Ambekeshwar Group Of Institutions

Technology & Management,
Lucknow

Session: 2023-24

PRACTICAL FILE

Branch:- CSE 2nd Year | 3rd Sem

Subject:- Data Structure Using C

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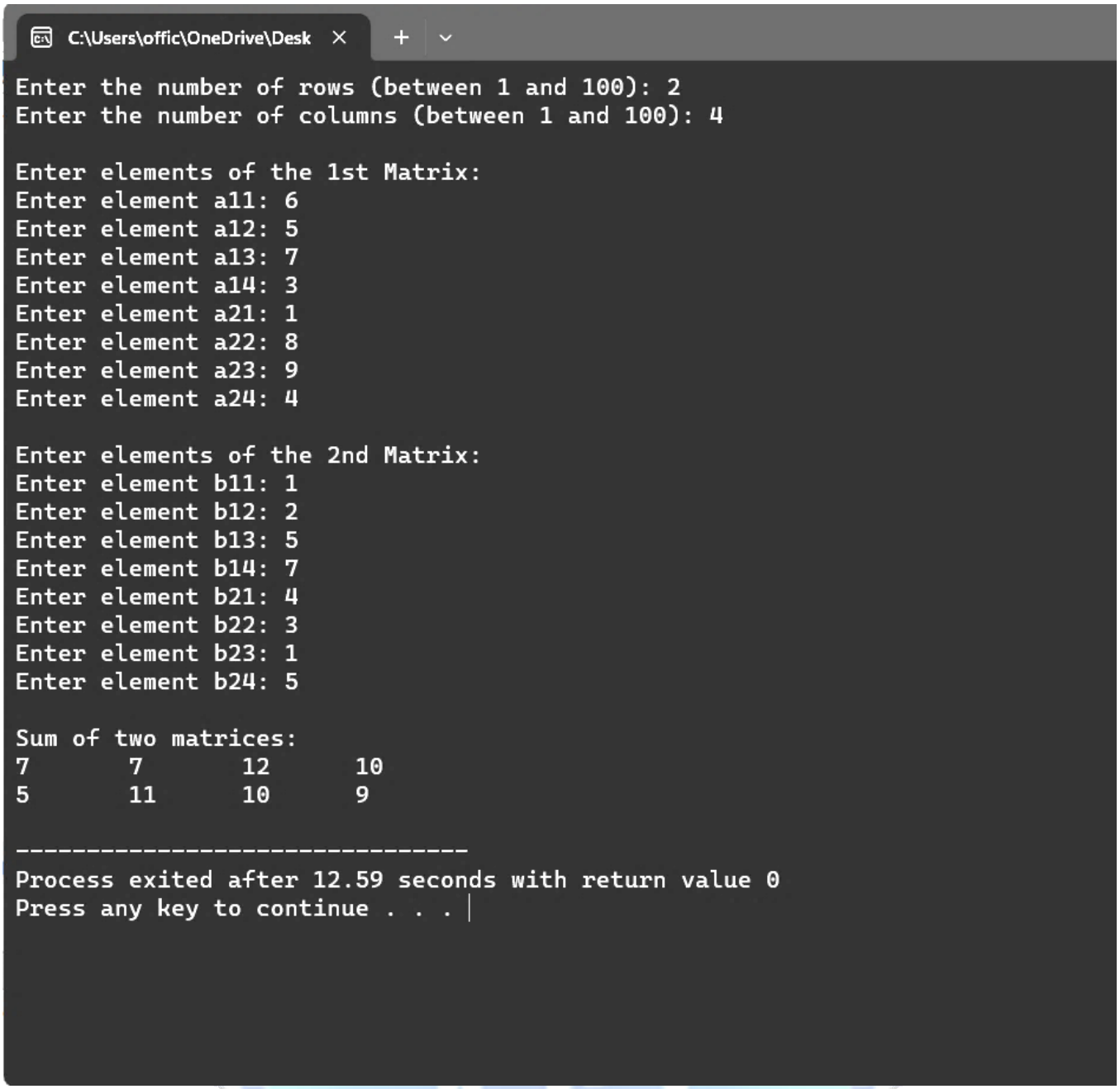
Practical No: 1

AIM : Addition of two matrices using functions.

```
#include <stdio.h>

int main() {
    int r, c, a[100][100], b[100][100], sum[100][100], i, j;

    printf("Enter the number of rows (between 1 and 100): ");
    scanf("%d", &r);

    printf("Enter the number of columns (between 1 and 100): ");
    scanf("%d", &c);

    printf("\nEnter elements of the 1st Matrix:\n");
    for (i = 0; i < r; ++i) {
        for (j = 0; j < c; ++j) {
            printf("Enter element a%d%d: ", i + 1, j + 1);
            scanf("%d", &a[i][j]);
        }
    }

    printf("\nEnter elements of the 2nd Matrix:\n");
    for (i = 0; i < r; ++i) {
        for (j = 0; j < c; ++j) {
            printf("Enter element b%d%d: ", i + 1, j + 1);
            scanf("%d", &b[i][j]);
        }
    }

    // Adding two matrices
    for (i = 0; i < r; ++i) {
        for (j = 0; j < c; ++j) {
            sum[i][j] = a[i][j] + b[i][j];
        }
    }

    // Printing the result
    printf("\nSum of two matrices:\n");
    for (i = 0; i < r; ++i) {
        for (j = 0; j < c; ++j) {
            printf("%d\t", sum[i][j]); // Add a tab (\t) for spacing
        }
        printf("\n"); // Move to the next row
    }
 return 0;
}
```

Output:


C:\Users\offic\OneDrive\Desk
Enter the number of rows (between 1 and 100): 2
Enter the number of columns (between 1 and 100): 4
Enter elements of the 1st Matrix:
Enter element a11: 6
Enter element a12: 5
Enter element a13: 7
Enter element a14: 3
Enter element a21: 1
Enter element a22: 8
Enter element a23: 9
Enter element a24: 4
Enter elements of the 2nd Matrix:
Enter element b11: 1
Enter element b12: 2
Enter element b13: 5
Enter element b14: 7
Enter element b21: 4
Enter element b22: 3
Enter element b23: 1
Enter element b24: 5
Sum of two matrices:
7 7 12 10
5 11 10 9
Process exited after 12.59 seconds with return value 0
Press any key to continue . . .

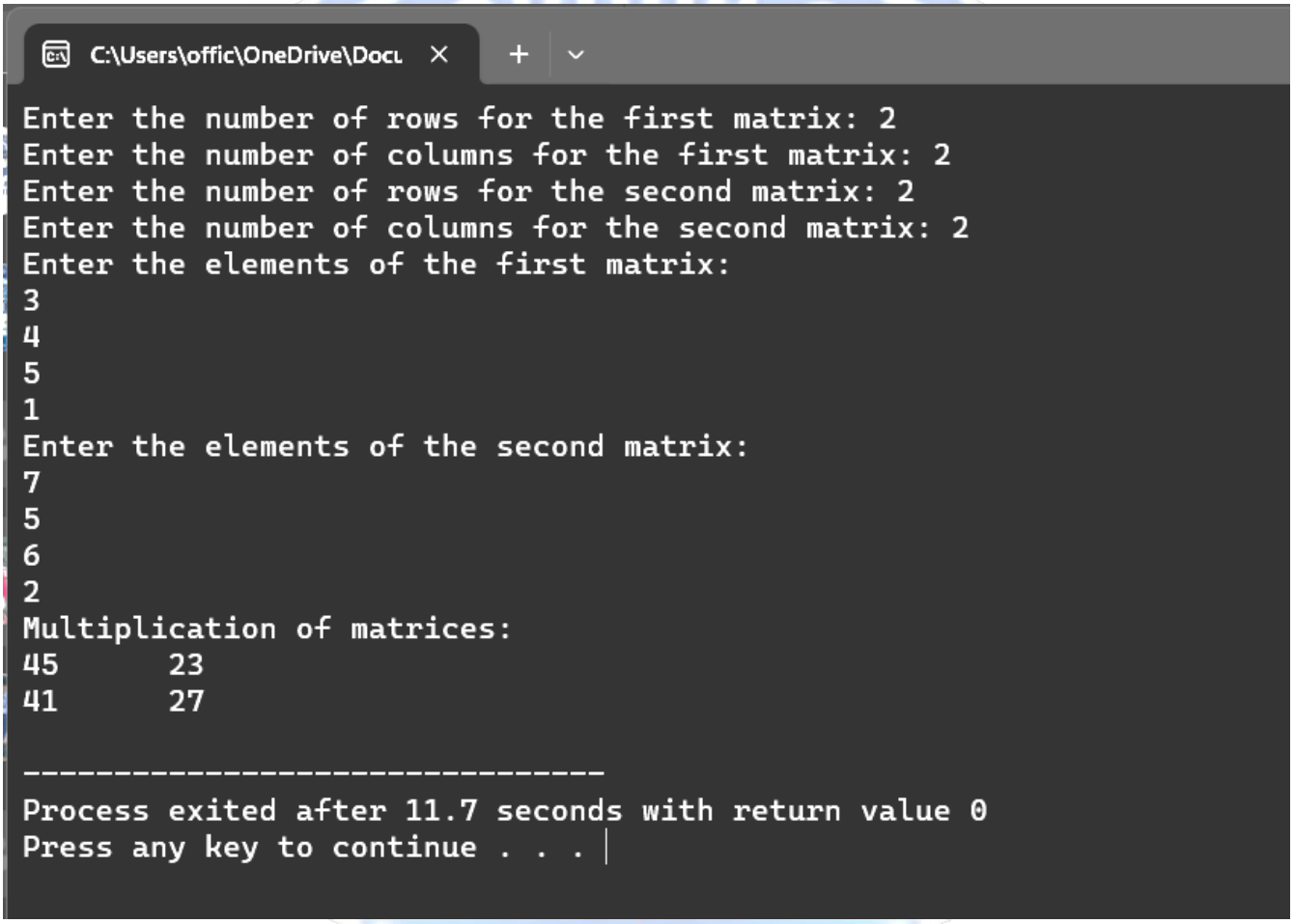
Practical No: 2

AIM : Multiplication of two matrices

```
#include <stdio.h>

int main() {
    int a[10][10], b[10][10], mul[10][10];
    int r1, c1, r2, c2, i, j, k;

    printf("Enter the number of rows for the first matrix: ");
    scanf("%d", &r1);
    printf("Enter the number of columns for the first matrix: ");
    scanf("%d", &c1);

    printf("Enter the number of rows for the second matrix: ");
    scanf("%d", &r2);
    printf("Enter the number of columns for the second matrix: ");
    scanf("%d", &c2);

    if (c1 != r2) {
        printf("Matrix multiplication is not possible.\n");
        return 1;
    }

    printf("Enter the elements of the first matrix:\n");
    for (i = 0; i < r1; i++) {
        for (j = 0; j < c1; j++) {
            scanf("%d", &a[i][j]);
        }
    }

    printf("Enter the elements of the second matrix:\n");
    for (i = 0; i < r2; i++) {
        for (j = 0; j < c2; j++) {
            scanf("%d", &b[i][j]);
        }
    }

    // Multiplication of matrices
    for (i = 0; i < r1; i++) {
        for (j = 0; j < c2; j++) {
            mul[i][j] = 0;
            for (k = 0; k < c1; k++) {
                mul[i][j] += a[i][k] * b[k][j];
            }
        }
    }

    // Printing the result
    printf("Multiplication of matrices:\n");
```

```
    for (i = 0; i < r1; i++) {
        for (j = 0; j < c2; j++) {
            printf("%d\t", mul[i][j]);
        }
        printf("\n");
    }

return 0;
}
```

Output:



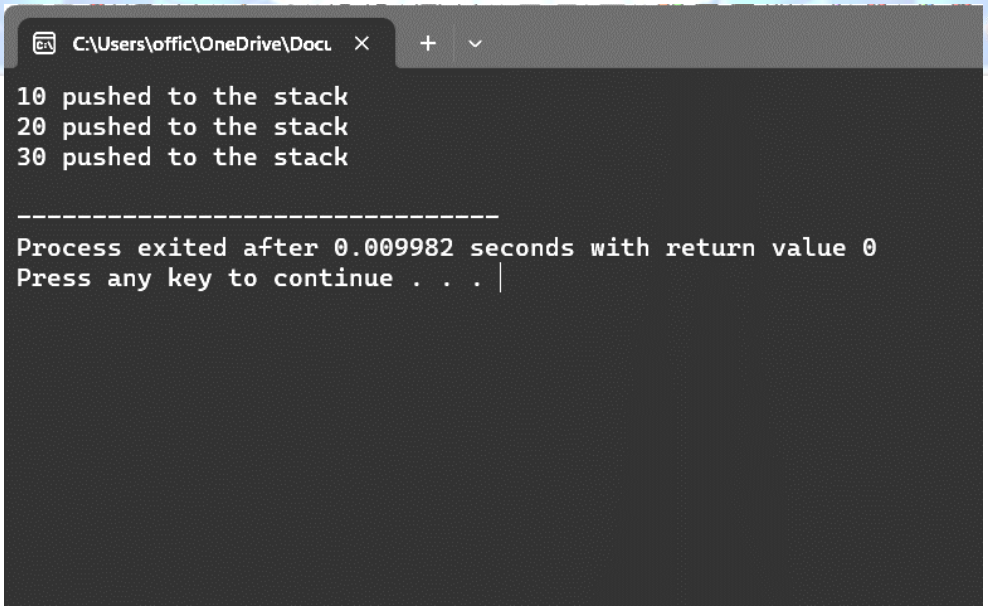
Practical No:- 3

AIM : Push and POP operation in stack

PUSH Operation

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

#define MAX_SIZE 100

int stack[MAX_SIZE];
int top = -1;

void push(int value) {
    if (top == MAX_SIZE - 1) {
        printf("Stack is full. Cannot push %d\n", value);
    } else {
        stack[++top] = value;
        printf("%d pushed to the stack\n", value);
    }
}

int main() {
    push(10);
    push(20);
    push(30);

return 0;
}
```

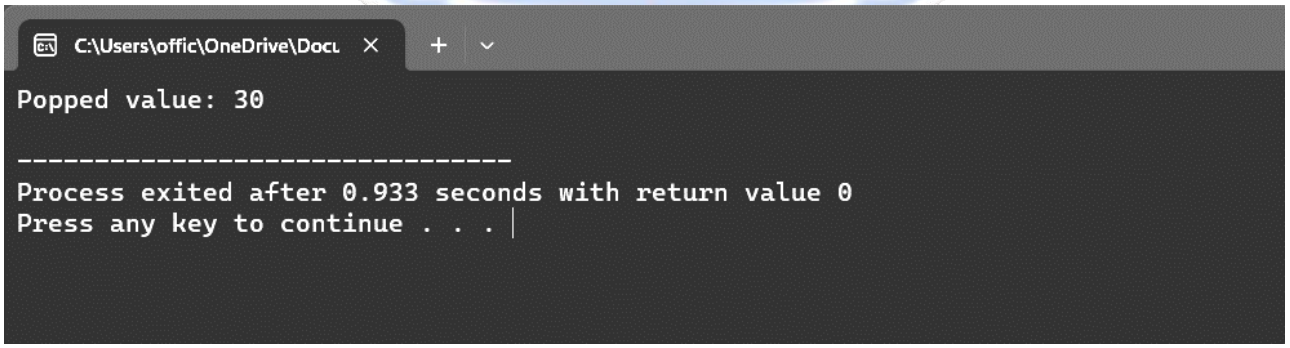
Output:



POP Operation

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

#define MAX_SIZE 100
int stack[MAX_SIZE];
int top = -1;

void push(int value) {
    if (top == MAX_SIZE - 1) {
        printf("Stack is full. Cannot push.\n");
    } else {
        stack[++top] = value;
    }
}
int pop() {
    if (top == -1) {
        printf("Stack is empty. Cannot pop.\n");
        return -1; // You can choose an appropriate value to indicate an error.
    } else {
        int value = stack[top--];
        return value;
    }
}
int main() {
    push(10);
    push(20);
    push(30);

    int poppedValue = pop();
    if (poppedValue != -1) {
        printf("Popped value: %d\n", poppedValue);
    }
    return 0;
}
```

Output:



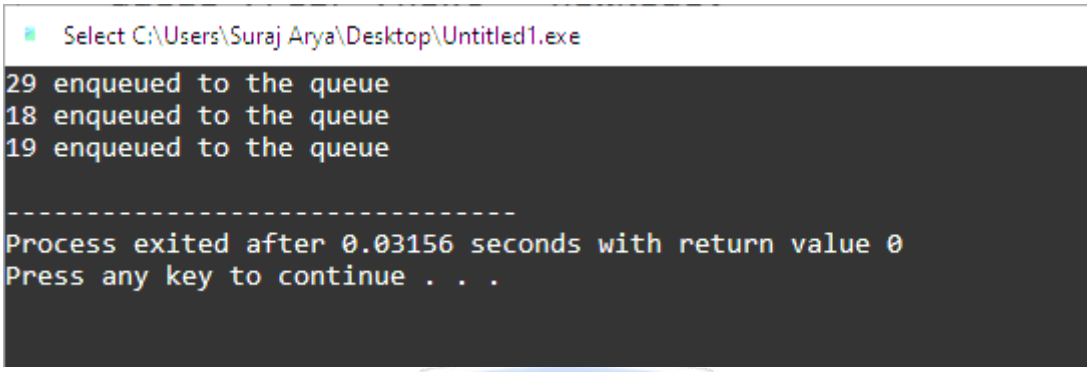
PRACTICAL: - 4

AIM : Insertion and deleting elements in queue.

- **Enqueue operation in Queue**

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

struct QueueNode {
    int data;
    struct QueueNode* next;
};

struct Queue {
    struct QueueNode* front;
    struct QueueNode* rear;
};

struct QueueNode* createNode(int data) {
    struct QueueNode* newNode = (struct QueueNode*)malloc(sizeof(struct QueueNode));
    newNode->data = data;
    newNode->next = NULL;
    return newNode;
}

struct Queue* createQueue() {
    struct Queue* queue = (struct Queue*)malloc(sizeof(struct Queue));
    queue->front = queue->rear = NULL;
    return queue;
}

void enqueue(struct Queue* queue, int data) {
    struct QueueNode* newNode = createNode(data);
    if (queue->rear == NULL) {
        queue->front = queue->rear = newNode;
    } else {
        queue->rear->next = newNode;
        queue->rear = newNode;
    }
    printf("%d enqueued to the queue\n", data);
}

int main() {
    struct Queue* queue = createQueue();
    enqueue(queue, 29);
    enqueue(queue, 18);
    enqueue(queue, 19);
return 0;
}
```

Output

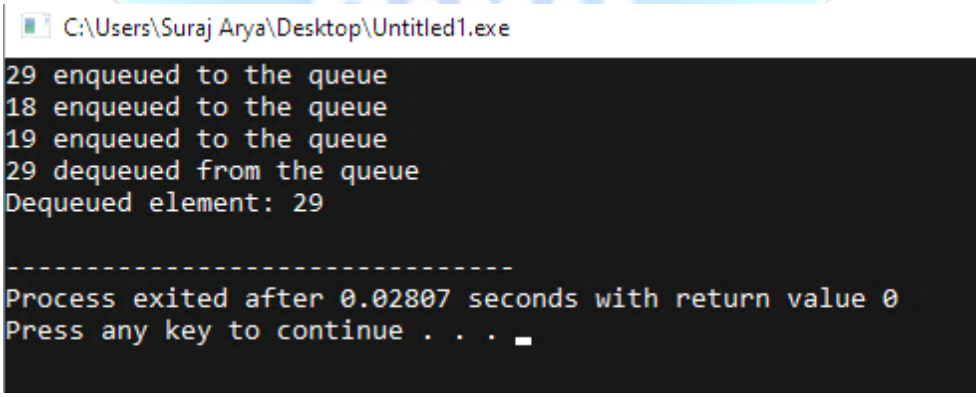


Dequeue operation in Queue

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

// Define the structure for a queue node
struct QueueNode {
    int data;
    struct QueueNode* next;
};

// Define the structure for the queue
struct Queue {
    struct QueueNode* front;
    struct QueueNode* rear;
};

// Function to create a new node
struct QueueNode* createNode(int data) {
    struct QueueNode* newNode = (struct QueueNode*)malloc(sizeof(struct QueueNode));
    newNode->data = data;
    newNode->next = NULL;
    return newNode;
}

// Function to create an empty queue
struct Queue* createQueue() {
    struct Queue* queue = (struct Queue*)malloc(sizeof(struct Queue));
    queue->front = queue->rear = NULL;
    return queue;
}

// Function to enqueue (insert) an element into the queue
void enqueue(struct Queue* queue, int data) {
    struct QueueNode* newNode = createNode(data);
    if (queue->rear == NULL) {
        queue->front = queue->rear = newNode;
    } else {
        queue->rear->next = newNode;
```

```
        queue->rear = newNode;
    }
    printf("%d enqueued to the queue\n", data);
}

// Function to dequeue (delete) an element from the queue
int dequeue(struct Queue* queue) {
    if (queue->front == NULL) {
        printf("Queue is empty, cannot dequeue\n");
        return -1; // Return a sentinel value to indicate an empty queue
    }
    int data = queue->front->data;
    struct QueueNode* temp = queue->front;
    queue->front = queue->front->next;
    free(temp);
    if (queue->front == NULL) {
        queue->rear = NULL;
    }
    printf("%d dequeued from the queue\n", data);
    return data;
}

int main() {
    struct Queue* queue = createQueue();
    // Enqueue some elements
    enqueue(queue, 29);
    enqueue(queue, 18);
    enqueue(queue, 19);
    // Dequeue elements
    int dequeued = dequeue(queue);
    if (dequeued != -1) {
        printf("Dequeued element: %d\n", dequeued);
    }
return 0;
}
```

Output



PRACTICAL:- 5

AIM : The binary search procedures to search on element in a given list.

```
#include <stdio.h>
  int binary_search(int arr[], int size, int target) {
    int low = 0, high = size - 1;
    while (low <= high) {
        int mid = (low + high) / 2;
        int mid_element = arr[mid];
        if (mid_element == target) {
            return mid;  // Element found, return its index
        } else if (mid_element < target) {
            low = mid + 1;  // Search the right half
        } else {
            high = mid - 1;  // Search the left half
        }
    }
    return -1;  // Element not found in the array
  }

int main() {
    int my_array[] = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};
    int size = sizeof(my_array) / sizeof(my_array[0]);
    int target_element = 7;

    int result = binary_search(my_array, size, target_element);

    if (result != -1) {
        printf("Element %d found at index %d.\n", target_element, result);
    } else {
        printf("Element %d not found in the array.\n", target_element);
    }

    return 0;
}
```

Output:-

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS

PS C:\Users\offic\Downloads\New folder> gcc Hello.c
PS C:\Users\offic\Downloads\New folder> ./a.exe
Element 7 found at index 6.
PS C:\Users\offic\Downloads\New folder>
```

PRACTICAL:- 6

AIM : The Selection sort technique.

```
#include <stdio.h>
void swap(int *xp, int *yp) {
    int temp = *xp;
    *xp = *yp;
    *yp = temp;
}
void selectionSort(int arr[], int n) {
    int i, j, minIndex;

    // Traverse the array
    for (i = 0; i < n-1; i++) {
        // Find the minimum element in unsorted array
        minIndex = i;
        for (j = i+1; j < n; j++) {
            if (arr[j] < arr[minIndex]) {
                minIndex = j;
            }
        }
        // Swap the found minimum element with the first element
        swap(&arr[minIndex], &arr[i]);
    }
}
void printArray(int arr[], int size) {
    int i;
    for (i=0; i < size; i++) {
        printf("%d ", arr[i]);
    }
    printf("\n");
}
int main() {
    int arr[] = {64, 25, 12, 22, 11};
    int n = sizeof(arr)/sizeof(arr[0]);

    printf("Original array: \n");
    printArray(arr, n);

    // Perform selection sort
    selectionSort(arr, n);

    printf("Sorted array: \n");
    printArray(arr, n);

    return 0;
}
```

Output:-

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS

PS C:\Users\offic\Downloads\New folder> gcc Hello.c
PS C:\Users\offic\Downloads\New folder> ./a.exe
Original array:
64 25 12 22 11
Sorted array:
11 12 22 25 64
PS C:\Users\offic\Downloads\New folder>
```

PRACTICAL:- 7

AIM : The Fibonacci Series with recursion.

```c
   #include <stdio.h>

// Function to calculate Fibonacci number using recursion
int fibonacci(int n) {
    if (n <= 1) {
        return n;
    } else {
        return fibonacci(n - 1) + fibonacci(n - 2);
    }
}

int main() {
    int n, i;

    printf("Enter the number of terms: ");
    scanf("%d", &n);

    printf("Fibonacci Series: ");
    for (i = 0; i < n; i++) {
        printf("%d ", fibonacci(i));
    }

    return 0;
}
```