**Experiment 11**

**Circular Queue Implementation Using Array**

**Date :** 05-10-2020

**Aim:** To implement a circular queue using array

**Data Structure used :** Queue, Array

**Algorithms**

**1. Algorithm for enqueue**

Input: An Array implementation of Circular Queue (C\_Q[SIZE]), with front pointing to the first element and rear pointing to the last element in and an element E to be inserted into the queue.

Output: The Circular Queue with the element E inserted at the front

Data Structure: Circular Queue

Steps:

Step 1: if((rear+1)%SIZE == front) then

Step 1: print(“The queue is full insertion not possible”)

Step 2: exit(1)

Step 2: else

Step 1: if(rear == -1) then

Step 1: front ++

Step 2: EndIf

Step 3: rear = (rear+1)%SIZE

Step 4: C\_Q[rear] = E

Step 3: EndIf

**2. Algorithm for dequeue**

Input: An Array implementation of Circular Queue (C\_Q[SIZE]), with front pointing to the first element and rear pointing to the last element in the queue.

Output: The element E which is removed form the circular queue

Steps:

Step 1: if(front == -1) then

Step 1: print(“The Queue is empty”)

Step 2: exit(1)

Step 2: else

Step 1: E = Q[front]

Step 2: if(front == rear) then

Step 1: front =-1

Step 2: rear =-1

Step 3: else

Step 1: front = (front+1)%SIZE

Step 4: endif

Step 3: endif

**Program code:**

#include<stdio.h>

#include<stdlib.h>

//Create a struct for our queue

typedef struct CQueue{

int\* Q;

int front;

int rear;

int size;

} CQueue;

CQueue\* initializeQueue(){

int size = 2;

//Create a pointer to stack

CQueue \*a = (CQueue\*) malloc (sizeof(CQueue));

if(a == NULL){

printf("An Overflow error has ocurred while creating the CircularQueue\n");

exit(1);

}

//create the array that will contain our stack

a->Q = (int\*)malloc(size\*sizeof(int));

if(a->Q == NULL){

printf("An Overflow error has ocurred while creating the Circular Queue array\n");

exit(1);

}

a->front = -1;

a->rear = -1;

a->size = size;

return a;

}

void deleteQueue(CQueue \*a){

free(a->Q);

free(a);

}

void enQueue(CQueue \*a,int item){

if((a->rear+1)%(a->size) == a->front){

a->size = a->size\*2;

a->Q = realloc(a->Q,a->size);

//printf("CircularQueue is Full \n");

//fflush(stdout);

if(a->Q == NULL){

printf("An Overflow Error has occured while reallocating the array\nEXITING!!!!!!!\n");

exit(1);

}

}

if(a->front == -1){

a->front = 0;

}

a->rear = (a->rear +1)%a->size;

a->Q[a->rear] = item;

}

int deQueue(CQueue \*a){

if(a->front == -1){

printf("You have made a grave mistake, the CQueue was empty\n\n");

deleteQueue(a);

exit(1);

return -1;

}

else{

int item = a->Q[a->front];

if(a->front == a->rear){

a->front = -1;

a->rear = -1;

}

else{

a->front = (a->front+1)%(a->size);

}

return item;

}

}

void displayQueue(CQueue \*a){

int i = a->front;

while(i!=(a->rear+1)%(a->size)){

printf("%d ",a->Q[i]);

i = (i+1)%a->size;

}

printf("\n");

}

int menu(CQueue \*a){

int RUN=1;

int c; //For the corresponding choice

int item; //To receive the item to push or pop from the array

while (RUN){

printf("\n");

printf("-----------------------------------------------\n");

printf("Circular Queue Implementation using structure\n");

printf("-----------------------------------------------\n");

printf("1.Insert\n");

printf("2.Delete\n");

printf("3.Print the queue\n");

printf("4.Exit\n");

printf("Enter the required choice --> ");

scanf("%d%\*c",&c);

switch(c){

case 1:printf("Enter the element to be inserted into the queue --> ");

scanf("%d%\*c",&item);

enQueue(a,item);

break;

case 2:item = deQueue(a);

printf("Item removed is is --> %d\n",item);

break;

case 3:printf("The Circular Queue is --> ");

displayQueue(a);

break;

case 4: RUN=0;

break;

default:printf("Entered command is unknown");

}

}

deleteQueue(a);

printf("Finished excecuting the code ALL DONE\n");

return RUN;

}

int main(){

CQueue \*a;

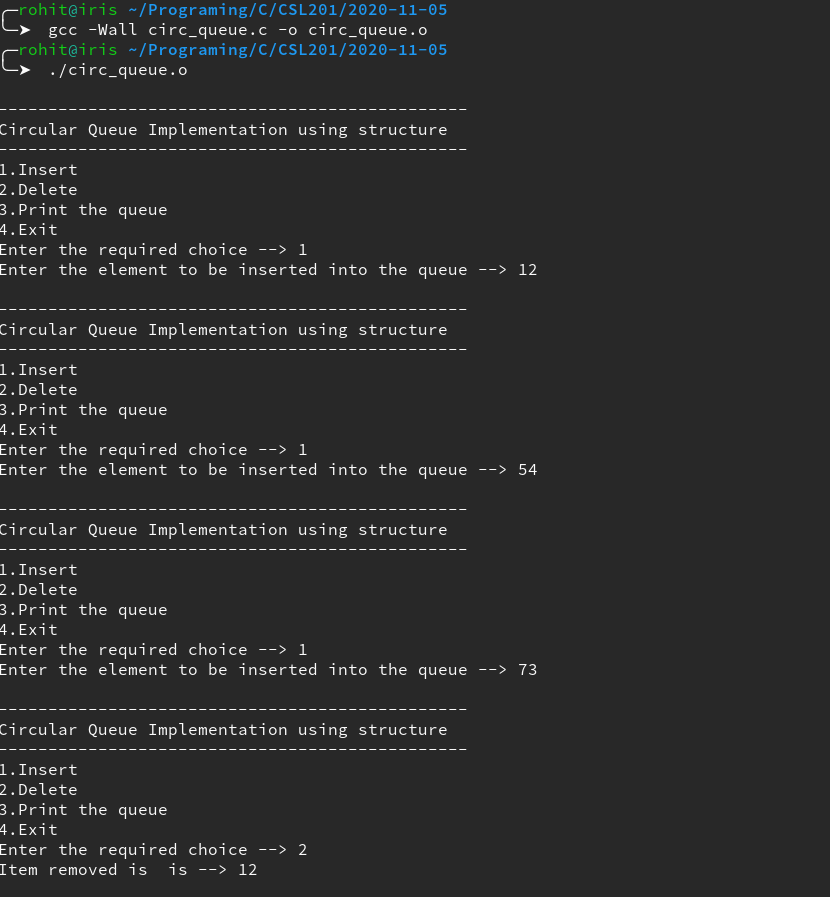
a = initializeQueue();

return menu(a);

}

**Result:** The Program was compiled successfully and the desired output was obtained.

**Sample input/Output:**

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