AIM: **GRAPH REPRESENTATION**

Implement graph data structure using adjacency matrix and adjacency list representation. Perform the graph traversal such as breadth-first-search (BFS) and depth-first-search (DFS).

PROGRAM:

```
#include <stdio.h>

#define MAX 10


int graph_matrix[MAX][MAX]; // Adjacency matrix

int graph_list[MAX][MAX];   // Array-based adjacency list

int list_size[MAX];         // Tracks the number of neighbors for each vertex


void add_edge_matrix(int u, int v) {

   graph_matrix[u][v] = 1;

   graph_matrix[v][u] = 1; // For undirected graph

}


void add_edge_list(int u, int v) {

   graph_list[u][list_size[u]++] = v;

   graph_list[v][list_size[v]++] = u;

}


void bfs_matrix(int start, int vertices) {

   int visited[MAX] = {0}, to_visit[MAX], front = 0, rear = 0;


   printf("BFS with Matrix: ");

   to_visit[rear++] = start;

   visited[start] = 1;


   while (front < rear) {

      int curr = to_visit[front++];

      printf("%d ", curr);
```

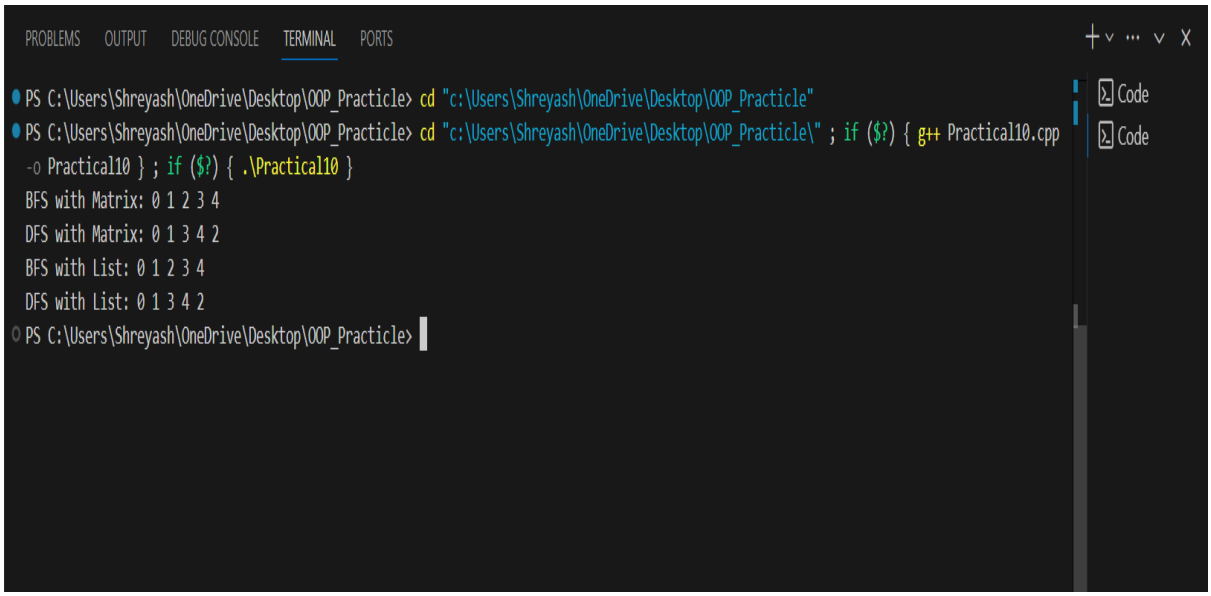
```
        for (int i = 0; i < vertices; i++) {
            if ((graph_matrix[curr][i] == 1) && (visited[i] == 0)) {
                to_visit[rear++] = i;
                visited[i] = 1;
            }
        }
    }
    printf("\n");
}

void bfs_list(int start, int vertices) {
    int visited[MAX] = {0}, to_visit[MAX], front = 0, rear = 0;

    printf("BFS with List: ");
    to_visit[rear++] = start;
    visited[start] = 1;

    while (front < rear) {
        int curr = to_visit[front++];
        printf("%d ", curr);

        for (int i = 0; i < list_size[curr]; i++) {
            int neighbor = graph_list[curr][i];
            if (visited[neighbor] == 0) {
                to_visit[rear++] = neighbor;
                visited[neighbor] = 1;
            }
        }
    }
    printf("\n");
```

```
}

void dfs_matrix(int start, int visited[], int vertices) {
    visited[start] = 1;
    printf("%d ", start);

    for (int i = 0; i < vertices; i++) {
        if ((graph_matrix[start][i] == 1) && (visited[i] == 0)) {
            dfs_matrix(i, visited, vertices);
        }
    }
}

void dfs_list(int start, int visited[]) {
    visited[start] = 1;
    printf("%d ", start);

    for (int i = 0; i < list_size[start]; i++) {
        int neighbor = graph_list[start][i];
        if (visited[neighbor] == 0) {
            dfs_list(neighbor, visited);
        }
    }
}

int main() {
    int vertices = 5, visited[MAX] = {0};

    // Add edges to adjacency matrix
    add_edge_matrix(0, 1);
    add_edge_matrix(0, 2);
```

```
    add_edge_matrix(1, 3);
    add_edge_matrix(1, 4);

    bfs_matrix(0, vertices);

    printf("DFS with Matrix: ");
    dfs_matrix(0, visited, vertices);
    printf("\n");

    // Reset adjacency list and visited array
    for (int i = 0; i < vertices; i++) {
        list_size[i] = 0;
        visited[i] = 0;
    }

    // Add edges to adjacency list
    add_edge_list(0, 1);
    add_edge_list(0, 2);
    add_edge_list(1, 3);
    add_edge_list(1, 4);

    bfs_list(0, vertices);

    printf("DFS with List: ");
    dfs_list(0, visited);
    printf("\n");

    return 0;
}
```

DS PRACTICAL 10

OUTPUT



GITHUB LINK : https://github.com/ShreyashGajbhiye453/Data-Structure-Practical-No.-01