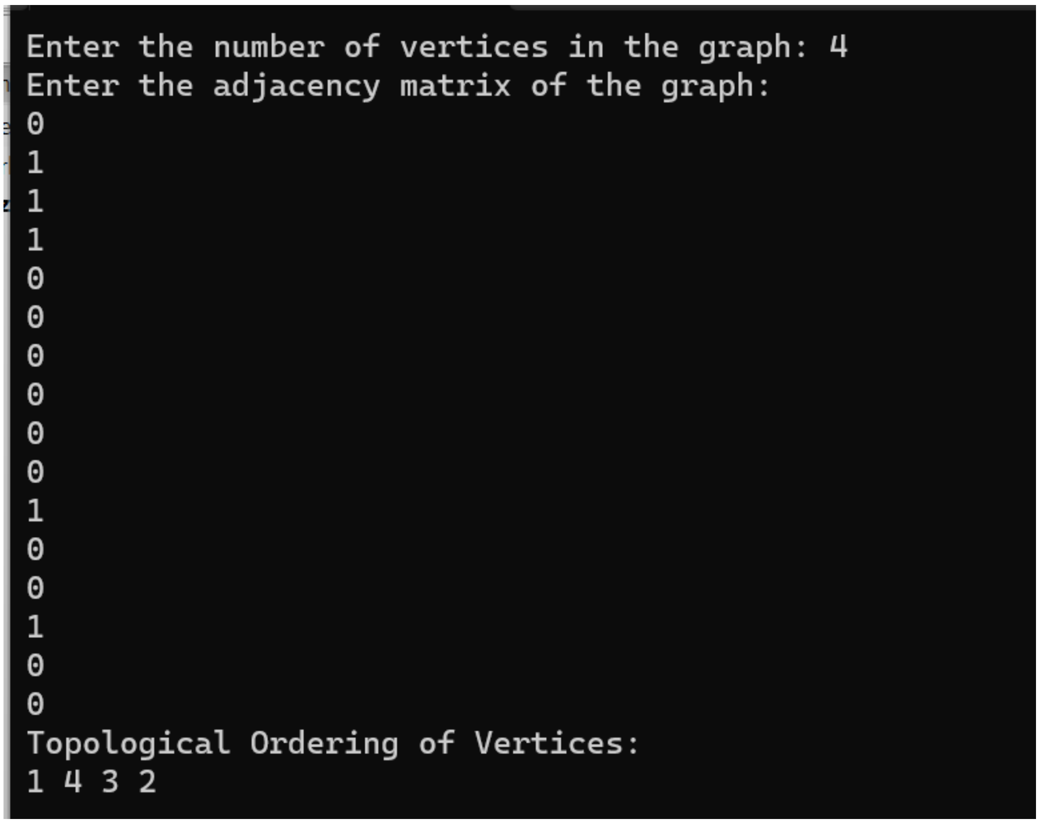
ADA-LAB-2

Q) Write program to obtain the Topological ordering of vertices in a given digraph.

Code-

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

#define MAX_VERTICES 100

typedef struct {
    int vertices[MAX_VERTICES];
    int count;
} Stack;

void initialize(Stack* stack) {
    stack->count = 0;
}

int isEmpty(Stack* stack) {
    return (stack->count == 0);
}

void push(Stack* stack, int value) {
    stack->vertices[stack->count++] = value;
}

int pop(Stack* stack) {
    if (isEmpty(stack)) {
        printf("Error: Stack underflow\n");
        exit(0);
    }
    return stack->vertices[--stack->count];
}

void topologicalSortDFS(int vertex, int** graph, int* visited, Stack* stack, int numVertices) {
    visited[vertex] = 1;

    int i;
    for (i = 0; i < numVertices; i++) {
        if (graph[vertex][i] && !visited[i]) {
            topologicalSortDFS(i, graph, visited, stack, numVertices);
        }
    }

    push(stack, vertex + 1);
}

void topologicalSort(int** graph, int numVertices) {
    Stack stack;
    int visited[MAX_VERTICES];
    int i;

    initialize(&stack);

    for (i = 0; i < numVertices; i++) {
        visited[i] = 0;
    }

    for (i = 0; i < numVertices; i++) {
        if (!visited[i]) {
            topologicalSortDFS(i, graph, visited, &stack, numVertices);
        }
    }

    printf("Topological Ordering of Vertices:\n");
    while (!isEmpty(&stack)) {
        printf("%d ", pop(&stack));
    }
    printf("\n");
}

int main() {
    int numVertices, i, j;

    printf("Enter the number of vertices in the graph: ");
    scanf("%d", &numVertices);

    int** graph = (int**)malloc(numVertices * sizeof(int*));
    for (i = 0; i < numVertices; i++) {
        graph[i] = (int*)malloc(numVertices * sizeof(int));
    }

    printf("Enter the adjacency matrix of the graph:\n");
    for (i = 0; i < numVertices; i++) {
        for (j = 0; j < numVertices; j++) {
            scanf("%d", &graph[i][j]);
        }
    }

    topologicalSort(graph, numVertices);


    return 0;
}
```

OUTPUT-



```
Enter the number of vertices in the graph: 4
Enter the adjacency matrix of the graph:
0
1
1
1
0
0
0
0
0
0
1
0
0
1
0
0
Topological Ordering of Vertices:
1 4 3 2
```