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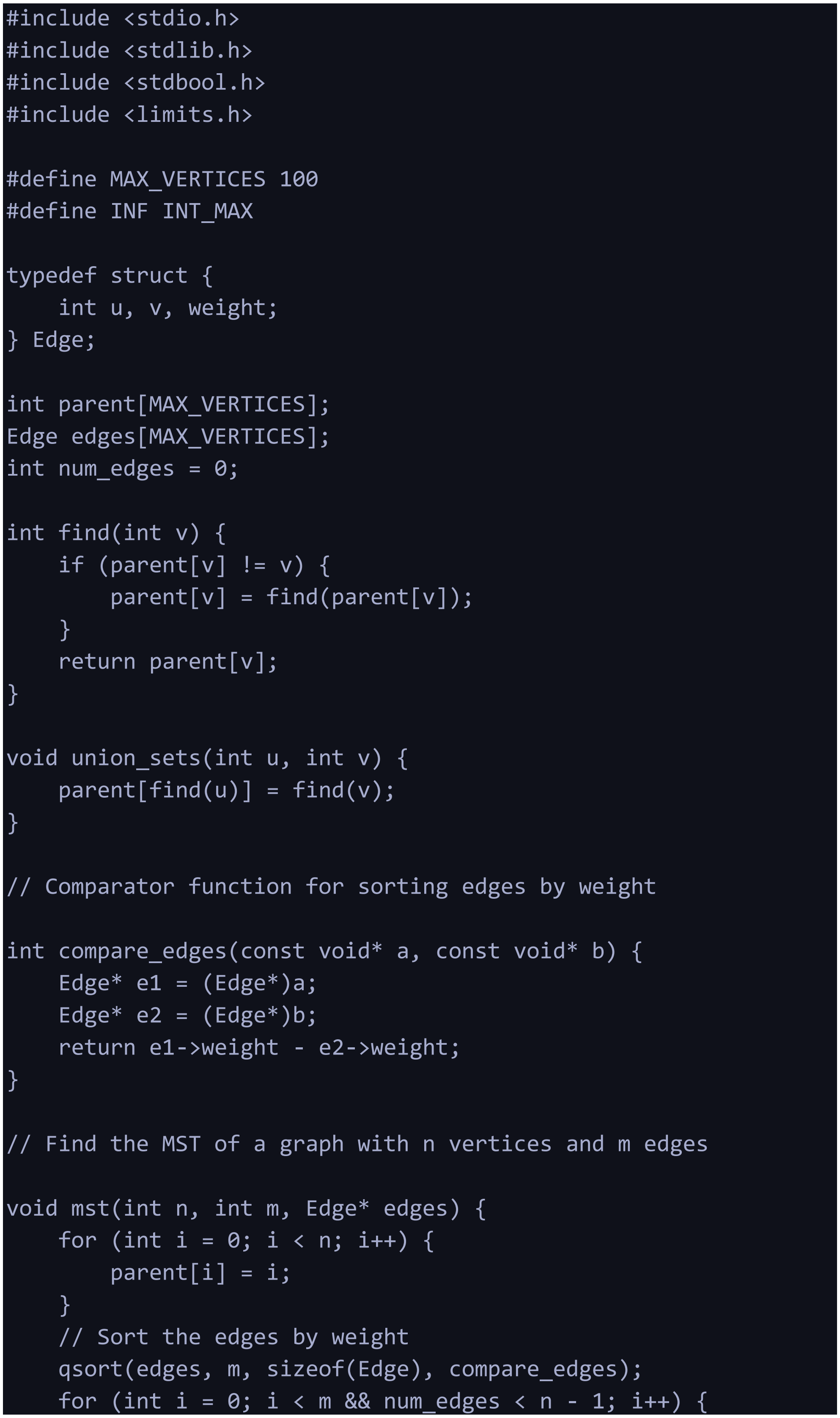
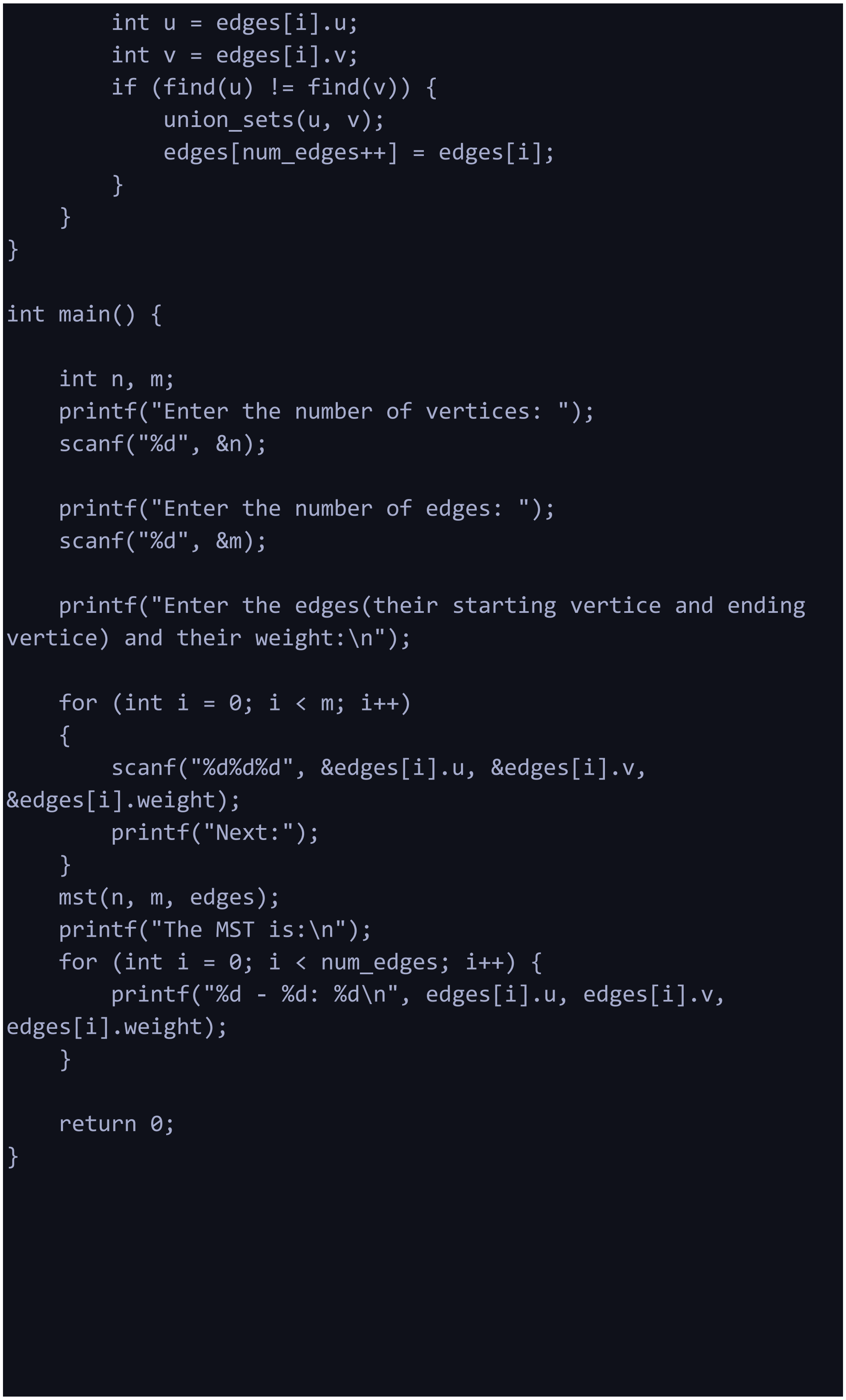
AIM:	Prims Algorithm
ALGORITHM/ THEORY:	The working of Prim’s algorithm can be described by using the following steps: ***Step 1:*** *Determine an arbitrary vertex as the starting vertex of the MST.* ***Step 2:*** *Follow steps 3 to 5 till there are vertices that are not included in the MST (known as fringe vertex).* ***Step 3:*** *Find edges connecting any tree vertex with the fringe vertices.* ***Step 4:*** *Find the minimum among these edges.* ***Step 5:*** *Add the chosen edge to the MST if it does not form any cycle.* ***Step 6:*** *Return the MST and exit* *Theory:* Prim’s algorithm is also a Greedy algorithm. This algorithm always starts with a single node and moves through several adjacent nodes, in order to explore all of the connected edges along the way. The algorithm starts with an empty spanning tree. The idea is to maintain two sets of vertices. The first set contains the vertices already included in the MST, and the other set contains the vertices not yet included. At every step, it considers all the edges that connect the two sets and picks the minimum weight edge from these edges. After picking the edge, it moves the other endpoint of the edge to the set containing MST.

PROGRAM:

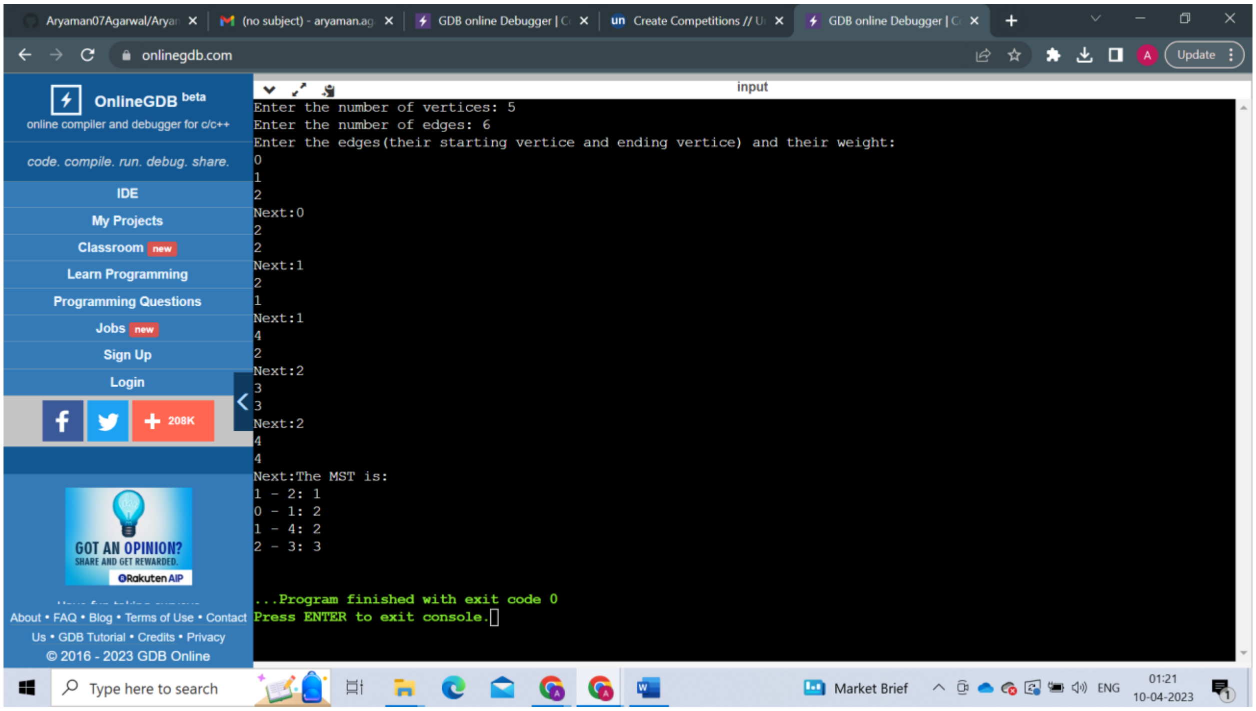


```c
#include <stdio.h>
#include <stdlib.h>
#include <stdbool.h>
#include <limits.h>

#define MAX_VERTICES 100
#define INF INT_MAX

typedef struct {
    int u, v, weight;
} Edge;

int parent[MAX_VERTICES];
Edge edges[MAX_VERTICES];
int num_edges = 0;

int find(int v) {
    if (parent[v] != v) {
        parent[v] = find(parent[v]);
    }
    return parent[v];
}

void union_sets(int u, int v) {
    parent[find(u)] = find(v);
}

// Comparator function for sorting edges by weight

int compare_edges(const void* a, const void* b) {
    Edge* e1 = (Edge*)a;
    Edge* e2 = (Edge*)b;
    return e1->weight - e2->weight;
}

// Find the MST of a graph with n vertices and m edges

void mst(int n, int m, Edge* edges) {
    for (int i = 0; i < n; i++) {
        parent[i] = i;
    }
    // Sort the edges by weight
    qsort(edges, m, sizeof(Edge), compare_edges);
    for (int i = 0; i < m && num_edges < n - 1; i++) {
```



```
        int u = edges[i].u;
        int v = edges[i].v;
        if (find(u) != find(v)) {
            union_sets(u, v);
            edges[num_edges++] = edges[i];
        }
    }
}

int main() {

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

    printf("Enter the number of edges: ");
    scanf("%d", &m);

    printf("Enter the edges(their starting vertice and ending
vertice) and their weight:\n");

    for (int i = 0; i < m; i++)
    {
        scanf("%d%d%d", &edges[i].u, &edges[i].v,
&edges[i].weight);
        printf("Next:");
    }
    mst(n, m, edges);
    printf("The MST is:\n");
    for (int i = 0; i < num_edges; i++) {
        printf("%d - %d: %d\n", edges[i].u, edges[i].v,
edges[i].weight);
    }

    return 0;
}
```

RESULT:



```
Enter the number of vertices: 5
Enter the number of edges: 6
Enter the edges(their starting vertice and ending vertice) and their weight:
0
1
2
Next:0
2
2
Next:1
2
1
Next:1
4
2
Next:2
3
3
Next:2
4
4
Next:The MST is:
1 - 2: 1
0 - 1: 2
1 - 4: 2
2 - 3: 3


...Program finished with exit code 0
Press ENTER to exit console.
```

CONCLUSION:	I understood how Prims Algorithm works to find out Minimum Spanning Tree.