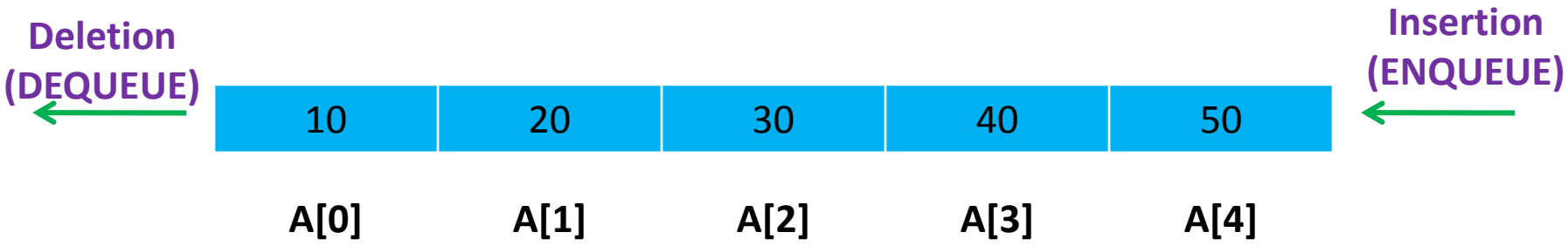
Subject : Data Structures
Topic : Queue

Queue

- Queue is Linear Data Structure
- It follows First In First Out(FIFO) principal
- It has two pointers front and rear

e.g.:



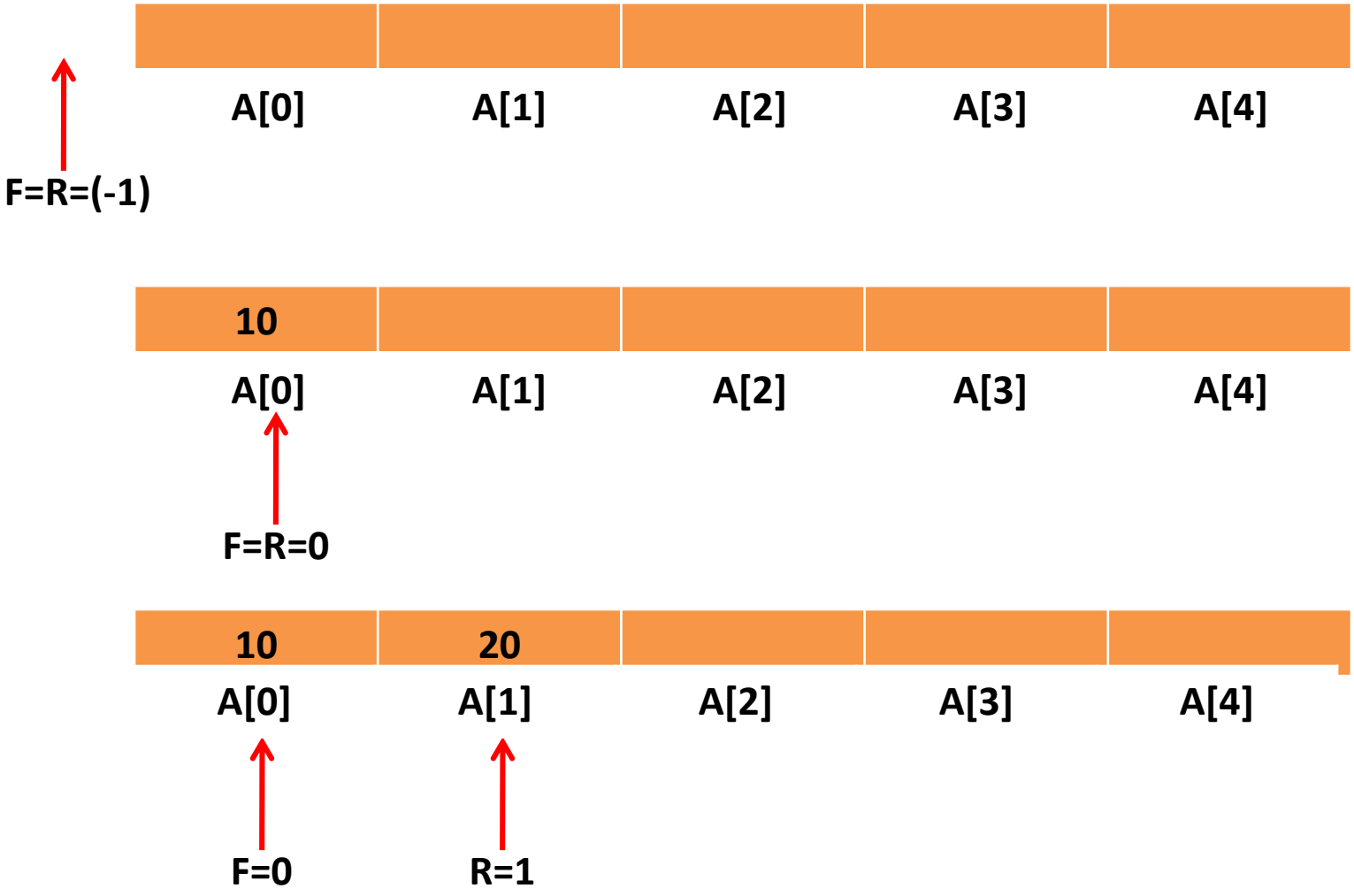
Operations on Queue

Insertion:

Algorithm:

Step 1: If REAR = MAX – 1 then
Write “Queue is Overflow”
Goto step 4
[End of IF]
Step 2: IF FRONT=-1 and REAR=-1
SET FRONT=REAR=0
ELSE
SET REAR=REAR+1
[END OF IF]
Step 3: SET QUEUE [REAR] = NUM
Step 4: EXIT

Example of Insertion in Queue



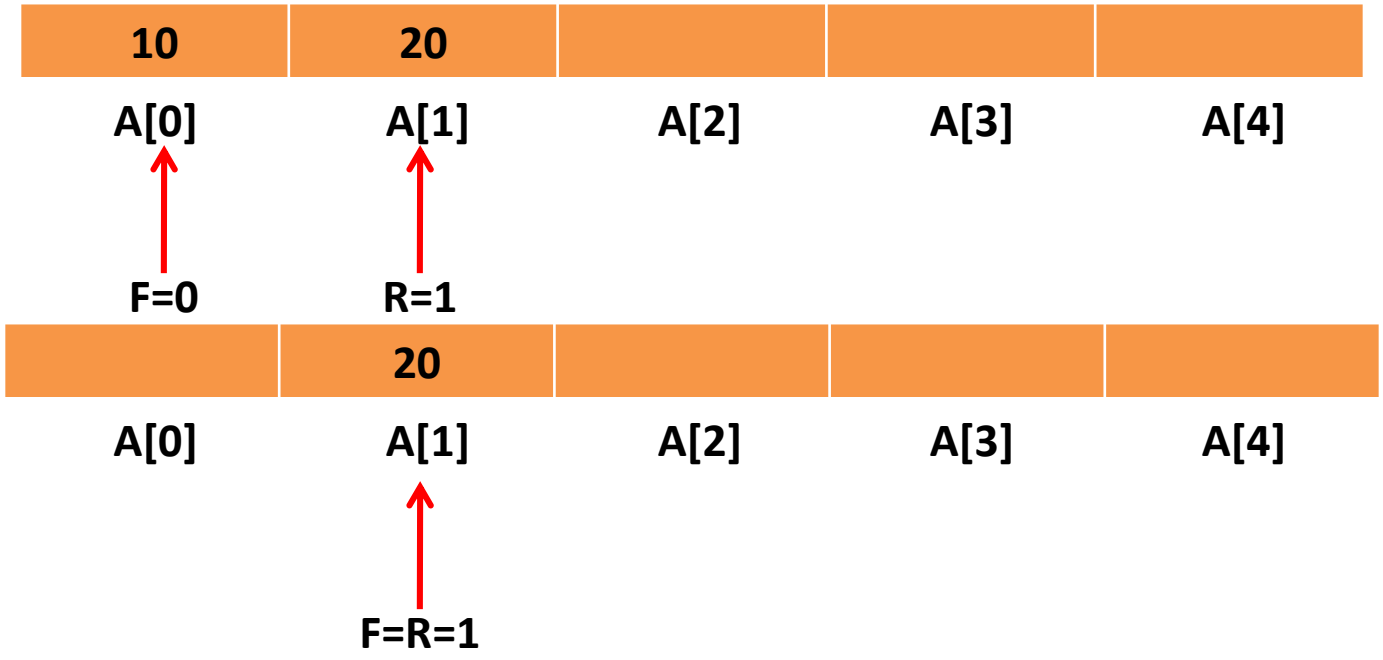
Operations on Queue

Deletion:

Algorithm:

Step 1: IF FRONT = -1 OR FRONT>REAR
Write “Queue is Underflow”
ELSE
SET VAL=QUEUE [FRONT]
FRONT = FRONT + 1
[END OF IF]
Step 2: EXIT

Example of Deletion in Queue



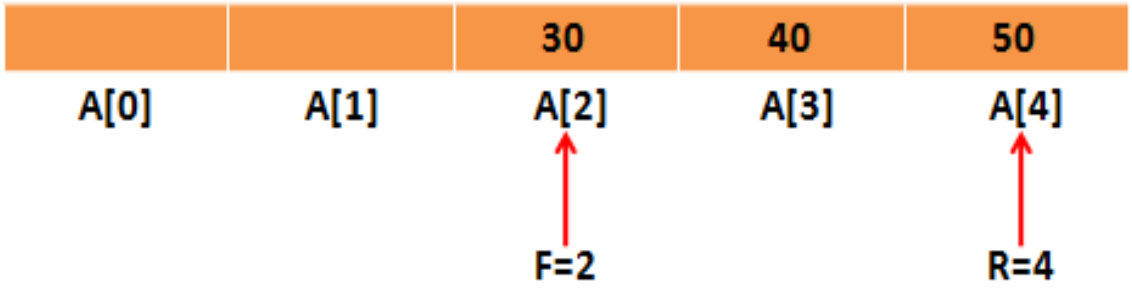
Types Of Queue

1. Circular Queue
2. Priority Queue
3. Deque
4. Multiple Queue

Circular Queue

Why Circular Queue is needed?

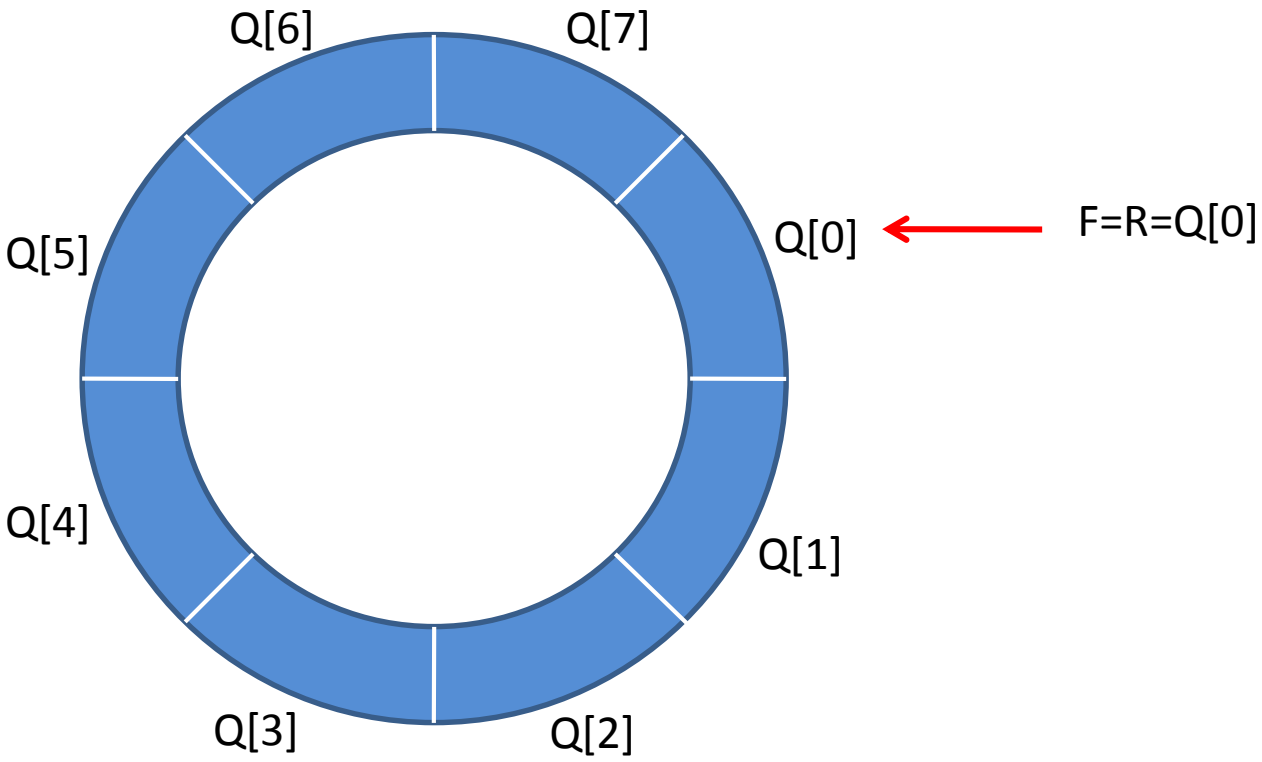
- Problem:
  - Wastage of memory in standard queue in DEQUEUE operation



What is Circular Queue?

- The Arrangement of the elements Q[0], Q[1], ...,Q[n] in a circular fashion with Q[1] following Q[n] is called Circular Queue.
- The **last node is connected to first node** to make a circle.
- Initially, Both Front and Rear pointers points to the beginning of the array.
- It is also known as "Ring Buffer".

- e.g.:



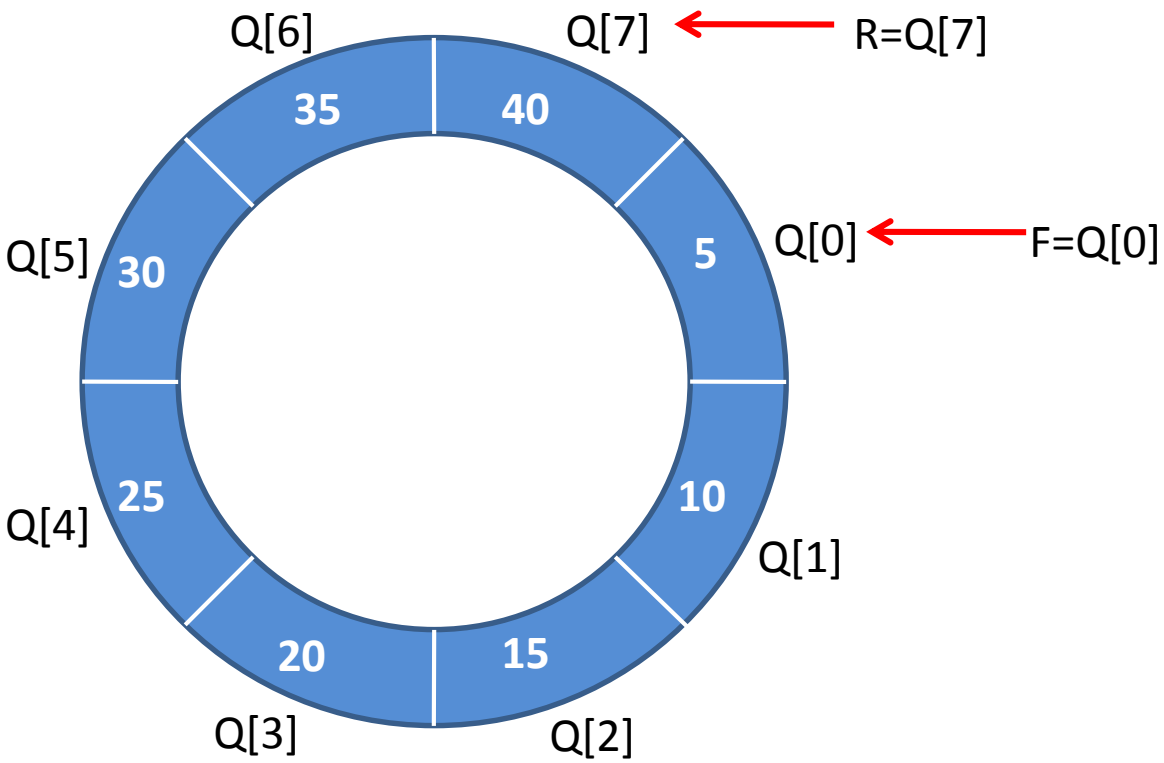
Operations on Circular Queue

Insertion:

Algorithm:

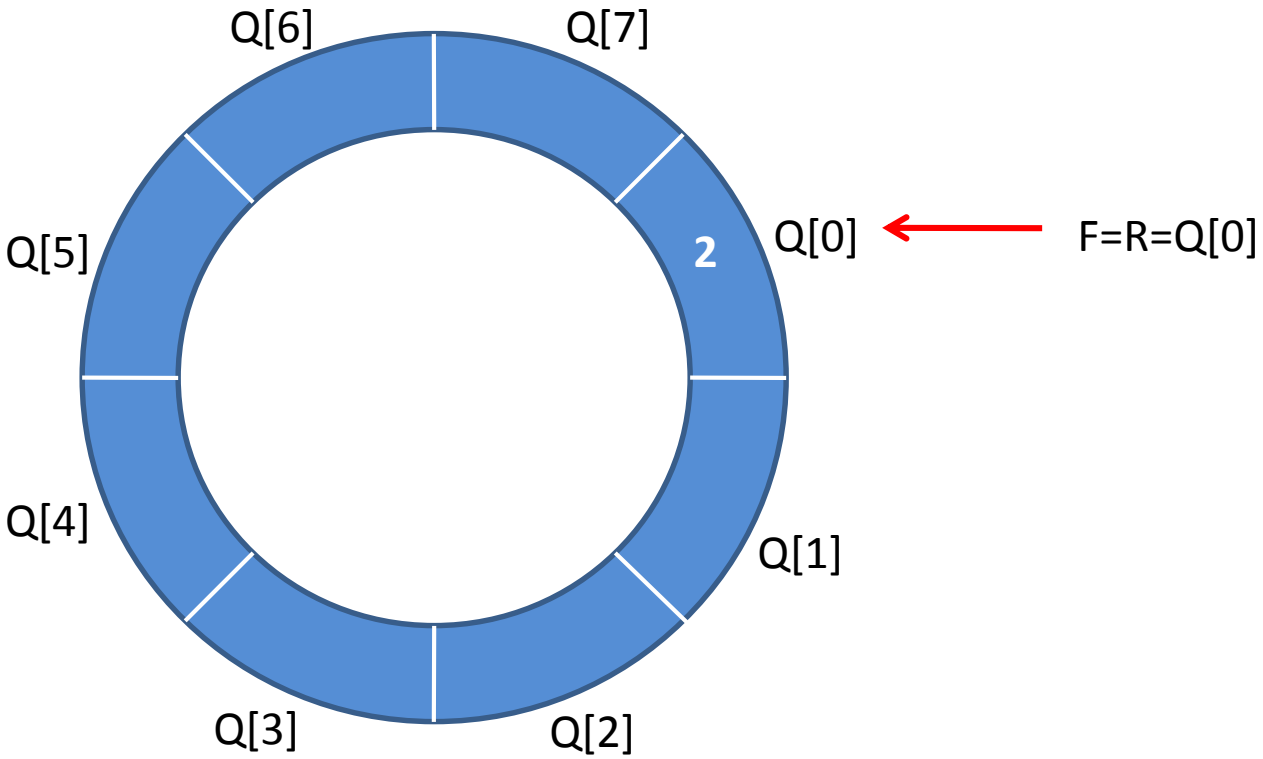
Step 1: IF FRONT=0 and REAR=MAX-1 Then
Write "Overflow"
Goto Step 4
[END OF IF]
Step 2: IF FRONT = REAR=-1 then
SET FRONT=REAR=0
ELSE IF REAR=MAX-1 and FRONT!=0
SET REAR=0
ELSE
SET REAR=REAR+1
[END OF IF]
Step 3: SET QUEUE[REAR]=VAL
Step 4: EXIT

e.g.:



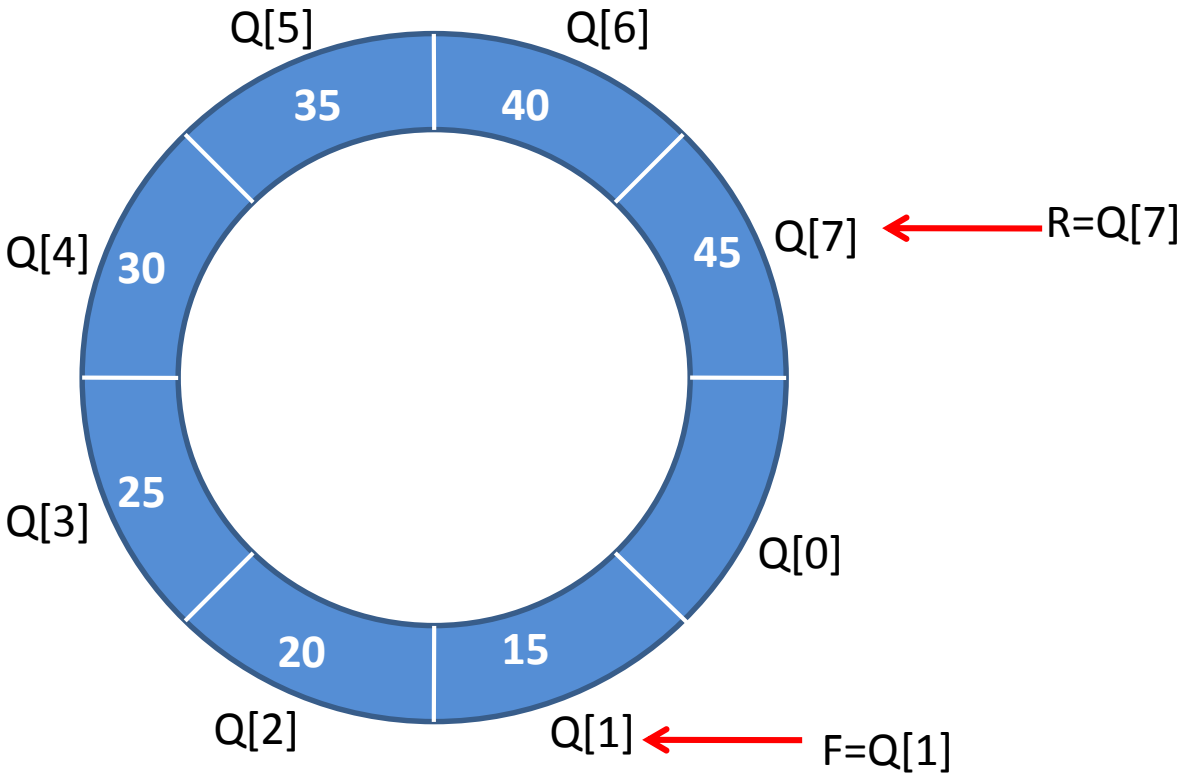
Queue is full(Overflow)

e.g.: (cond..)



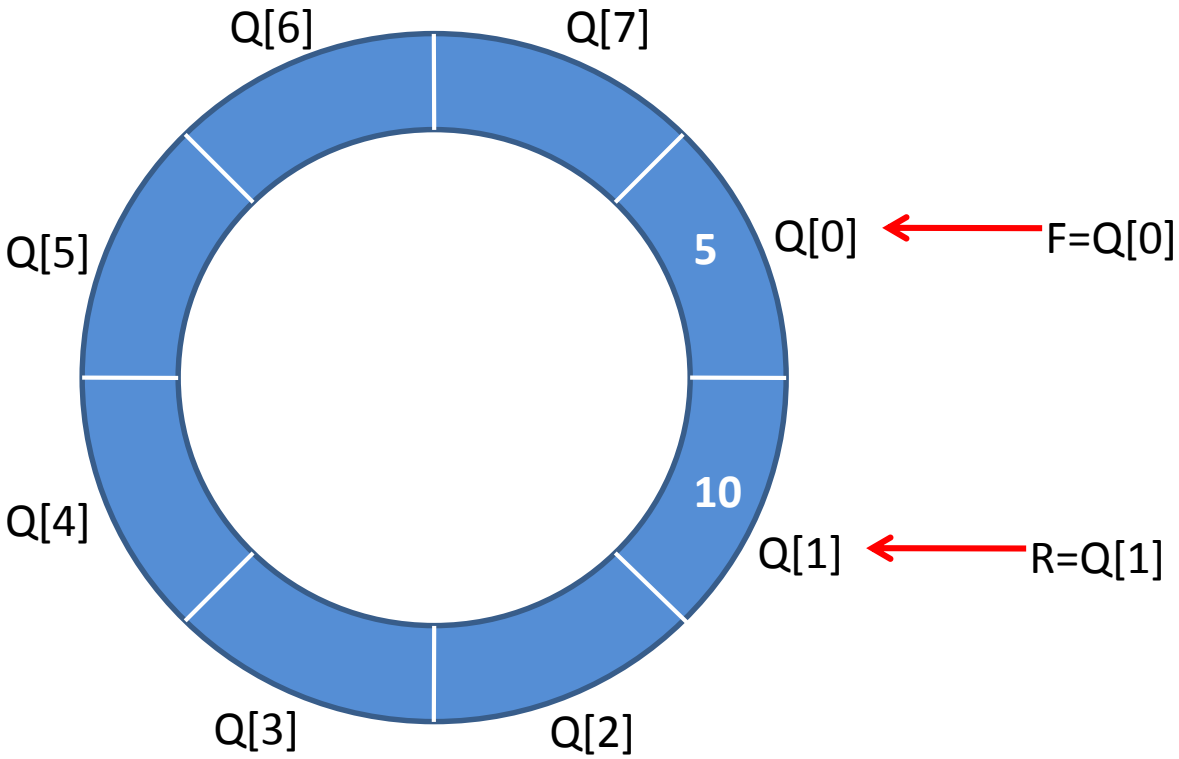
If F=R=-1 then F=R=0

e.g.: (cond..)



If REAR=MAX-1 and FRONT!=0

e.g.: (cond..)



Rear=Rear+1

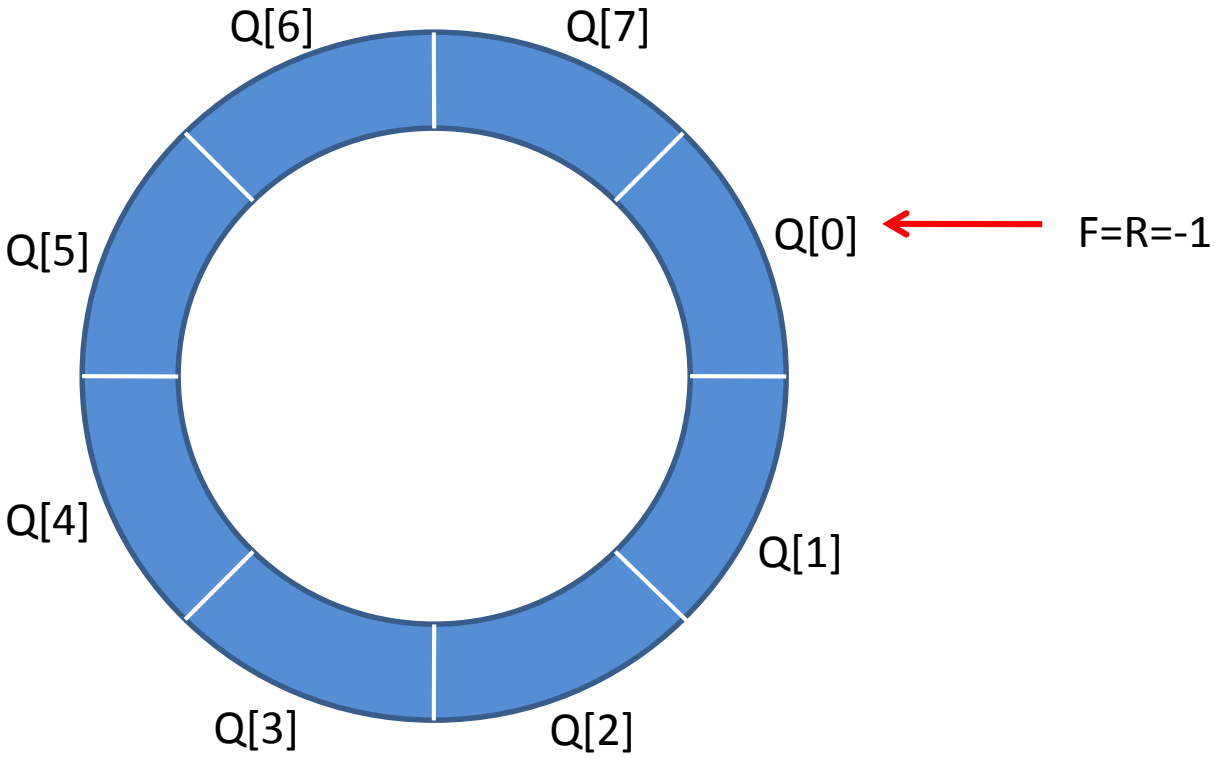
Operations on Circular Queue

Deletion:

Algorithm:

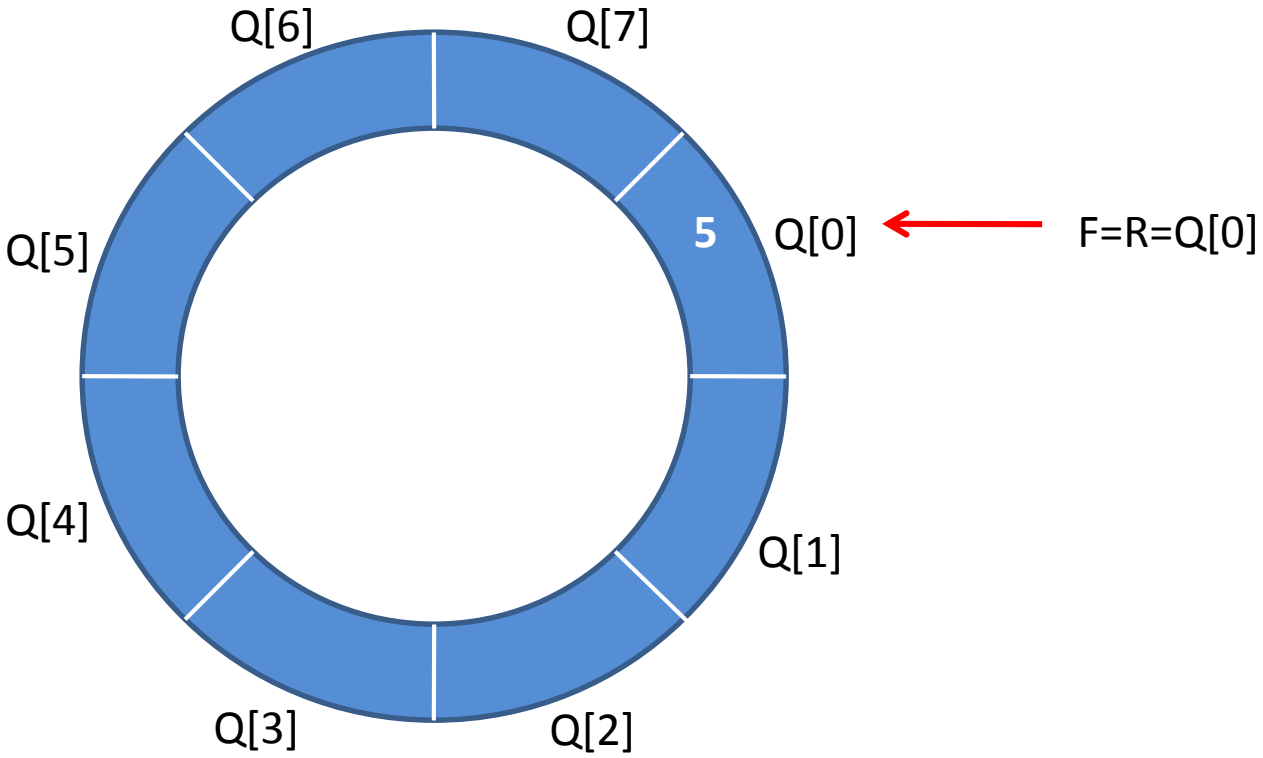
```
Step 1: If FRONT = -1 then
                Write ("Circular Queue Underflow“)
                    GOTO Step 4
Step 2: SET VAL=QUEUE[FRONT]
Step 3: If FRONT = REAR then
                SET FRONT=REAR=-1
           ELSE
                 IF FRONT=MAX-1
                          SET FRONT=0
                ELSE
                          SET FRONT=FRONT+1
                [END OF IF]
           [END OF IF]
Step 4: EXIT
```

e.g.:



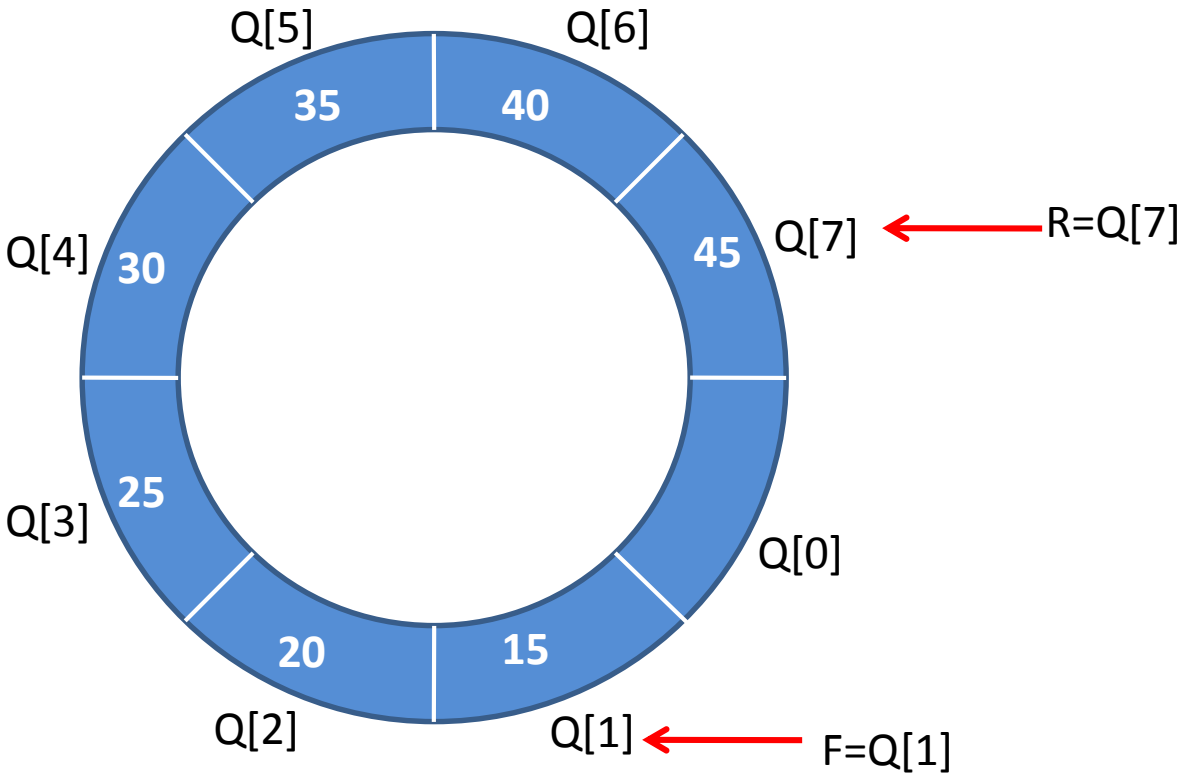
Queue is Empty(Underflow)

e.g.:



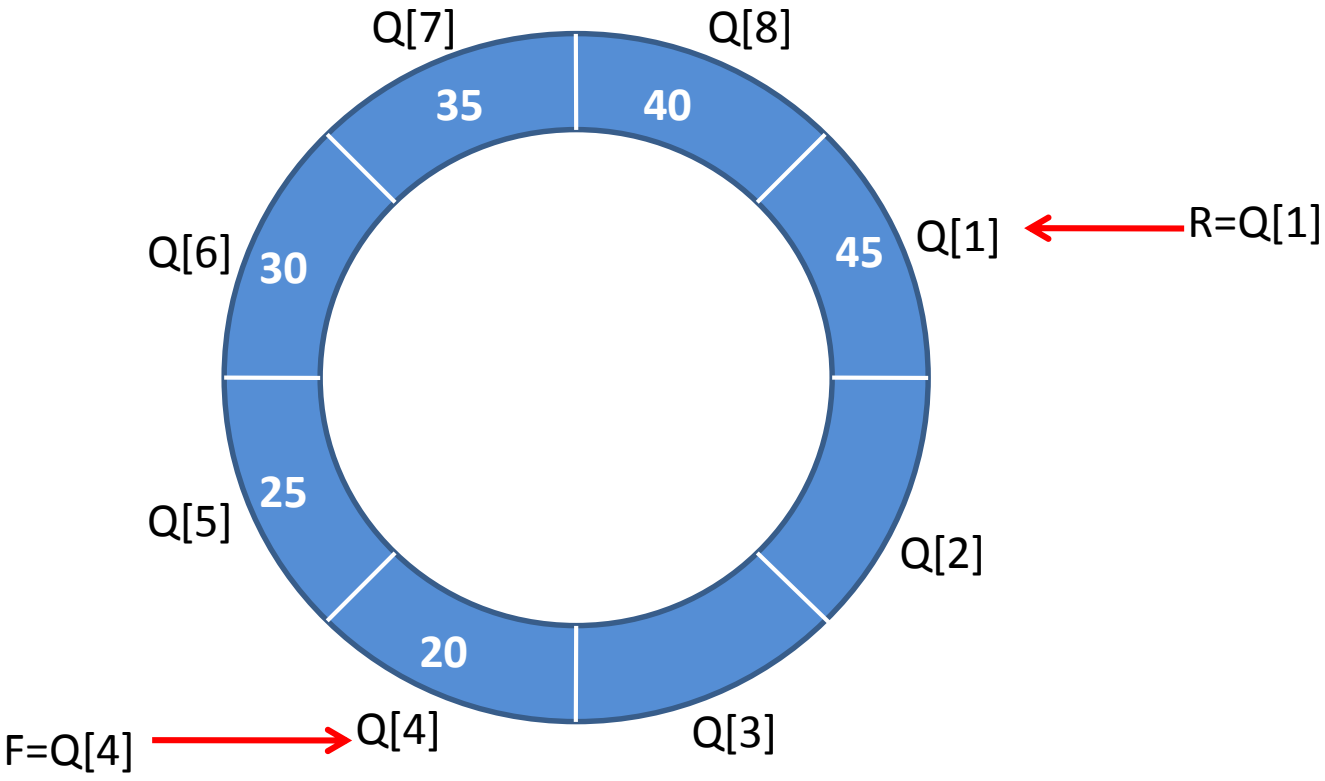
If F=R=0 then F=R=-1

e.g.: (cond..)



If Front=MAX-1 then Front=0

e.g.: (cond..)



Front=Front+1

Priority Queue

Priority Queue

- In priority queue, each element is assigned a priority.
- Priority of an element determines the order in which the elements will be processed.
- Rules:
  1. An element with higher priority will processed before an element with a lower priority.
  2. Two elements with the same priority are processed on a First Come First Serve basis.

Types of Priority Queue

1. Ascending Priority Queue

   In this type of priority queue, elements can be inserted into any order but only the smallest element can be removed.

2. Descending Priority Queue

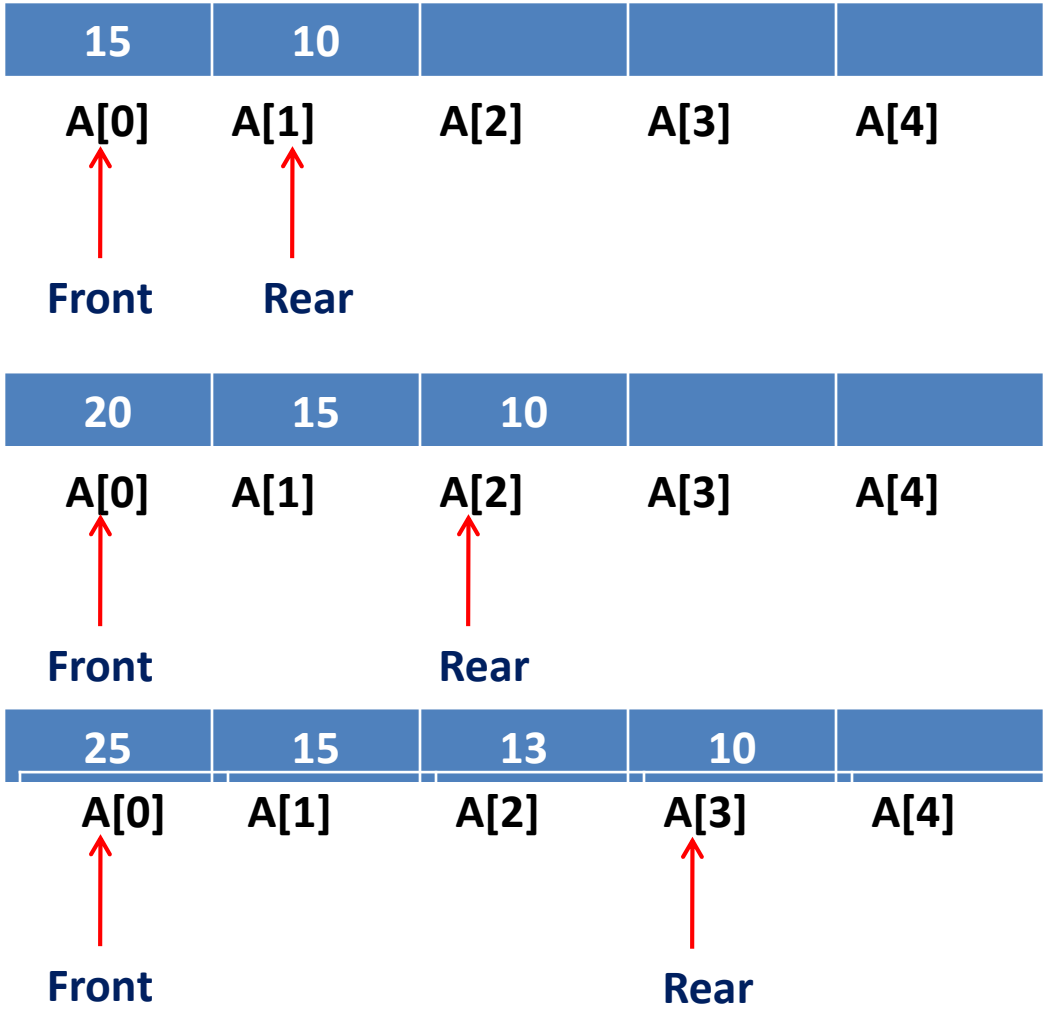
   In this type of priority queue, elements can be inserted into any order but only the largest element can be removed.

Array Representation of Priority Queue

Insertion Operation:

- While inserting elements in priority queue we will add it at the appropriate position depending on its priority
- It is inserted in such a way that the elements are always ordered either in Ascending or descending sequence

Array Representation of Priority Queue

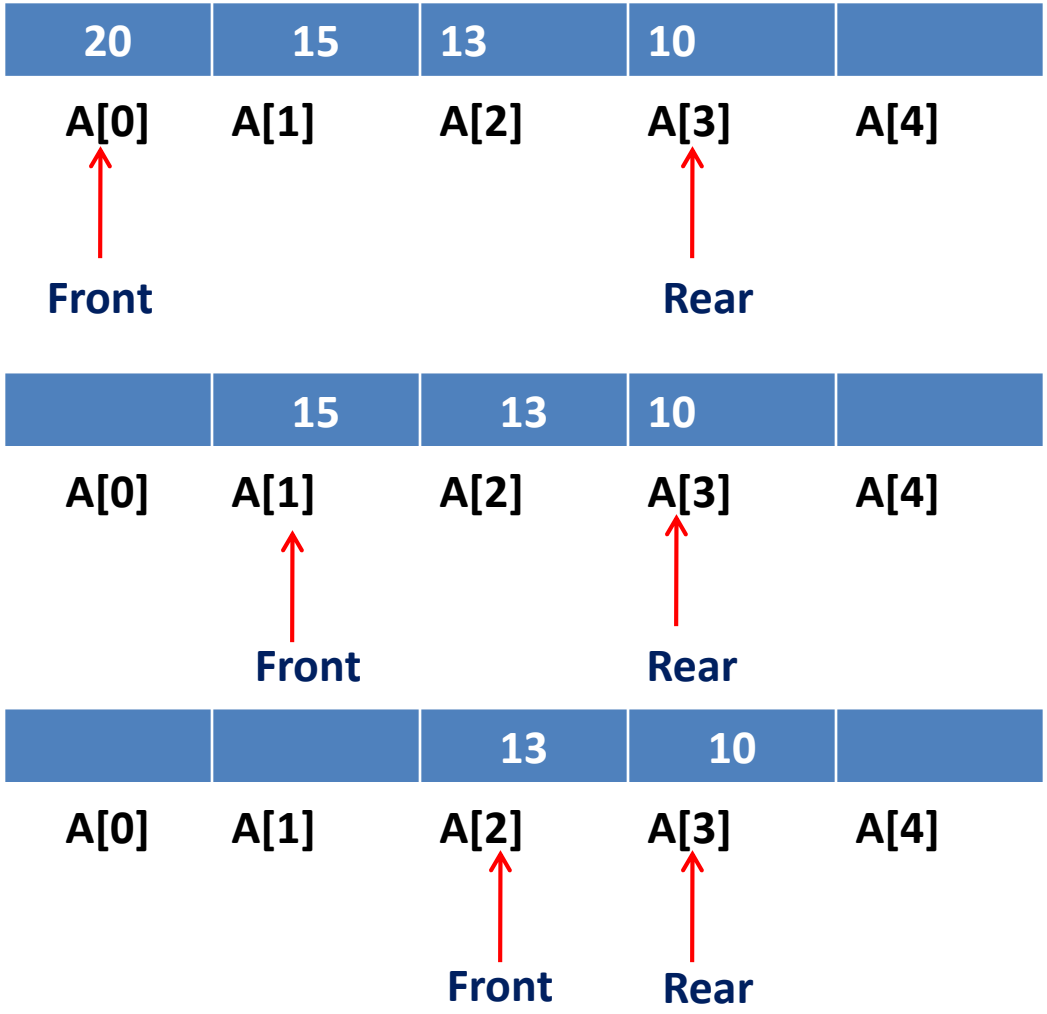


Array Representation of Priority Queue

Deletion Operation:

- While deletion, the element at the front is always deleted.

Array Representation of Priority Queue



Double Ended Queue

Deque / Double Ended Queue

- A list in which elements can be inserted or deleted either end
- It is also known as **“Head-Tail Linked List”**
- It has two pointers LEFT and RIGHT, which point to either end of the deque.
- Dequeue can be implemented using Circular Array or a Circular doubly linked list where Dequeue[n-1] is followed by Dequeue[0]

Types of Deque

- Input Restricted Deque:-

  In this dequeue, insertion can be done only at one of the end, while deletion can be done from both ends.

- Output Restricted Deque:-

  In this dequeue, deletion can be done only at one of the ends, while insertions can be done on both ends

THANK YOU…