



Second Best MST Algorithm

Step-by-Step Visual Simulation

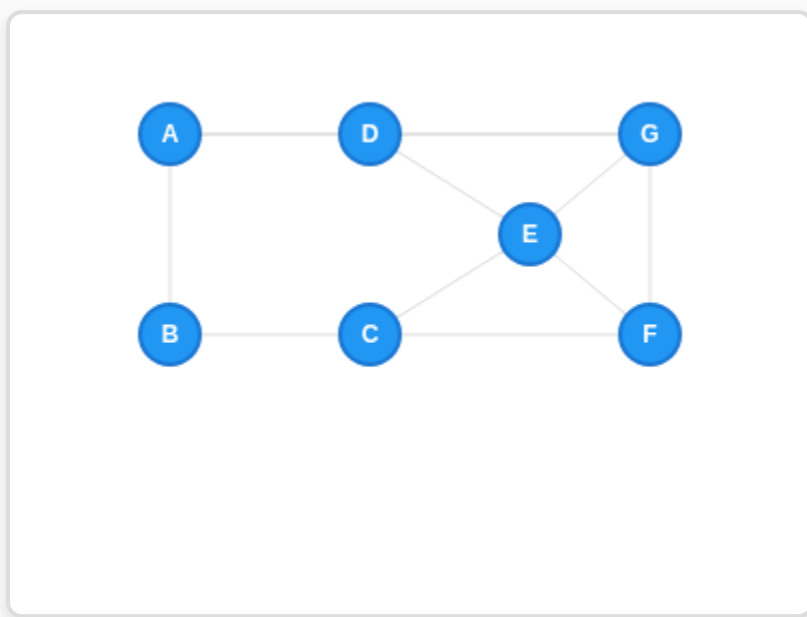
Step 0: Original Graph

Given Graph: We start with the weighted undirected graph from the problem.

Nodes: A, B, C, D, E, F, G

Edges with weights: A-D(3), A-B(2), B-C(5), C-E(2), C-F(6), D-E(4), D-G(2), E-F(2), E-G(5), F-G(3), A-G(4)

Original Weighted Graph

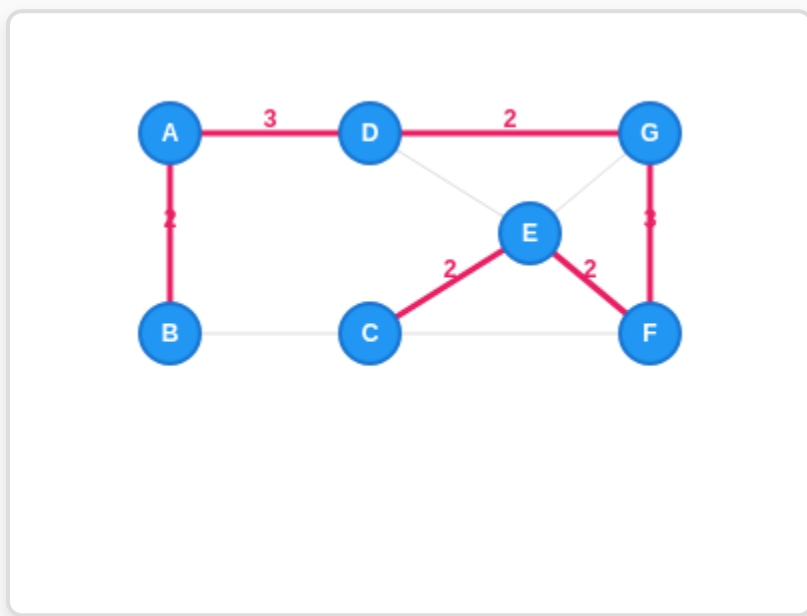


Step 1: Find First MST using Kruskal's Algorithm

Algorithm: Sort edges by weight and add them if they don't create a cycle.

Edge selection order: A-B(2), C-E(2), D-G(2), E-F(2), A-D(3), F-G(3)

First MST (Kruskal's Algorithm)



Total Weight: 13

MST Edges:
A-B (2)
C-E (2)
D-G (2)
E-F (2)
A-D (3)
F-G (3)

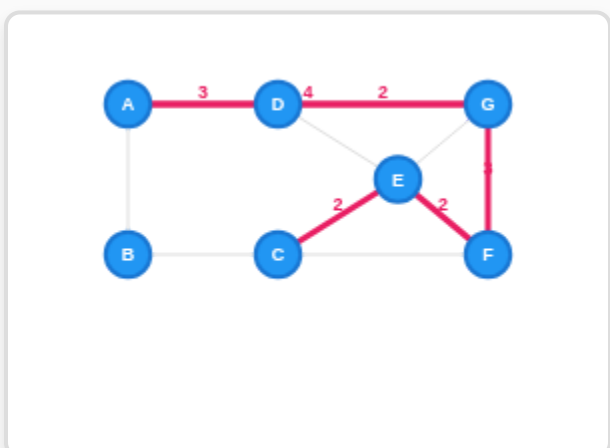
Step 2: Second Best MST Algorithm

Strategy: For each edge in the first MST, remove it and find the MST of the remaining graph.

The minimum weight among all these alternative MSTs is the second best MST.

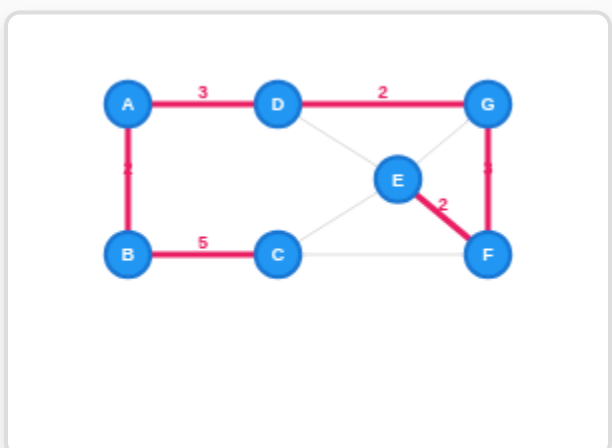
Step 3: Testing Each Alternative (Remove one MST edge at a time)

Remove A-B (weight 2)



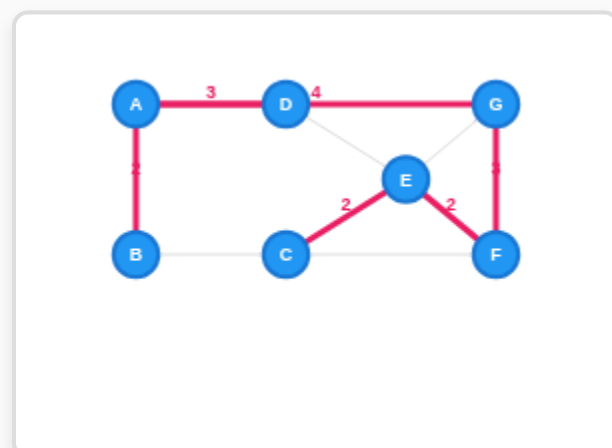
New MST Weight: 16

Remove C-E (weight 2)



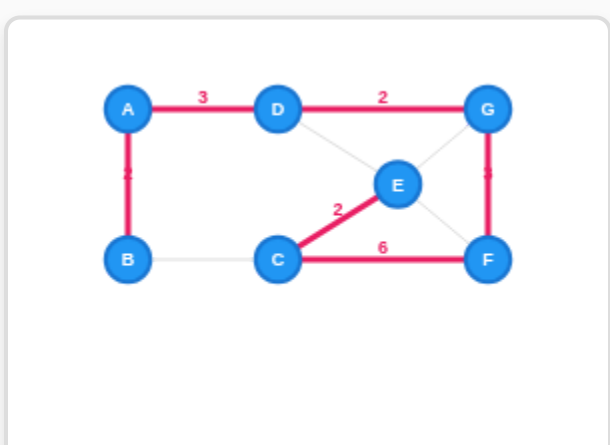
New MST Weight: 17

Remove D-G (weight 2)



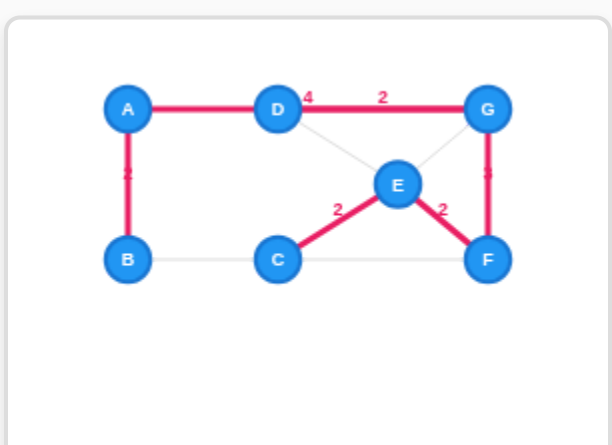
New MST Weight: 15

Remove E-F (weight 2)



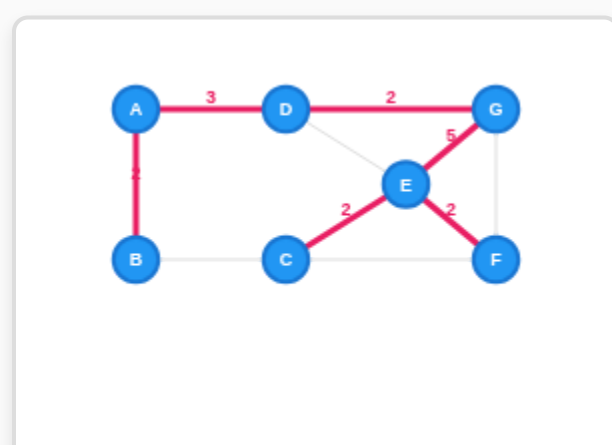
New MST Weight: 17

Remove A-D (weight 3)



New MST Weight: 14

Remove F-G (weight 3)



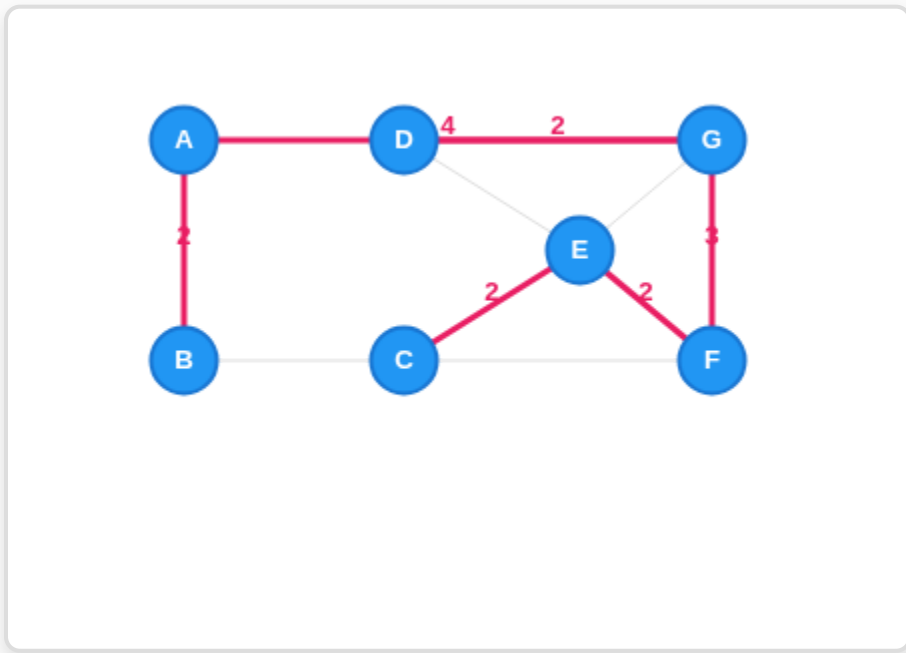
New MST Weight: 15

Step 4: Identify Second Best MST

Alternative MST weights:

- Without A-B: 16
- Without C-E: 17
- Without D-G: 15
- Without E-F: 17
- Without A-D: **14** ← Minimum!
- Without F-G: 15

Second Best MST (Remove A-D from first MST)



Weight: 14 (Difference: +1)

Second Best MST Edges:
A-B (2)
C-E (2)
D-G (2)
E-F (2)
F-G (3)
A-G (4) ← Replacement edge



Final Answer

First MST Weight: 13

Second Best MST Weight: 14

The second best MST is obtained by replacing edge A-D(3) with A-G(4)