Prims Algorithm

Deva Shriyansh A

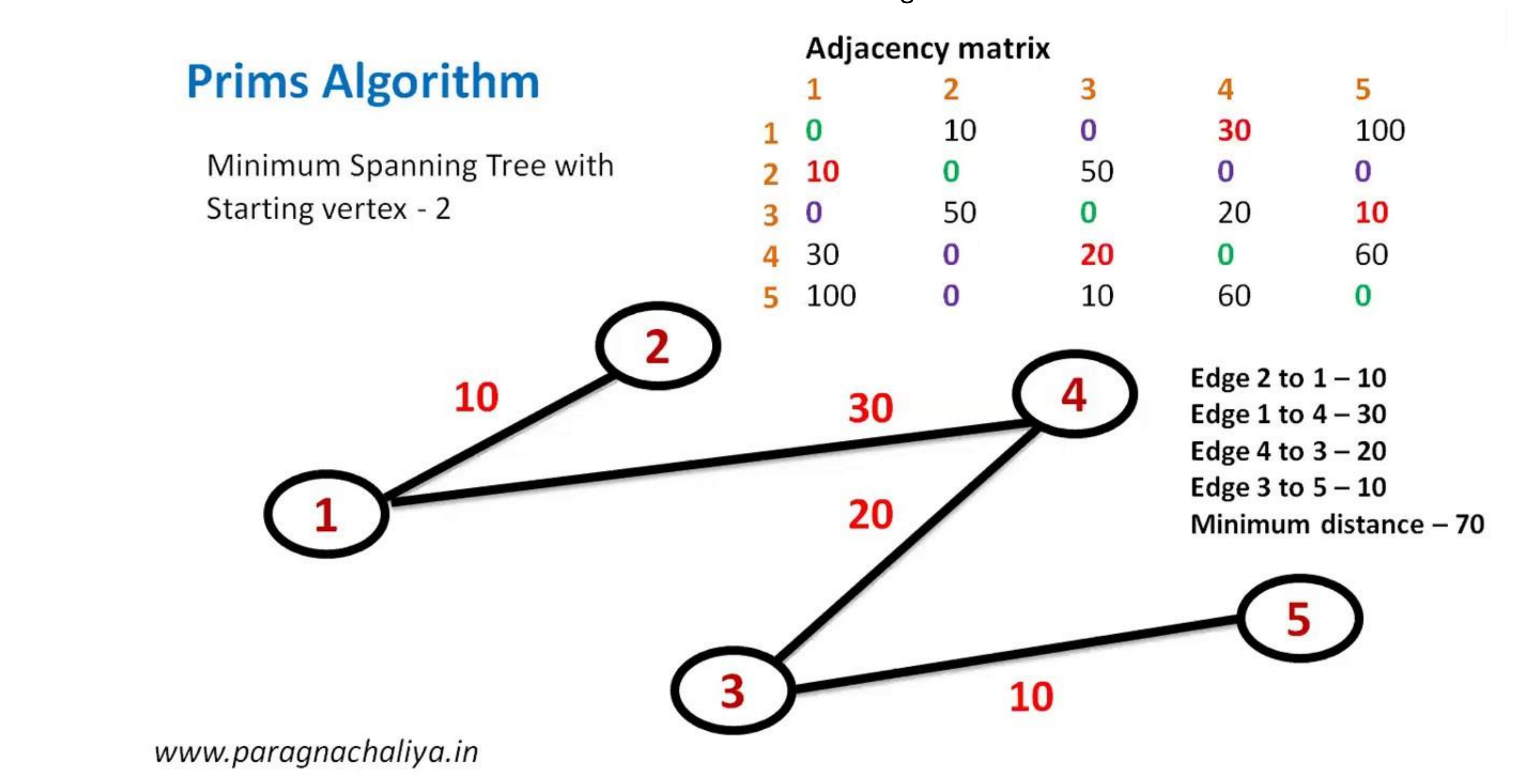
19070122049

```
#include <iostream>

#define infinity 1000
#define MAX 10

int adj[MAX][MAX], n, spanning[MAX][MAX];

int primsAlgo()
{
    int cost[MAX][MAX];
    int u, v, minimumDistance, distance[MAX], from[MAX];
    int visited[MAX], numEdges, minimumCost;

    // cost[][] matrix and spanning[][] creation
    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++)
        {
            if (adj[i][j] == 0)
                cost[i][j] = infinity;
            else
                cost[i][j] = adj[i][j];
            spanning[i][j] = 0;
        }

    // visited[],distance[] and from[] initialised here
    distance[0] = 0;
    visited[0] = 1;

    for (int i = 1; i < n; i++)
    {
        distance[i] = cost[0][i];
        from[i] = 0;
        visited[i] = 0;
    }

    minimumCost = 0;  //cost of spanning tree
    numEdges = n - 1; //no. of edges to be added

    while (numEdges > 0)
    {
        //locating the vertex at minimum distance from the tree
        minimumDistance = infinity;
        for (int i = 1; i < n; i++)
            if (visited[i] == 0 && distance[i] < minimumDistance)
            {
                v = i;
                minimumDistance = distance[i];
            }

        u = from[v];

        //edge insertion in spanning tree
        spanning[u][v] = distance[v];
        spanning[v][u] = distance[v];
        numEdges--;
        visited[v] = 1;
```

```cpp
        // distance[] array updation
        for (int i = 1; i < n; i++)
            if (visited[i] == 0 && cost[i][v] < distance[i])
            {
                distance[i] = cost[i][v];
                from[i] = v;
            }

        minimumCost = minimumCost + cost[u][v];
    }

    return (minimumCost);
}

int main()
{
    int totalCost;

    std::cout << "Enter no. of vertices:";
    std::cin >> n;

    std::cout << "\nEnter the adjacency matrix:\n";

    for (int i = 0; i < n; i++)
        for (int j = 0; j < n; j++)
            std::cin >> adj[i][j];

    totalCost = primsAlgo();
    std::cout << "\nspanning tree matrix:\n";

    for (int i = 0; i < n; i++)
    {
        std::cout << "\n";
        for (int j = 0; j < n; j++)
            std::cout << spanning[i][j] << "\t";
    }

    std::cout << "\n\nTotal cost of spanning tree = " << totalCost;
    return 0;
}
```

Output

The reference image is :

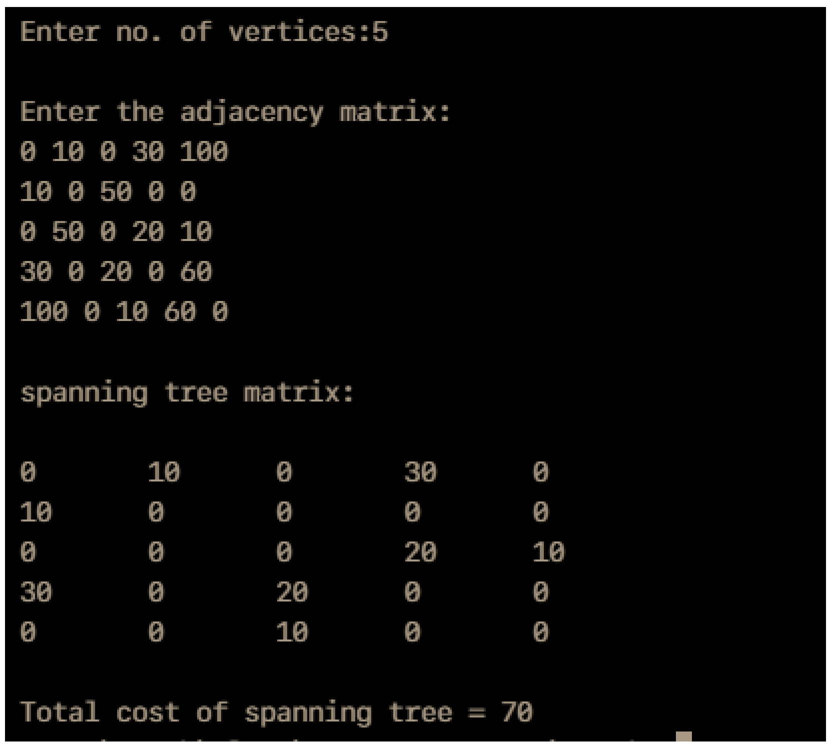


Adjacency matrix

	1	2	3	4	5
1	0	10	0	30	100
2	10	0	50	0	0
3	0	50	0	20	10
4	30	0	20	0	60
5	100	0	10	60	0

Edge 2 to 1 – 10
Edge 1 to 4 – 30
Edge 4 to 3 – 20
Edge 3 to 5 – 10
Minimum distance – 70

Running the code :



```
Enter no. of vertices:5

Enter the adjacency matrix:
0 10 0 30 100
10 0 50 0 0
0 50 0 20 10
30 0 20 0 60
100 0 10 60 0

spanning tree matrix:

0       10      0       30      0
10      0       0       0       0
0       0       0       20      10
30      0       20      0       0
0       0       10      0       0

Total cost of spanning tree = 70
```