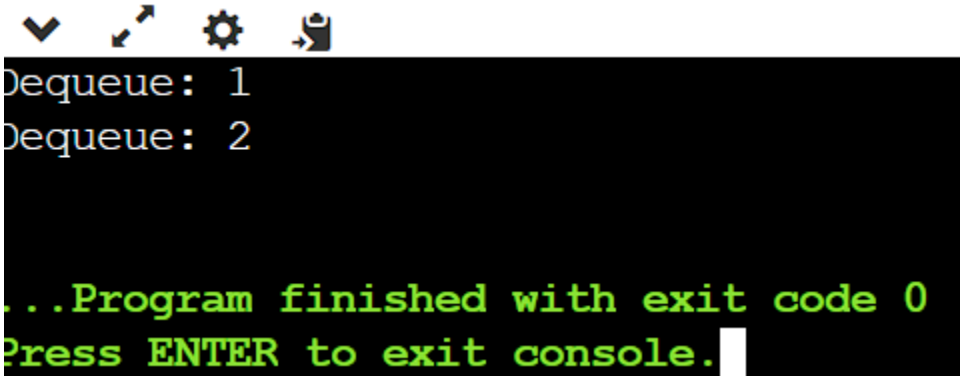
1. Week 3 & 4: Simulate the following tasks:
a. Implementation the following operations: enqueue, dequeue and finding an element:

1. Linear Queue using arrays
2. Circular queue using arrays

1.
```
#include <stdio.h>
#include <stdlib.h>

#define MAX_SIZE 5

typedef struct {
    int queue[MAX_SIZE];
    int front, rear;
} LinearQueue;

LinearQueue* createLinearQueue() {
    LinearQueue* q = (LinearQueue*)malloc(sizeof(LinearQueue));
    q->front = -1;
    q->rear = -1;
    return q;
}

int isLinearQueueEmpty(LinearQueue* q) {
    return q->front == -1;
}

int isLinearQueueFull(LinearQueue* q) {
    return (q->rear == MAX_SIZE - 1) ? 1 : 0;
}

void linearEnqueue(LinearQueue* q, int data) {
    if (isLinearQueueFull(q)) {
        printf("Queue is full.\n");
        return;
    }
    if (q->front == -1) {
        q->front = 0;
    }
    q->rear++;
    q->queue[q->rear] = data;
}
```

```
int linearDequeue(LinearQueue* q) {
    if (isLinearQueueEmpty(q)) {
        printf("Queue is empty.\n");
        return -1;
    }
    int data = q->queue[q->front];
    if (q->front == q->rear) {
        q->front = -1;
        q->rear = -1;
    } else {
        q->front++;
    }
    return data;
}

int main() {
    LinearQueue* q = createLinearQueue();
    linearEnqueue(q, 1);
    linearEnqueue(q, 2);
    linearEnqueue(q, 3);
    linearEnqueue(q, 4);
    linearEnqueue(q, 5);

    printf("Dequeue: %d\n", linearDequeue(q));
    printf("Dequeue: %d\n", linearDequeue(q));

    free(q);
    return 0;
}
```

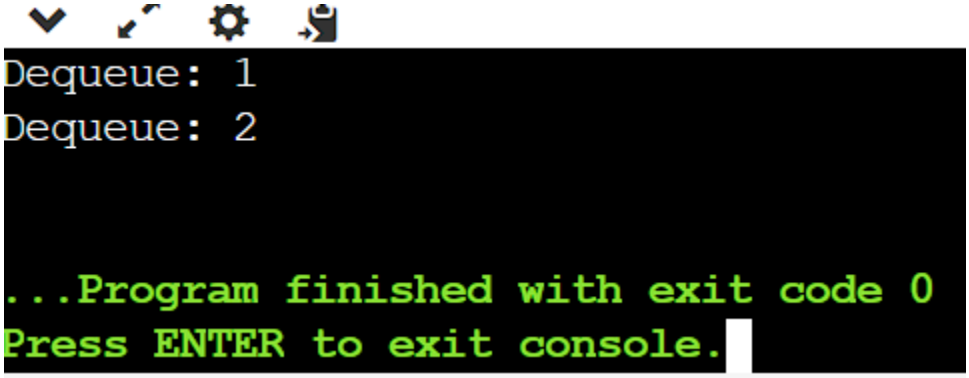


2.

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

```c
#include <stdlib.h>

#define MAX_SIZE 5

typedef struct {
    int queue[MAX_SIZE];
    int front, rear;
} CircularQueue;

CircularQueue* createCircularQueue() {
    CircularQueue* q = (CircularQueue*)malloc(sizeof(CircularQueue));
    q->front = -1;
    q->rear = -1;
    return q;
}

int isCircularQueueEmpty(CircularQueue* q) {
    return q->front == -1;
}

int isCircularQueueFull(CircularQueue* q) {
    return (q->rear + 1) % MAX_SIZE == q->front ? 1 : 0;
}

void circularEnqueue(CircularQueue* q, int data) {
    if (isCircularQueueFull(q)) {
        printf("Queue is full.\n");
        return;
    }
    if (isCircularQueueEmpty(q)) {
        q->front = 0;
    }
    q->rear = (q->rear + 1) % MAX_SIZE;
    q->queue[q->rear] = data;
}

int circularDequeue(CircularQueue* q) {
    if (isCircularQueueEmpty(q)) {
        printf("Queue is empty.\n");
        return -1;
    }
    int data = q->queue[q->front];
    if (q->front == q->rear) {
        q->front = -1;
```

```
        q->rear = -1;
    } else {
        q->front = (q->front + 1) % MAX_SIZE;
    }
    return data;
}

int main() {
    CircularQueue* q = createCircularQueue();
    circularEnqueue(q, 1);
    circularEnqueue(q, 2);
    circularEnqueue(q, 3);
    circularEnqueue(q, 4);
    circularEnqueue(q, 5);

    printf("Dequeue: %d\n", circularDequeue(q));
    printf("Dequeue: %d\n", circularDequeue(q));

    free(q);
    return 0;
}
```



ASSIGNMENT-2

```
#include <stdio.h>
#include <stdbool.h>

#define N 4

void printSolution(int board[N][N]) {
    for (int i = 0; i < N; i++) {
```

```
        for (int j = 0; j < N; j++) {
            printf("%d ", board[i][j]);
        }
        printf("\n");
    }
}

bool isSafe(int board[N][N], int row, int col) {
    int i, j;


    for (i = 0; i < col; i++)
        if (board[row][i])
            return false;


    for (i = row, j = col; i >= 0 && j >= 0; i--, j--)
        if (board[i][j])
            return false;


    for (i = row, j = col; j >= 0 && i < N; i++, j--)
        if (board[i][j])
            return false;

    return true;
}

bool solveNQueensUtil(int board[N][N], int col) {

    if (col >= N)
        return true;


    for (int i = 0; i < N; i++) {

        if (isSafe(board, i, col)) {

            board[i][col] = 1;


            if (solveNQueensUtil(board, col + 1))
                return true;
```

```
            board[i][col] = 0;
        }
    }


    return false;
}

bool solveNQueens() {
    int board[N][N] = {{0, 0, 0, 0},
                       {0, 0, 0, 0},
                       {0, 0, 0, 0},
                       {0, 0, 0, 0}};

    if (solveNQueensUtil(board, 0) == false) {
        printf("Solution does not exist");
        return false;
    }

    printSolution(board);
    return true;
}

int main() {
    solveNQueens();
    return 0;
}
```