Chapter 7 Spanning Trees Homework Problems Due Monday April 1

2. For each graph, determine whether the graph is a tree or not. If the graph is not a tree, give the reason(s) why not.

(a) The graph shown in Fig. 7-32(a)

(b) The graph shown in Fig. 7-32(b)

(c) The graph shown in Fig. 7-32(c)

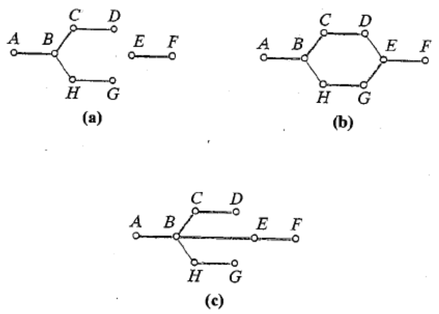

FIGURE 7-32

In Exercises 5 through 8, assume that G is a graph with no loops or multiple edges, and choose the option that best applies: (I) G is definitely a tree (explain why); (II) G is definitely not a tree (explain why); or (III) G may or may not be a tree (in this case, give two examples of graphs that fit the description—one a tree and the other one not).

5. (a) G has 8 vertices and 10 edges.

(b) G has 8 vertices and 7 edges.

(c) G has 8 vertices and is connected, and every edge in G is a bridge.

(d) G has 8 vertices, and there is exactly one path from any vertex to any other vertex.

(e) G has 8 vertices and 7 bridges.

7. (a) *G* has 8 vertices and no circuits.

(b) *G* has 8 vertices, 7 edges, and exactly one circuit.

(c) *G* has 8 vertices, 7 edges, and no circuits.

11. Consider the network shown in Fig. 7-33.

(a) Find a spanning tree of the network.

(b) Calculate the redundancy of the network.

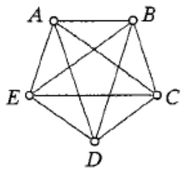

FIGURE 7-33

12. Consider the network shown in Fig. 7-34.

(a) Find a spanning tree of the network.

(b) Calculate the redundancy of the network.

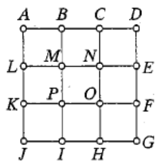

FIGURE 7-34

17. (a) How many different spanning trees does the network shown in Fig. 7-39(a) have?

(b) How many different spanning trees does the network shown in Fig. 7-39(b) have?

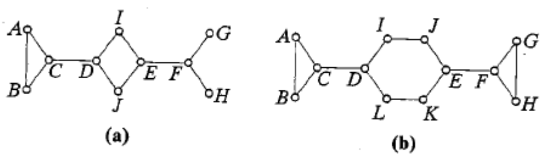

FIGURE 7-39

Do not list them all, but rather find a way to count them.

19. For the network shown in Fig. 7-41,

(a) find the MST of the network using Kruskal's algorithm.

(b) give the weight of the MST found in (a).

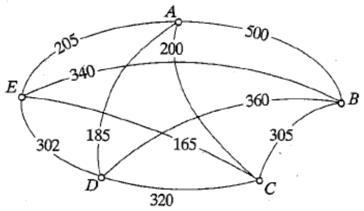

FIGURE 7-41

22. For the network shown in Fig. 7-44,

(a) find the MST of the network using Kruskal's algorithm.

(b) give the weight of the MST found in (a).

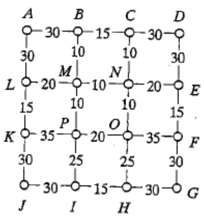

FIGURE 7-44

25. The 3 by 4 grid shown in Fig. 7-47 represents a network of streets (3 blocks by 4 blocks) in a small subdivision. For landscaping purposes, it is necessary to get water to each of the corners by laying down a system of pipes along the streets. The cost of laying down the pipes is $40,000 per mile, and each block of the grid is exactly half a mile long. Find the cost of the cheapest network of pipes connecting all the corners of the subdivision. Explain your answer. (*Hint:* First determine the number of blocks in the MST.)

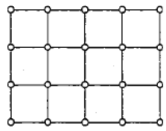

FIGURE 7-47

41. Give an example of a graph with $N = 11$ vertices and $M = 10$ edges having

(a) exactly one circuit.

(b) exactly two circuits.

(c) exactly three circuits.

51. **(a)** How many spanning trees does the network shown in Fig. 7-65(a) have?

(b) How many different spanning trees does the network shown in Fig. 7-65(b) have?

(c) How many different spanning trees does the network shown in Fig. 7-65(c) have?