

## Experiment No: 3

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**Roll No: 21143285**

**Program:**

### Prim's MST:

```
#include <bits/stdc++.h>
using namespace std;
#define V 5
int minKey(int key[], bool mstSet[])
{
    int min = INT_MAX, min_index;
    for (int v = 0; v < V; v++)
        if (mstSet[v] == false && key[v] < min)
            min = key[v], min_index = v;
    return min_index;
}
void printMST(int parent[], int graph[V][V])
{
    cout << "Edge \tWeight\n";
    for (int i = 1; i < V; i++)
        cout << parent[i] << " - " << i << " \t"
            << graph[i][parent[i]] << " \n";
}

void primMST(int graph[V][V])
{
    int parent[V];
    int key[V];
    bool mstSet[V];
    for (int i = 0; i < V; i++)
        key[i] = INT_MAX, mstSet[i] = false;
    key[0] = 0;
    parent[0] = -1;
    for (int count = 0; count < V - 1; count++) {
        int u = minKey(key, mstSet);
        mstSet[u] = true;
        for (int v = 0; v < V; v++)
            if (graph[u][v] && mstSet[v] == false
                && graph[u][v] < key[v])
                parent[v] = u, key[v] = graph[u][v];
    }
}
```

```

    printMST(parent, graph);
}
int main()
{
    cout << "Name : Aniket Tiwari\n";
    cout << "Roll No : 21143285\n";
    int graph[V][V] = { { 0, 2, 0, 6, 0 },
                        { 2, 0, 3, 8, 5 },
                        { 0, 3, 0, 0, 7 },
                        { 6, 8, 0, 0, 9 },
                        { 0, 5, 7, 9, 0 } };
    primMST(graph);
    return 0;
}

```

## Output:

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```

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```

```

D:\Programming\College Experiments\TY 5 Sem\DAA Lab>cd "d:\Prog
\Programming\College Experiments\TY 5 Sem\DAA Lab\"PrimsMST
Name : Aniket Tiwari
Roll No : 21143285
Edge      Weight
0 - 1      2
1 - 2      3
0 - 3      6
1 - 4      5

```

## Kruskal's Algorithm:

```
#include <bits/stdc++.h>

using namespace std;

class DSU {
    int* parent;
    int* rank;

public:
    DSU(int n)
    {
        parent = new int[n];
        rank = new int[n];

        for (int i = 0; i < n; i++) {
            parent[i] = -1;
            rank[i] = 1;
        }
    }

    int find(int i)
    {
        if (parent[i] == -1)
            return i;

        return parent[i] = find(parent[i]);
    }

    void unite(int x, int y)
    {
        int s1 = find(x);
        int s2 = find(y);
```

```

    if (s1 != s2) {
        if (rank[s1] < rank[s2]) {
            parent[s1] = s2;
            rank[s2] += rank[s1];
        }
        else {
            parent[s2] = s1;
            rank[s1] += rank[s2];
        }
    }
}
};

```

```

class Graph {
    vector<vector<int>> > edgelist;
    int V;

public:
    Graph(int V) { this->V = V; }

    void addEdge(int x, int y, int w)
    {
        edgelist.push_back({ w, x, y });
    }

    void kruskals_mst()
    {
        sort(edgelist.begin(), edgelist.end());
    }
}

```

```

DSU s(V);
int ans = 0;
cout << "Following are the edges in the "
      "constructed MST"
      << endl;
for (auto edge : edgelist) {
    int w = edge[0];
    int x = edge[1];
    int y = edge[2];

    if (s.find(x) != s.find(y)) {
        s.unite(x, y);
        ans += w;
        cout << x << " -- " << y << " == " << w
              << endl;
    }
}

cout << "Minimum Cost Spanning Tree: " << ans;
}
};

int main()
{
    cout << "Name : Aniket Tiwari\n";
    cout << "Roll No : 21143285\n";
    Graph g(4);
    g.addEdge(0, 1, 10);
    g.addEdge(1, 3, 15);
    g.addEdge(2, 3, 4);

```

```
g.addEdge(2, 0, 6);  
g.addEdge(0, 3, 12);  
g.kruskals_mst();  
return 0;  
}
```

## Output:

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```
Microsoft Windows [Version 10.0.22621.521]  
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D:\Programming\College Experiments\TY 5 Sem\DAA Lab>cd "d:\Programming'  
&& "d:\Programming\College Experiments\TY 5 Sem\DAA Lab\"KruskalsMST  
Name : Aniket Tiwari  
Roll No : 21143285  
Following are the edges in the constructed MST  
2 -- 3 == 4  
2 -- 0 == 6  
0 -- 1 == 10  
Minimum Cost Spanning Tree: 20
```