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Aim : Implementing A Circular Queue from Array ADT in C language

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Practical No : 3

Subject : Data Structure

Code :

Queue.h header file

```c
#include <stdio.h>
#include <stdlib.h>
struct Queue  {
    int *arr;
    int front, rear, max;
};

int isFull(struct Queue * queue){
    return queue -> front == (queue -> rear + 1) % queue -> max;
}
int isEmpty(struct Queue * queue){
    return queue -> rear == -1;
}
void allocateMemory(struct Queue * queue, int max){
    queue -> arr = (int *)malloc(sizeof(int) * max);
    queue -> front = -1;
    queue -> rear = -1;
    queue -> max = max;
}

void enqueue(struct Queue * queue, int element){
    if(isFull(queue)){
        printf("\nQueue is full\n");
        return;
    }
    if(queue -> rear == -1){
       queue -> front = 0;
       queue -> rear = 0;
       queue -> arr[queue -> rear] = element;
       return;
    }
```

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```
    queue -> rear = (queue -> rear + 1) % queue -> max;
    queue -> arr[queue -> rear] = element;
}
int dqueue(struct Queue * queue){

    if(isEmpty(queue)){
        printf("queue is Empty \n");
        return -1;
    }
    if(queue -> front == queue -> rear){
    int curr = queue -> arr[queue -> front];
        queue -> front = -1;
        queue -> rear = -1;
        return curr;
    }
    int curr = queue -> arr[queue -> front];
       queue -> front = (queue -> front + 1) % queue -> max;
       return curr;
}
void display (struct Queue * queue){
    int curr = queue -> front;

    if(isEmpty(queue)){
        printf("Queue is Empty\n");
        return;
    }

    while(curr != queue -> rear){
        printf("%d ", queue -> arr[curr]);
        curr = (curr + 1) % queue -> max;
    }
     printf("%d \n", queue -> arr[curr]);
}
```

Queue.c file

```
#include <stdio.h>
#include "Queue.h"

int main()
{
    struct Queue *queue = (struct Queue *)malloc(sizeof(struct Queue));
    int n;
```

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```
    printf("enter the queue size : ");
    scanf("%d", &n);
    allocateMemory(queue, n);

    int x = 1;
    while (x != 0)
    {
        printf("enter 0 to exit else \nenter : 1 for add || 2 for delete || 3
for display: ");
        scanf("%d", &x);
        switch (x)
        {
        case 1:
        {
            int i;
            printf("enter the element to add : ");
            scanf("%d", &i);
            enqueue(queue, i);
            break;
        }
        case 2:
        {
            printf("the element you removed is : %d\n", dqueue(queue));
            break;
        }
        case 3:
        {
            display(queue);
            break;
        }
        default:
            printf("an invalid input\n");
        }
    }
}
```

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```
PS C:\Users\SUJAL NIMJE\Downloads\queue> gcc queue.c
PS C:\Users\SUJAL NIMJE\Downloads\queue> ./a.exe
enter the queue size : 4
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 2
queue is Empty
the element you removed is : -1
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 1
enter the element to add : 10
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 1
enter the element to add : 20
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 1
enter the element to add : 30
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 1
enter the element to add : 40
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 3
10 20 30 40
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 1
enter the element to add : 50

Queue is full
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 2
the element you removed is : 10
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 3
20 30 40
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 1
enter the element to add : 10
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 3
20 30 40 10
enter 0 to exit else
enter : 1 for add || 2 for delete || 3 for display: 0
an invalid input
PS C:\Users\SUJAL NIMJE\Downloads\queue>
```