Spanning Tree Algorithm

Spanning Tree

- A **spanning tree** is defined as a tree-like subgraph of a connected, undirected graph that includes all the vertices of the graph.

Minimum Spanning Tree

- *A **minimum spanning tree (MST)** is defined as a **spanning tree** that has the minimum weight among all the possible spanning trees*

Properties of Spanning Tree

- The number of vertices (**V**) in the graph and the spanning tree is the same.
- There is a fixed number of edges in the spanning tree which is equal to one less than the total number of vertices (**E** = **V-1**).
- The spanning tree should not be **disconnected**.
- The spanning tree should be **acyclic.**
- The total cost (or weight) of the spanning tree is defined as the sum of the edge weights of all the edges of the spanning tree.
- There can be many possible spanning trees for a graph.

Properties of Minimum Spanning Tree

- all the properties of a spanning tree
- An added constraint of having the minimum possible weights among all possible spanning trees.
- there can be many possible MSTs for a graph.

Kruskal Algorithm

- First, it sorts all the edges of the graph by their weights,
- Then starts the iterations of finding the spanning tree.
- At each iteration, the algorithm adds the next lowest-weight edge one by one, such that the edges picked until now does not form a cycle.

Prims Algorithm

- It starts by selecting an arbitrary vertex and then adding it to the MST.
- Then, it repeatedly checks for the minimum edge weight that connects one vertex of MST to another vertex that is not yet in the MST.
- This process is continued until all the vertices are included in the MST.

- Difference between Shortest path and Minimum Spanning Tree?