Name: Vishal Bhimgonda Desai

Roll no: B78

PRN : 2425010086

C Program to Implement DFS

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

// Structure for a node in the adjacency list
struct Node {
    int data;
    struct Node* next;
};

// Structure for the adjacency list
struct List {
    struct Node* head;
};

// Structure for the graph
struct Graph {
    int vertices;
    struct List* array;
};

// Function to create a new node
struct Node* createNode(int data) {
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
    newNode->data = data;
```

```
    newNode->next = NULL;
    return newNode;
}

// Function to create a graph with a given number of vertices
struct Graph* createGraph(int vertices) {
    struct Graph* graph = (struct Graph*)malloc(sizeof(struct Graph));
    graph->vertices = vertices;
    graph->array = (struct List*)malloc(vertices * sizeof(struct List));

    for (int i = 0; i < vertices; i++) {
        graph->array[i].head = NULL;
    }

    return graph;
}

// Function to add an edge to the graph
void addEdge(struct Graph* graph, int src, int dest) {
    struct Node* newNode = createNode(dest);
    newNode->next = graph->array[src].head;
    graph->array[src].head = newNode;

    // Add reverse edge to make the graph undirected
    newNode = createNode(src);
    newNode->next = graph->array[dest].head;
    graph->array[dest].head = newNode;
}

// Function to perform Depth First Search (DFS) from a given vertex
void DFS(struct Graph* graph, int vertex, bool visited[]) {
```

```
    visited[vertex] = true;
    printf("%d ", vertex);

    struct Node* currentNode = graph->array[vertex].head;
    while (currentNode) {
        int adjacentVertex = currentNode->data;
        if (!visited[adjacentVertex]) {
            DFS(graph, adjacentVertex, visited);
        }
        currentNode = currentNode->next;
    }
}

// Function to perform DFS traversal from a given vertex in a specified order
void DFSTraversal(struct Graph* graph, int* order, int orderSize) {
    bool* visited = (bool*)malloc(graph->vertices * sizeof(bool));
    for (int i = 0; i < graph->vertices; i++) {
        visited[i] = false;
    }

    for (int i = 0; i < orderSize; i++) {
        if (!visited[order[i]]) {
            DFS(graph, order[i], visited);
        }
    }

    free(visited);
}

int main() {
    int vertices = 4;
```

```
    struct Graph* graph = createGraph(vertices);

    addEdge(graph, 2, 0);
    addEdge(graph, 0, 2);
    addEdge(graph, 1, 2);
    addEdge(graph, 0, 1);
    addEdge(graph, 3, 3);
    addEdge(graph, 1, 3);

    int order[] = {2, 0, 1, 3};
    int orderSize = sizeof(order) / sizeof(order[0]);

    printf("Following is Depth First Traversal (starting from vertex 2):\n");
    DFSTraversal(graph, order, orderSize);

    return 0;
}
```

Output:

Following is Depth First Traversal (starting from vertex 2):

2 0 1 3