

Aim:

Write a program to implement `circular queue` using **dynamic array**.

Sample Input and Output:

```
Enter the maximum size of the circular queue : 3
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Circular queue is underflow.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Circular queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 111
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 222
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 333
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 444
Circular queue is overflow.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Elements in the circular queue : 111 222 333
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Deleted element = 111
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 1
Enter element : 444
Successfully inserted.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Elements in the circular queue : 222 333 444
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Deleted element = 222
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Deleted element = 333
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 2
Deleted element = 444
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 3
Circular queue is empty.
1.Enqueue 2.Dequeue 3.Display 4.Exit
Enter your option : 4
```

Source Code:

```
#include <stdio.h>
#include <stdlib.h>
int *cqueue;
int front, rear;
int maxSize;
void initCircularQueue()
{
    cqueue = (int *)malloc(maxSize * sizeof(int));
    front = -1;
    rear = -1;
}
void dequeue()
{
    if (front == -1)
    {
        printf("Circular queue is underflow.\n");
    }
    else
    {
        printf("Deleted element = %d\n", *(cqueue + front));
        if (rear == front)
        {
            rear = front = -1;
        }
        else if (front == maxSize - 1)
        {
            front = 0;
        }
        else
        {
            front++;
        }
    }
}
void enqueue(int x)
{
    if (((rear == maxSize - 1) && (front == 0)) || (rear + 1 == front))
    {
        printf("Circular queue is overflow.\n");
    }
    else
    {
        if (rear == maxSize - 1)
        {
            rear = -1;
        }
        else if (front == -1)
        {
            front = 0;
        }
        rear++;
        cqueue[rear] = x;
        printf("Successfully inserted.\n");
    }
}
```

```
}
void display()
{
    int i;
    if (front == -1 && rear == -1)
    {
        printf("Circular queue is empty.\n");
    }
    else
    {
        printf("Elements in the circular queue : ");
        if (front <= rear)
        {
            for (i = front; i <= rear; i++)
            {
                printf("%d ", *(cqueue + i));
            }
        }
        else
        {
            for (i = front; i <= maxSize - 1; i++)
            {
                printf("%d ", *(cqueue + i));
            }
            for (i = 0; i <= rear; i++)
            {
                printf("%d ", *(cqueue + i));
            }
        }
        printf("\n");
    }
}

int main()
{
    int op, x;
    printf("Enter the maximum size of the circular queue : ");
    scanf("%d", &maxSize);
    initCircularQueue();
    while(1)
    {
        printf("1.Enqueue 2.Dequeue 3.Display 4.Exit\n");
        printf("Enter your option : ");
        scanf("%d",&op);
        switch(op)
        {
            case 1:
                printf("Enter element : ");
                scanf("%d",&x);
                enqueue(x);
                break;
            case 2:
                dequeue();
                break;
            case 3:
                display();
                break;
        }
    }
}
```

```

        case 4:
            exit(0);
        }
    }
}

```

Execution Results - All test cases have succeeded!

Test Case - 1
User Output
Enter the maximum size of the circular queue : 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Circular queue is underflow. 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option : 3
Circular queue is empty. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 111
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 222
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 333
Successfully inserted. 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 444
Circular queue is overflow. 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option : 3
Elements in the circular queue : 111 222 333 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Deleted element = 111 1
1.Enqueue 2.Dequeue 3.Display 4.Exit 1
Enter your option : 1
Enter element : 444
Successfully inserted. 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option : 3
Elements in the circular queue : 222 333 444 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Deleted element = 222 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2

Deleted element = 333 2
1.Enqueue 2.Dequeue 3.Display 4.Exit 2
Enter your option : 2
Deleted element = 444 3
1.Enqueue 2.Dequeue 3.Display 4.Exit 3
Enter your option : 3
Circular queue is empty. 4
1.Enqueue 2.Dequeue 3.Display 4.Exit 4
Enter your option : 4