```

OUTPUT