P 1 - Minimum Spanning Tree

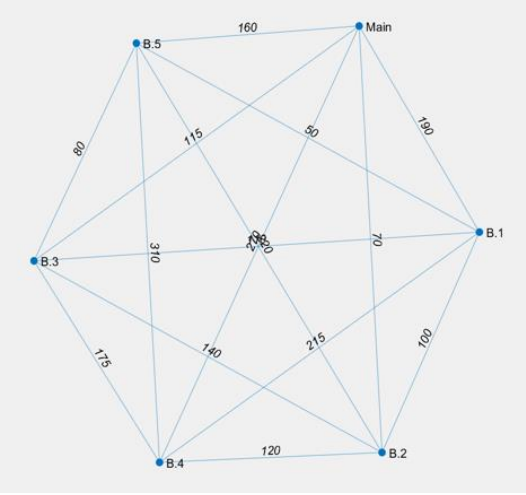
Premiere Bank will be connecting computer terminals at each one of its branch offices to the computer at its main office using a land cable system. A branch office need not be connected directly to the main office. It can be connected indirectly by being connected to another branch office that is connected (directly or indirectly) to the main office. The only requirement is that every branch office be connected by some route to the main office. The distance (in miles) between every pair of offices is shown below.

	Distance between Pairs of Offices					
	Main	**B.1**	**B.2**	**B.3**	**B.4**	**B.5**
Main office	—	190	70	115	270	160
Branch 1	190	—	100	110	215	50
Branch 2	70	100	—	140	120	220
Branch 3	115	110	140	—	175	80
Branch 4	270	215	120	175	—	310
Branch 5	160	50	220	80	310	—

(a) Describe how this problem fits the framework of the minimum spanning tree problem.

A minimum spanning tree is a spanning tree with minimum total weight. The conditions given in this Problem 1 well fit in the MST's setting to find the minimum distance that can connect the main office and the 5 branches with no loop/cycle within the tree paths.

(b) Draw an undirected graph for this problem.

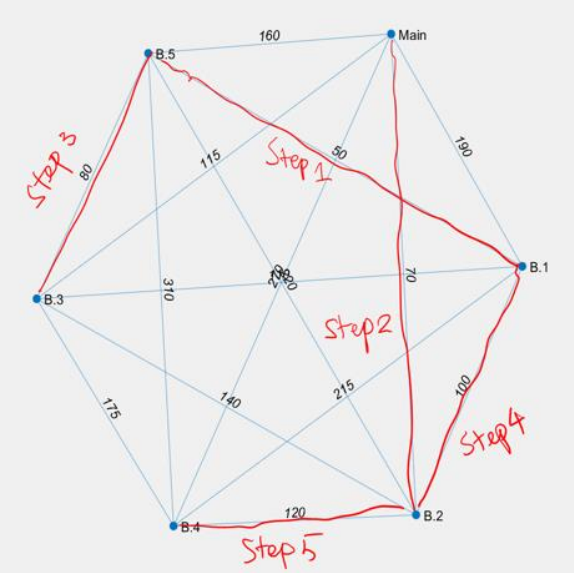


(c) Apply Kruskal's Algorithm to solve it.

Applying the Kruskal's Algorithm, our team had the following criteria to solve it:

- Pick an edge with minimum edge from edge group & Avoid loops/cycles in the path
    1) Step1: Connect B.1 and B.5 with edge weigh of 50
    2) Step2: Connect Main and B.2 with edge weight of 70
    3) Step3: Connect B.3 and B.5 with edge weight of 80
    4) Step4: Connect B.1 and B.2 with edge weight of 100
    5) Step5: Connect B.2 and B.4 with edge weight of 120

In the end, the Kruskal's Algorithm based MST path is generated. Minimum total distance/weight = 50+70+80+100+120=420



(d) Verify your solution with MATLAB.

(See solution in the attached .mat file)