Foundations of Discrete Mathematics
COT 2104
Chapters 11 & 12 (Answer Review)

1. If G is a tree and H is a subgraph of G, then H must also be a tree if H is connected.
    a. True x
    b. False

2. If G is not a tree and H is a subgraph of G, then H must also not be a tree.
    a. True
    b. False x

3. Every tree possesses an Eulerian trail.
    a. True
    b. False x

4. If A is the adjacency matrix of a tree, then $A^n = 0$ for some n.
    a. True x
    b. False

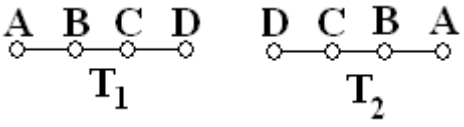
5. If A is the adjacency matrix of a graph G ans $A^n = 0$ for some n, then G must be a tree.
    a. True x
    b. False

6. A tree with eight vertices has seven edges.
    a. True x
    b. False

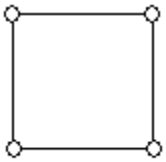
7. A graph with 20 edges and 21 vertices must be a tree.
    a. True
    b. False x

8. A tree with more than one vertex has at most two leaves
    a. True
    b. False x

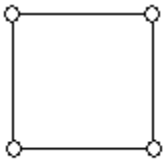
9. Labeled trees T_1 and T_2 are isomorphic.
    a. True x
    b. False



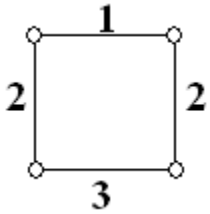
10. The graph T has four different spanning trees.
    a. True x
    b. False



11. Any two spanning trees of T are isomorphic.
    a. True x
    b. False



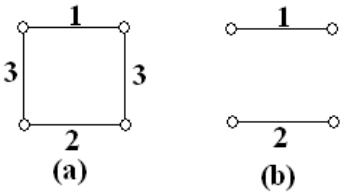
12. The weighted graph has a unique minimum spanning tree.
    a. True x
    b. False



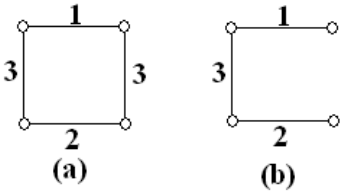
13. Every connected graph has a spanning tree.
    a. True x
    b. False

14. If a graph G has a unique spanning tree, then G is a tree.
    a. True x
    b. False

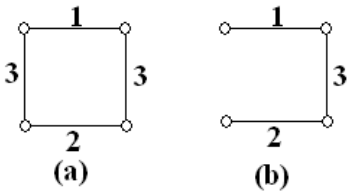
15. If Kruskal's algorithm is applied to a graph on (a) after one application of step 2, we will have the edges shown on (b)
    a. True x
    b. False



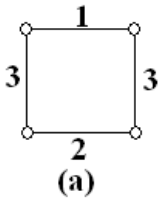
16. If Kruskal's algorithm is applied to (a), we might end up with the spanning tree on (b)
    a. True x
    b. False



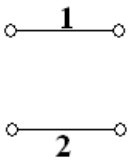
17. If Kruskal's algorithm is applied to (a), we might end up with the spanning tree on (b)
    a. True x
    b. False



18. If Prim's algorithm is applied to a graph on (a) after one application of step 2, we will have the edges shown on (b)



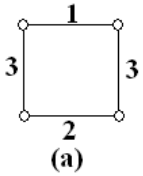
(a)



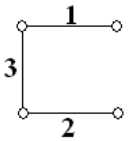
(b)

a. True
b. False x

19. If Prim's algorithm is applied to (a), we might end up with the spanning tree on (b).



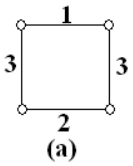
(a)



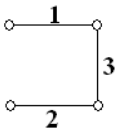
(b)

a. True x
b. False

20. If Prim's algorithm is applied to (a), we might end up with the spanning tree on (b)



(a)



(b)

a. True x
b. False

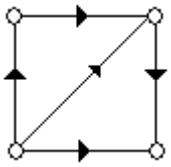
21. In Prim's algorithm, Step 1 will always select the edges of least weight in the graph.
a. True
b. False x

22. The decision whether to use Kruskal's algorithm or Prim's on a graph G depends on the relative magnitude of the vertex set and edge set of G.
a. True x
b. False

23. Kruskal's algorithm can be used on unweighted graphs.
a. True x
b. False

24. Prim's algorithm can be used on unweighted graphs.
a. True x
b. False

25. The digraph of the picture is acyclic.

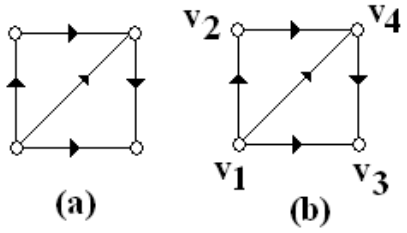


a. True x
b. False

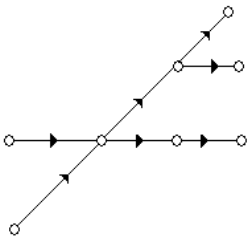
26. If every edge in an acyclic undirected graph is given a direction, the resulting digraph is acyclic.
    a. True x
    b. False

27. If a digraph is acyclic, then the underlying undirected graph must be acyclic.
    a. True
    b. False x

28. The digraph of the picture (b) is a canonical labeling of the digraph of the picture (a).
    a. True x
    b. False



29. The digraph of the picture is a rooted tree with some vertex as a root.
    a. True x
    b. False



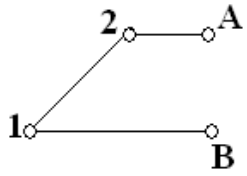
30. A digraph is acyclic if and only if every labeling of its vertices is canonical.
    a. True x
    b. False

31. If a rooted (directed) tree with root v, there is a unique path from v to every other vertex.
    a. True x
    b. False

32. In a rooted (directed) tree, every vertex other than the root has outdegree 1.
    a. True
    b. False x

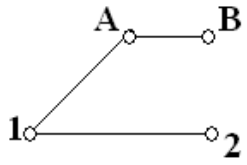
33. At any stage during a depth-first search, the vertices that have been labeled are all connected by edges.
    a. True x
    b. False

34. Depth-first search has assigned labels 1 and 2 as shown in the picture. The next vertex to be labeled will be B.



a. True
b. False x

35. Depth-first search has assigned labels 1 and 2 as is shown in the picture. The next vertex to be labeled will be A.



a. True x
b. False

36. If G is a graph with ten vertices and depth-first search stops after eight vertices have been labeled, G is not connected.

a. True x
b. False

37. If a graph G is connected, the edges that are used in a depth-first search on G will form a spanning tree for G.

a. True x
b. False

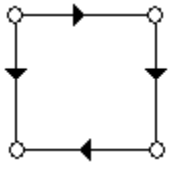
38. If depth-first search is applied to a tree starting at some designated vertex 1, the resulting labeling must be unique.

a. True
b. False x

39. Every spanning tree of K_n is obtainable as a depth-first search spanning tree.

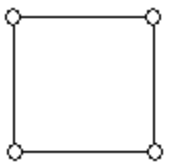
a. True
b. False x

40. The digraph of the picture is strongly connected.



a. True
b. False x

41. The graph in the picture has a strongly connected orientation.



a. True x
b. False

42. The graph in the picture has a strongly connected orientation.

a. True
b. False x