Kruskal's Algorithm

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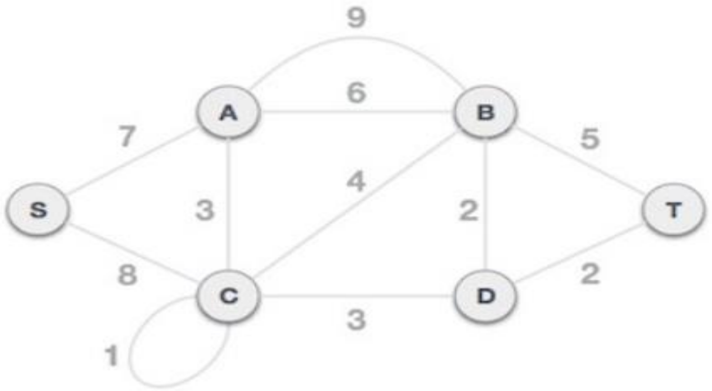
Kruskal's Algorithm

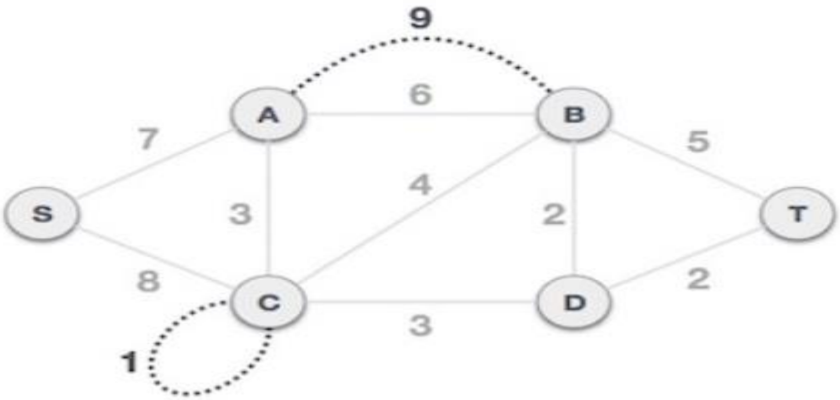
- It is a greedy algorithm that finds a **MST** for a **weighted undirected graph**.
- Sort the edges and keep adding edges with the lowest weight until the MST if formed.

Steps

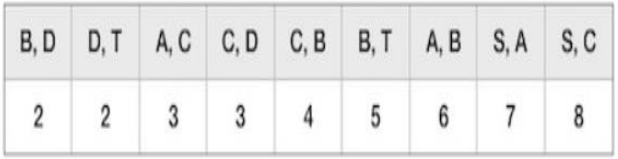
1. Remove all loops and parallel edges
2. Sort all the edges from low weight to high.
3. Take the edge with the lowest weight and add it to the spanning tree. If adding the edge created a cycle, then reject this edge.
4. Keep repeating step 3 until we get a minimum spanning tree

Kruskal's Algorithm Working



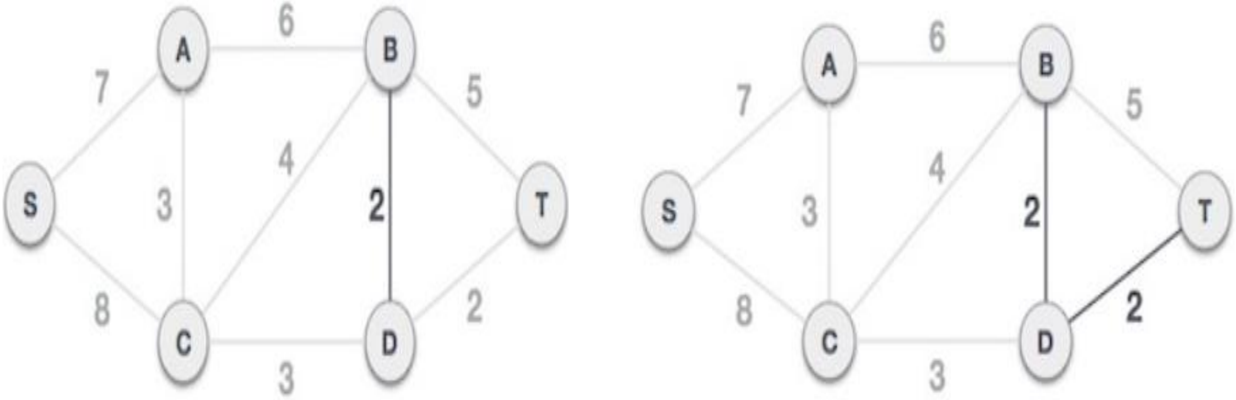


Step 1:
Remove all loops and parallel edges from the given graph. In case of parallel edges, keep the one which has the least cost



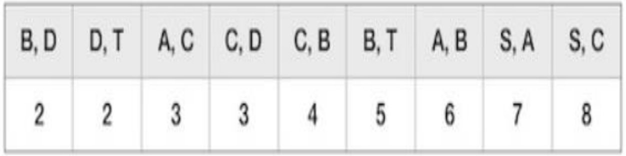
B, D	D, T	A, C	C, D	C, B	B, T	A, B	S, A	S, C
2	2	3	3	4	5	6	7	8

Step 2:
Arrange all edges in their increasing order of weight

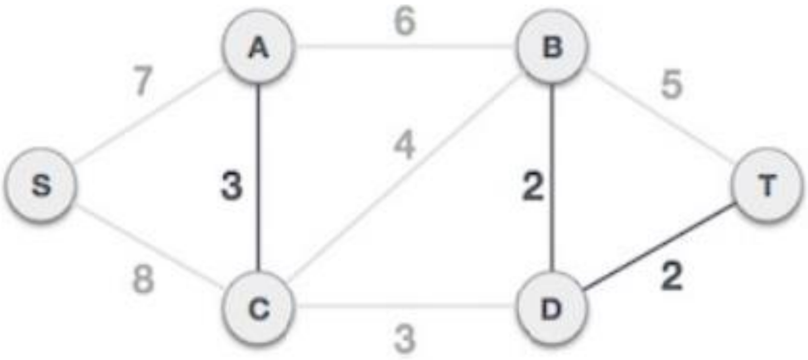


Step 3: Add the edge which has the least weightage: Here the least cost is 2 and edges involved are B,D and D,T. So we add BD first and then DT

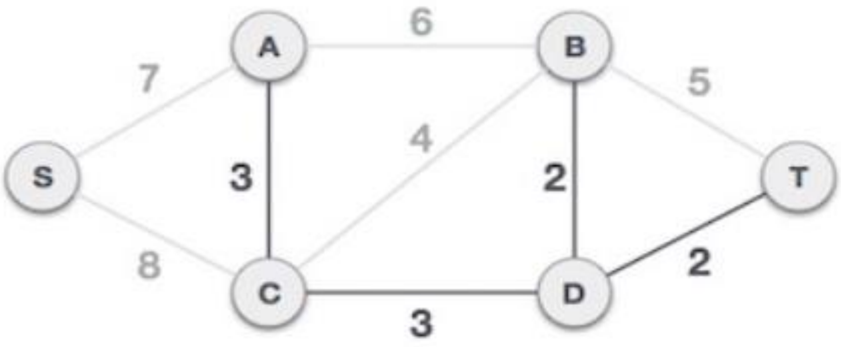
Kruskal's Algorithm Working



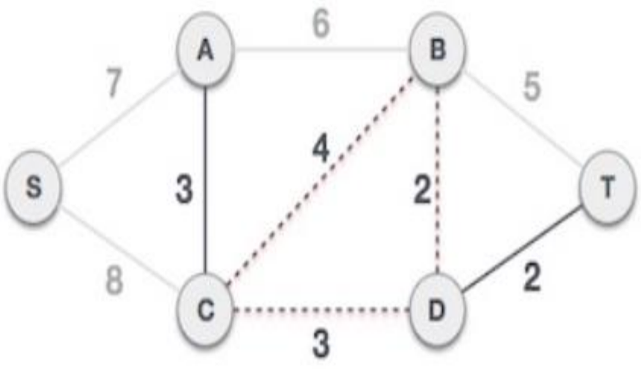
B, D	D, T	A, C	C, D	C, B	B, T	A, B	S, A	S, C
2	2	3	3	4	5	6	7	8



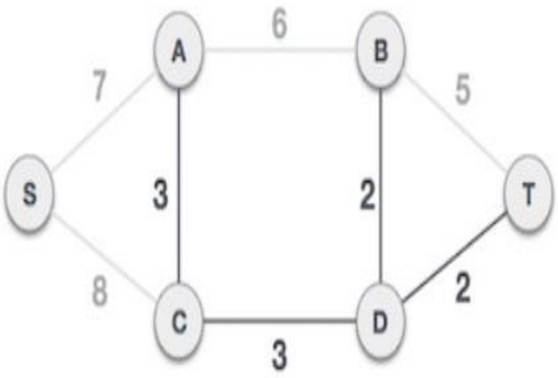
Next cost is 3, add A,C



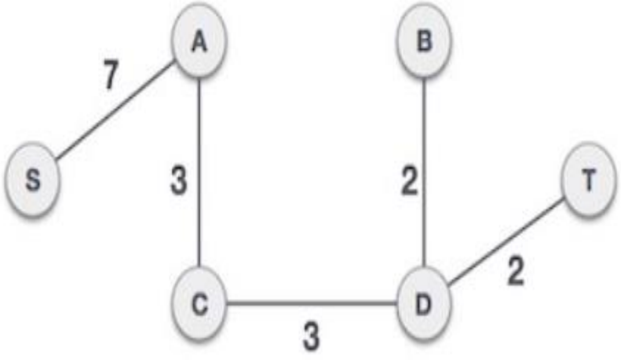
Next cost is 3, add C,D



Next cost is 4, but adding this will create a cycle. So we avoid this edge C,B

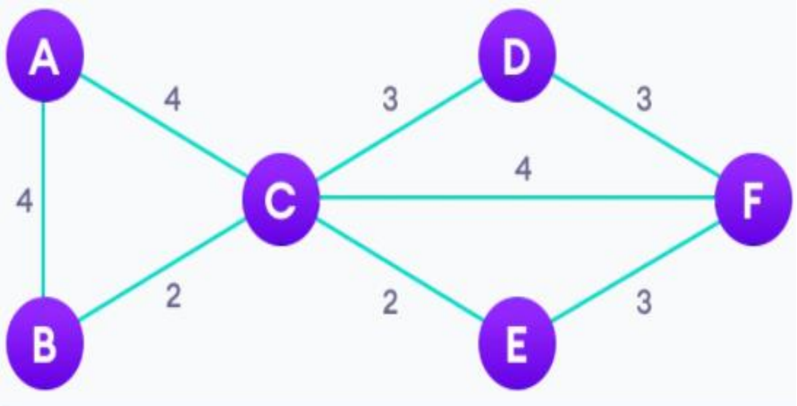


Edges with cost 5 and 6 also create cycle. So avoid these edges B,T & A,B



Add the edge S,A with cost 7. Hence we have included all the nodes. So MST if formed.

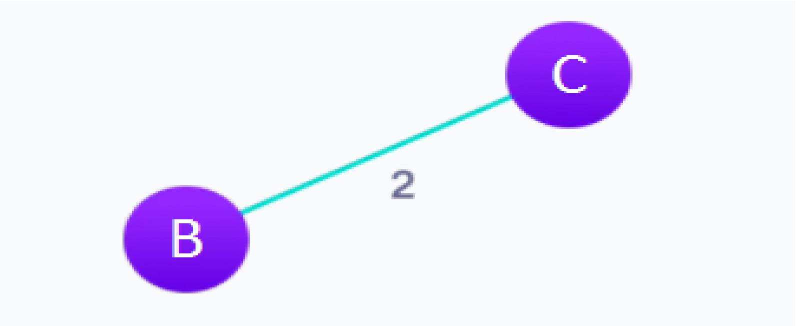
Kruskal's Algorithm: Example



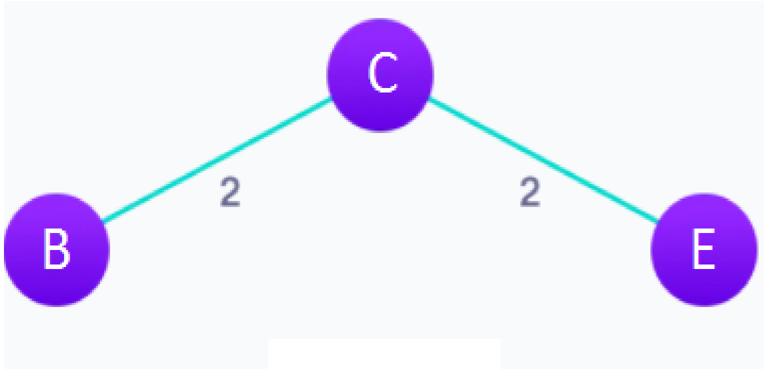
Start with a weighted graph

BC	CE	CD	EF	DF	CF	AC	AB
2	2	3	3	3	4	4	4

Arrange all edges in their increasing order of weight

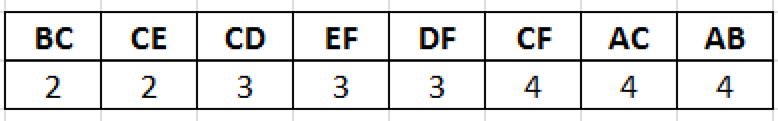


Choose the edge with the least weight, if there are more than 1, choose anyone

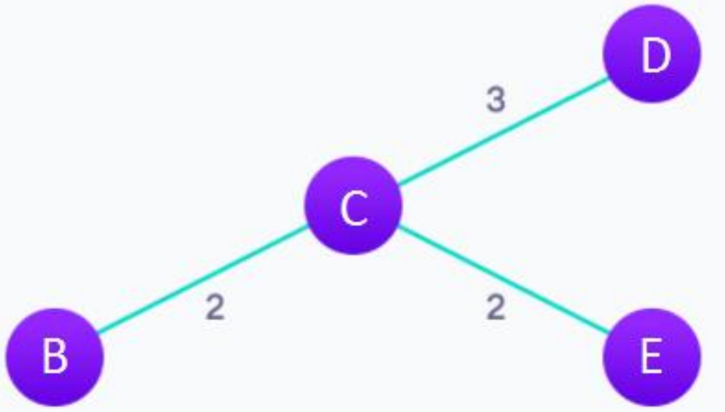


Choose the next shortest edge and add it

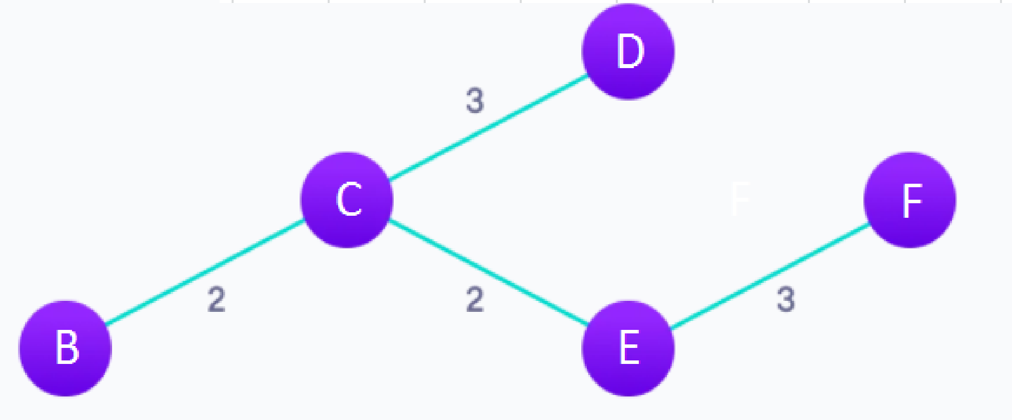
Kruskal's Algorithm: Example



BC	CE	CD	EF	DF	CF	AC	AB
2	2	3	3	3	4	4	4



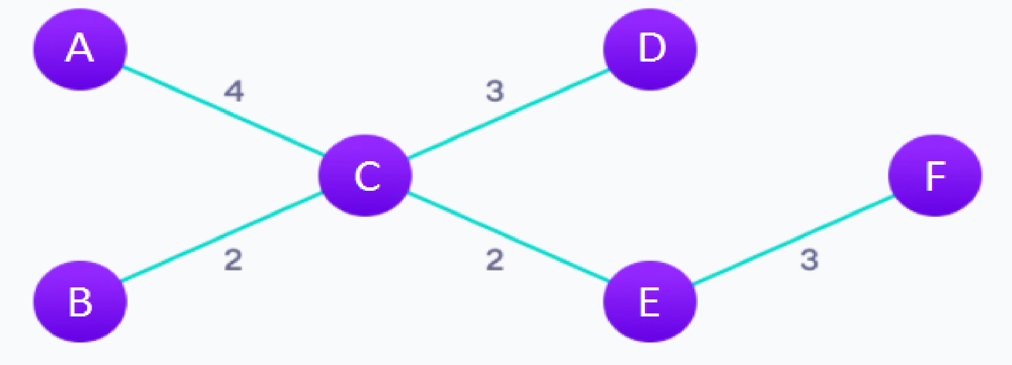
Choose the next shortest edge that doesn't create a cycle and add it



Choose the next shortest edge that doesn't create a cycle and add it

Next cost is 3, but adding DF will create a cycle. So we avoid this edge.

Next cost is 4, but adding CF will create a cycle. So we avoid this edge.



Next add AC; so MST is formed.