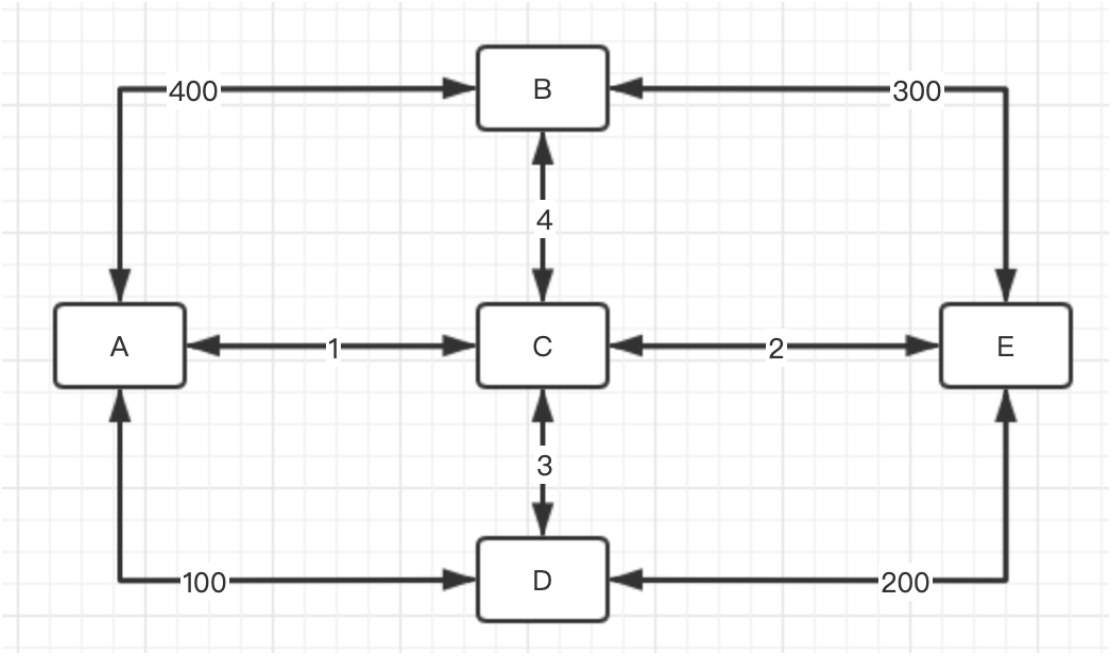
i).The example is shown as following:



ii). Assume three places i,j,k located as whatever kind of triangle with edges ij, ik, jk. According to the property of triangle, we know that d(i,j) ⩽ d(i, k) + d(k, j) for all i, j, k. Thus, if we want to arrive j from I, it is clear that the shortest path is to go to j directly from i, since d(i,j) ⩽ d(i, k) + d(k, j) always applies, instead of passing through k. And thus, the TSP solution can't contain a vertex several times.

iii).The algorithm is shown as following:

Step 1: Use the Kruskal' s algorithm to construct a minimum spanning tree

It is clear that what TSP does is to find a cycle with the smallest costs, thus the sum of the costs of all edges in the minimal spanning tree must be smaller than the length of the optimal tour since the MST connects all vertices with the smallest cost and doesn' t contain any cycle.

Step 2: Start from the root of the MST and perform the tree traversal.

After traversing all the vertices and returning to the root node, each edge in the tree is traversed exactly twice, resulting in a cost that is twice the sum of all the edges in the tree. Since the boundary of the sum is the optimal trip length, the cost of this route is twice that of the optimal trip length.