ECON 381 HOMEWORK 4

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1. A linked, weighted graph's MST is a subgraph that joins all of its vertices together, with no cycles and the smallest feasible total edge weight.

Iteratively adding the least expensive edge that doesn't form a cycle is how Kruskal's method operates.

The steps fort he provided graph are as follows:

A. We sort each edge by weight

- A-B (3)

- B-C (3)

- A-D (4)

- C-E (4)

- D-E (7)

- B-E (9)

B. We begin with a blank graph.

C. We Include edges ina sorted manner, except those that form loops

Add A to B (3), B to C (3), A to D (4), and C to E (4).

The edges A-B, B-C, A-D, C-E make up the MST, which has a total weight of 14.

2. If every edge weight is different, then an MST will be unique. There may be more than one MST if there are several edges with the same weight. The edges A-D and C-E in the above graph have the same weight (4), as do edges A-B and B-C (3). Consequently, there is no assurance that the MST is unique. To obtain another MST with the same total weight, for instance, we may have selected B-E rather as A-D.

3. Dijkstra's Algorithm for shortest paths:

The shortest routes between a single source vertex and every other vertex in a graph are determined by Dijkstra's algorithm.

Steps	Current Node	Visited Nodes	Distances
0	A	(A)	A:0, B:3, C:infinity, D:4, E: infinity
1	B	(A,B)	A:0, B:3, C:6, D:4, E: infinity
2	D	(A,B,D)	A:0, B:3, C:6, D:4, E:11
3	C	(A,B,D,C)	A:0, B:3, C:6, D:4, E:10
4	E	(A,B,C,D,E)	A:0, B:3, C:6, D:4, E:10

4. An edge that, when remowed, increases the number of connected components in the graph is known as a critical edge. Put otherwise, the graph becomes disconnected if a vital edge is removed.

A-D is a key edge in this graph. Nodes A and D will be in different components if A-D is removed.

5. A cut vertex, is a vertex whose removal expands the graph's linked components.

Node B is an articulation point in this graph. Nodes A and D will be isolated from C and E if B is eliminated.

6. Yes. The graph won't disconnect if a single node (such as C) is removed if there are no essential edges or articulation points. A different route from B to E must thus exist.

7. The capacity of a graph to remain connected and functional even after nodes or edges are removed is known as graph resilience. Two important makers of a graph's vulnerability are critical edges and articulation points. A graph that has a lot of articulation points and crucial edges is not as strong.