Practical No:7

You have a business with several offices; you want to lease phone lines to connect them up with each other; and the phone company charges different amount of money to connect different pair of cities. You want to a set a line that connect all offices with minimum total cost. Solve the problem using appropriate data structure.

Objective:

- To analyse advanced data structure like Graph. To study various Graph representation techniques.
- To Implement Prims algorithm to find MST.

Outcomes:-

Choose most appropriate data structures and apply algorithms for graphical solutions of the problems

Pre-requisite:-

- Knowledge of C++ programming
- Knowledge of MST and algorithms to find MST

Input:-

Read a graph from user using 2D array Staring Vertex

Output:-

MST edges

Description:

Minimum Spanning Tree (MST)

• A **minimum spanning tree (MST)** or **minimum weight spanning tree** is a possubset of the edges of a connected, edge-weighted undirected graph that connects all the vertices together, without any cycles and with the minimum sible total edge weight.

Examples:

• **Telecommunications Company, Computer Networks, Telecommunications Networks, Transportation Networks, Water Supply Networks and Electrical Grids:**

A minimum spanning tree would be one with the lowest total cost, representing the least expensive path for laying the cable.
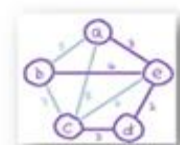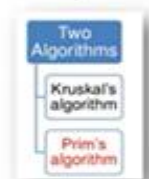
Prims Algorithm Introduction

- Prim's Algorithm is a famous greedy algorithm.

- It is used for finding the Minimum Spanning Tree (MST) of a given graph.

- To apply Prim's algorithm, the given graph must be weighted, connected and undirected.

- Prim's algorithm finds the subset of edges that includes every vertex of the graph such that the sum of the weights of the edges can be minimized.

- The edges with the minimal weights causing no cycles in the graph got selected.

- Time Complexity of Prims Algorithm is O(E+logV).
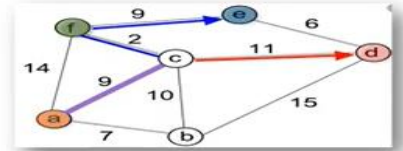
Prim's Algorithm Implementation

Step-01:

- Randomly choose any vertex.
- The vertex connecting to the edge having least weight is usually selected.
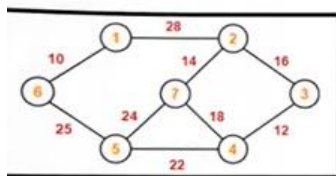
Step-02:

- Find all the edges that connect the tree to new vertices.
- Find the least weight edge among those edges and include it in the existing tree.
- If including that edge creates a cycle, then reject that edge and look for the next least weight edge.

Step-03:

- Keep repeating step-02 until all the vertices are included and Minimum Spanning Tree (MST) is obtained.

Example of Prims Algorithm
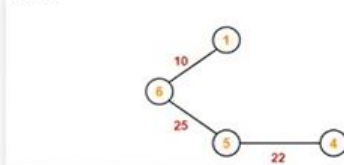
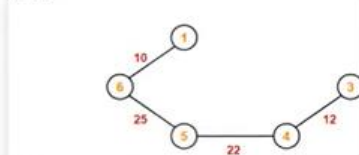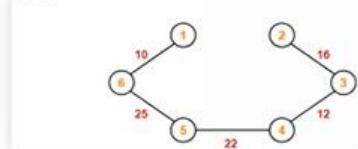**Q.** Construct minimum spanning tree of given graph:
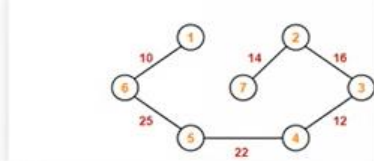
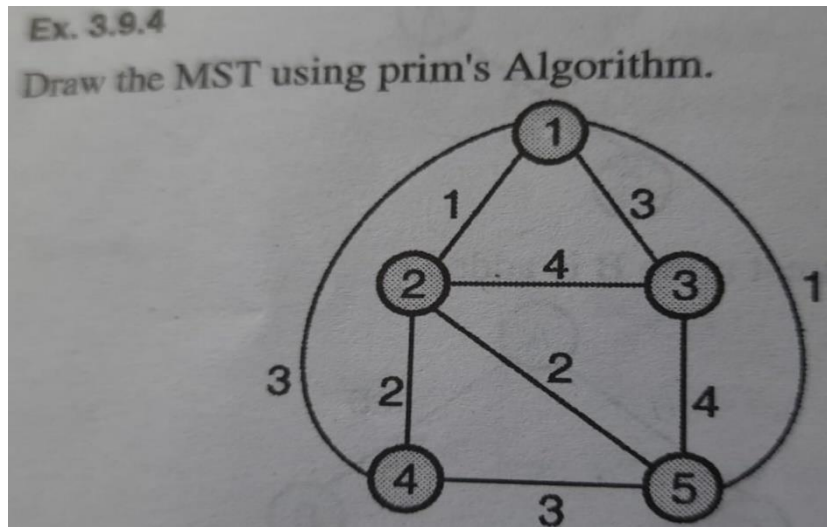**Program:** Write your own program and attach printouts

Output:

Conclusion:

By this way, we can find the MST using Prim's Algorithm and find the minimum total cost.

Question Bank:

1. What do you mean by spanning tree of a graph?

2. Explain Minimum spanning tree algorithm.

Ex. 3.9.4

Draw the MST using prim's Algorithm.

3.