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YEAR	SEM
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CS8391

DATA STRUCTURES

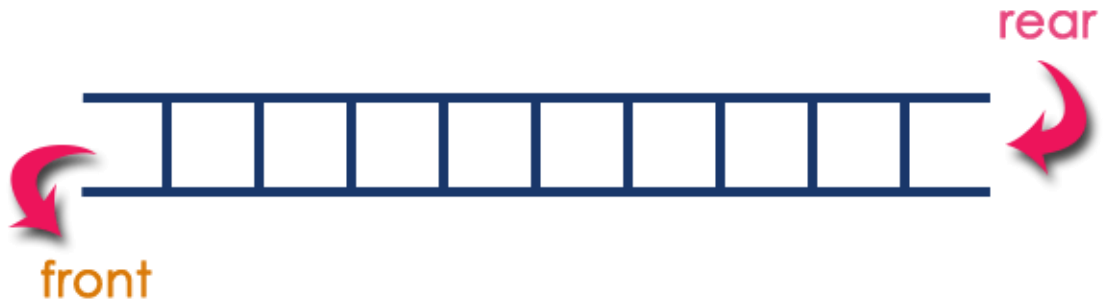
UNIT No. 2

2.3.1 Queue ADT Array Implementation

Version 1.00

4 QUALITY EDUCATION

Queue is a linear data structure in which the insertion and deletion operations are performed at two different ends. In a queue data structure, adding and removing elements are performed at two different positions. The insertion is performed at one end and deletion is performed at another end. In a queue data structure, the insertion operation is performed at a position which is known as 'rear' and the deletion operation is performed at a position which is known as 'front'. In queue data structure, the insertion and deletion operations are performed based on FIFO (First In First Out).



The following operations are performed on a queue data structure:

1. **enQueue(value) - (To insert an element into the queue)**
2. **deQueue() - (To delete an element from the queue)**
3. **display() - (To display the elements of the queue)**

Queue data structure can be implemented in two ways. They are as follows...

1. **Using Array**
2. **Using Linked List**

Queue Operations using Array

Queue data structure using array can be implemented as follows...

Before we implement actual operations, first follow the below steps to create an empty queue.

- Step 1 - Include all the **header files** which are used in the program and define a constant **'SIZE'** with specific value.
- Step 2 - Declare all the **user defined functions** which are used in queue implementation.
- Step 3 - Create a one dimensional array with above defined SIZE (**int queue[SIZE]**)
- Step 4 - Define two integer variables **'front'** and '**rear**' and initialize both with '**-1**'. (**int front = -1, rear = -1**)

- Step 5 - Then implement main method by displaying menu of operations list and make suitable function calls to perform operation selected by the user on queue.

enQueue(value) - Inserting value into the queue

In a queue data structure, enQueue() is a function used to insert a new element into the queue. In a queue, the new element is always inserted at **rear** position. The enQueue() function takes one integer value as a parameter and inserts that value into the queue. We can use the following steps to insert an element into the queue...

- Step 1 - Check whether **queue** is **FULL**. (**rear == SIZE-1**)
- Step 2 - If it is **FULL**, then display **"Queue is FULL!!! Insertion is not possible!!!"** and terminate the function.
- Step 3 - If it is **NOT FULL**, then increment **rear** value by one (**rear++**) and set **queue[rear]** = **value**.

deQueue() - Deleting a value from the Queue

In a queue data structure, deQueue() is a function used to delete an element from the queue. In a queue, the element is always deleted from **front** position. The deQueue() function does not take any value as parameter. We can use the following steps to delete an element from the queue...

- Step 1 - Check whether **queue** is **EMPTY**. (**front == rear**)
- Step 2 - If it is **EMPTY**, then display **"Queue is EMPTY!!! Deletion is not possible!!!"** and terminate the function.
- Step 3 - If it is **NOT EMPTY**, then increment the **front** value by one (**front ++**). Then display **queue[front]** as deleted element. Then check whether both **front** and **rear** are equal (**front == rear**), if it **TRUE**, then set both **front** and **rear** to '**-1**' (**front = rear = -1**).

display() - Displays the elements of a Queue

We can use the following steps to display the elements of a queue...

- Step 1 - Check whether **queue** is **EMPTY**. (**front == rear**)
- Step 2 - If it is **EMPTY**, then display **"Queue is EMPTY!!!"** and terminate the function.
- Step 3 - If it is **NOT EMPTY**, then define an integer variable '**i**' and set '**i = front+1**'.

- Step 4 - Display '**queue[i]**' value and increment '**i**' value by one (**i++**). Repeat the same until '**i**' value reaches to **rear** (**i** <= **rear**)

Implementation of Queue Data structure using Array - C Programming

```
#include<stdio.h>
#include<conio.h>
#define SIZE 10
void enQueue(int);
void deQueue();
void display();
int queue[SIZE], front = -1, rear = -1;
void main()
{
  int value, choice;
  clrscr();
  while(1){
    printf("\n\n***** MENU *****\n");
    printf("1. Insertion\n2. Deletion\n3. Display\n4. Exit");
    printf("\nEnter your choice: ");
    scanf("%d",&choice);
    switch(choice){
        case 1: printf("Enter the value to be insert: ");
                scanf("%d",&value);
                enQueue(value);
                break;
        case 2: deQueue();
                break;
        case 3: display();
                break;
        case 4: exit(0);
        default: printf("\nWrong selection!!! Try again!!!");
    }
```

```
    }
  }
  void enQueue(int value){
    if(rear == SIZE-1)
      printf("\nQueue is Full!!! Insertion is not possible!!!");
    else{
      if(front == -1)
            front = 0;
      rear++;
      queue[rear] = value;
      printf("\nInsertion success!!!");
    }
  }
  void deQueue(){
    if(front == rear)
      printf("\nQueue is Empty!!! Deletion is not possible!!!");
    else{
      printf("\nDeleted : %d", queue[front]);
      front++;
      if(front == rear)
            front = rear = -1;
    }
  }
  void display(){
    if(rear == -1)
      printf("\nQueue is Empty!!!");
    else{
      int i;
      printf("\nQueue elements are:\n");
      for(i=front; i<=rear; i++)
            printf("%d\t",queue[i]);
    }
```

```
}
```