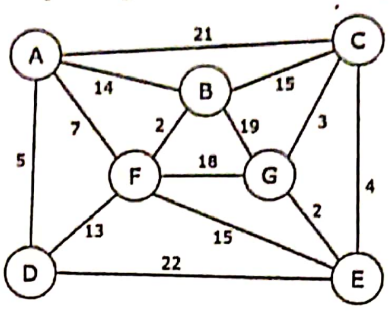
CSE 207

Exercise: MST

1.

You will be computing two minimum spanning trees for the following undirected, weighted graph.




a)Using Prim's algorithm b) Using Kruskal's algorithm

2. Let G be a connected undirected graph with 100 vertices and 300 edges. The weight of a minimum spanning tree in G is 500. When the weight of each edge of G is increased by 5, the weight of the minimum spanning tree is _____.

3. Kruskal's algorithm can return different spanning trees for the same input graph G, depending on how it breaks ties when the edges are sorted into order. Show that for each minimum spanning tree T of G, there is a way to sort the edges of G in Kruskal's algorithm so that the algorithm returns T .

4. Professor Borden proposes a new divide-and-conquer algorithm for computing minimum spanning trees, which goes as follows. Given a graph G D .V;E/, partition the set V of vertices into two sets V1 and V2 such that |V1| and |V2| differ by at most 1. Let E1 be the set of edges that are incident only on vertices in V1, and let E2 be the set of edges that are incident only on vertices in V2. Recursively solve a minimum-spanning-tree problem on each of the two subgraphs G1 = (V1;E1) and G2 =(V2; E2) Finally, select the minimum-weight edge in E that crosses the cut .V1;V2, and use this edge to unite the resulting two minimum spanning trees into a single spanning tree. Either argue that the algorithm correctly computes a minimum spanning tree of G, or provide an example for which the algorithm fails.