Chapter 7 & 8 Test Review

Name___________________________________

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

1) Which of the following four graphs is a tree?

A) Graph 1 and Graph 4
B) Graph 1 and Graph 3
C) Graph 2 and Graph 3
D) Graph 2 and Graph 4
E) None of the above

2) A tree is
   A) any connected graph whose edges number one fewer than its vertices.
   B) any graph for which there is one and only one path joining any two vertices.
   C) any graph with one component and no circuits.
   D) All of the above define a tree.
   E) None of the above

3) The number of edges in a tree with 49 vertices is
   A) 49.
   B) 48.
   C) 249.
   D) 50.
   E) None of the above

4) The number of vertices in a tree with 49 edges is
   A) 50.
   B) 49.
   C) 249.
   D) 48.
   E) None of the above

5) Assume that G is a graph with no loops or multiple edges. It is known that G has 5 vertices, 4
edges, and that the degree of each vertex is either 1 or 2. What can be said about G?
   A) G is a tree.
   B) G has 4 bridges.
   C) G is not a tree.
   D) G could be a tree.
   E) None of the above
6) Assume that G is a graph with 10 vertices. It is known that one vertex has degree 9 and the other vertices each have degree 1. What can be said about G?
   A) G is a tree.
   B) It is impossible to tell if G is a tree or not.
   C) G is not a tree.
   D) G has no bridges.
   E) None of the above

7) How many spanning trees does the following graph have?

   A) 4
   B) 5
   C) 8
   D) 3
   E) None of the above

8) Any spanning tree of the following graph contains

   A) edge BD.
   B) edges AB and DE.
   C) each edge of the graph.
   D) edges AB, BC, CD, and DE.
   E) None of the above

9) How many spanning trees does the following graph have?

   A) 24
   B) 25
   C) 23
   D) 15
   E) None of the above
The question(s) that follow refer to the problem of finding the minimum spanning tree for the weighted graph shown below.

10) Using Kruskal's algorithm, which edge should we choose third?
   A) BC  
   B) CD  
   C) AC  
   D) BD  
   E) None of the above

11) The total weight of the minimum spanning tree is
   A) 125.  
   B) 68.  
   C) 26.  
   D) 24.  
   E) None of the above

Use the mileage chart shown below to find the minimum spanning tree for the 5 cities of Boston, Buffalo, Chicago, Columbus, and Louisville.

<table>
<thead>
<tr>
<th></th>
<th>Boston</th>
<th>Buffalo</th>
<th>Chicago</th>
<th>Columbus</th>
<th>Louisville</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston</td>
<td>*</td>
<td>446</td>
<td>963</td>
<td>735</td>
<td>941</td>
</tr>
<tr>
<td>Buffalo</td>
<td>446</td>
<td>*</td>
<td>522</td>
<td>326</td>
<td>532</td>
</tr>
<tr>
<td>Chicago</td>
<td>963</td>
<td>522</td>
<td>*</td>
<td>308</td>
<td>292</td>
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<tr>
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<td>735</td>
<td>326</td>
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<td>*</td>
<td>209</td>
</tr>
<tr>
<td>Louisville</td>
<td>941</td>
<td>532</td>
<td>292</td>
<td>209</td>
<td>*</td>
</tr>
</tbody>
</table>

12) Using Kruskal's algorithm which edge is chosen third?
   A) Boston – Chicago.  
   B) Boston – Buffalo.  
   C) Buffalo – Columbus.  
   D) Columbus – Louisville.  
   E) None of the above

13) Which of the following edges is not in the minimum spanning tree?
   A) Boston – Chicago.  
   B) Buffalo – Columbus.  
   C) Columbus – Louisville.  
   D) Boston – Buffalo.  
   E) All of the above are in the minimum spanning tree.
14) The length of the minimum spanning tree connecting the cities of Boston, Buffalo, Chicago, Columbus, and Louisville is
   A) 1273 miles.
   B) 1795 miles.
   C) 2236 miles.
   D) 1135 miles.
   E) None of the above

Assume you have four cities (A, B, C, and D) located at the corners of a 100 mile by 100 mile square which are to be connected by a network of power lines.

15) Which of the following figures represents the shortest network of power lines connecting these four cities?
   A)
   B)
   C)
   D)
   E) None of the above

16) At a cost of $10,000 per mile, the cost of laying the optimal network of power lines is closest to
   A) 3 million dollars.
   B) 1.73 million dollars.
   C) 2.73 million dollars.
   D) 2 million dollars.
   E) 1 million dollars.
Solve the problem.

17) Triangle ABC has two legs of length 2 as shown below. If S is a Steiner point of triangle ABC, find the measure of angle α.

![Diagram of Triangle ABC]

A) 45°
B) 75°
C) 30°
D) 60°
E) All of the above

For the following question(s), refer to the digraph below.

![Diagram of Digraph]

18) Vertex B has
A) indegree 0, outdegree 3.
B) indegree 3, outdegree 0.
C) indegree 1, outdegree 2.
D) indegree 2, outdegree 1.
E) None of the above

19) Which of the following is not a path from vertex C to vertex E in the digraph?
A) C, A, B, E
B) C, D, E
C) All of the above are paths from C to E.
D) C, A, E
E) None of the above are paths from C to E.
20) Suppose that the vertices of the digraph represent individuals and there is an arc going from vertex $X$ to vertex $Y$ if and only if $X$ "likes" $Y$. Which of the following statements [A), B), C), or D)] is not true?

A) $B$ likes $E$ but $E$ does not like $B$.
B) $B$ and $C$ do not like each other.
C) $A$ likes $B$ and $E$ but does not like $C$ or $D$.
D) $A$ and $B$ like each other.
E) All of the above statements are true.

For the following question(s), refer to the tournament digraph below. The vertices of the digraph represent five tennis players in a round-robin tournament. An arc $XY$ represents the fact that $X$ defeated $Y$ in the tournament.

21) Which player won the tournament?
A) $A$.
B) $B$.
C) $C$.
D) $D$.
E) $E$.

22) How many games were played in the tournament?
A) 10
B) 32
C) 5
D) 5!
E) None of the above

23) Which player came in last in the tournament?
A) $A$.
B) $B$.
C) $C$.
D) $D$.
E) $E$.

Assume you have a digraph with 5 vertices ($A$, $B$, $C$, $D$, and $E$) and 9 arcs. $B$ is incident from $D$, $E$, and $A$; $C$ is incident to $E$ and $A$ and incident from $D$; $E$ is incident to $D$ and incident from $A$.

24) Vertex $E$ is
A) incident to vertex $B$ only.
B) incident to vertex $A$ only.
C) incident to vertices $B$ and $D$.
D) incident to vertex $C$ only.
E) None of the above

25) How many cycles are there in the digraph that start and end at $C$?
A) 3
B) 1
C) 2
D) 0
E) None of the above
Suppose you have the following project digraph. (The numbers in parenthesis represent hours.)

![Project Digraph Diagram]

26) The number of tasks in the project is
   A) 8.
   B) 9.
   C) 7.
   D) 6.
   E) None of the above

27) The length of the critical path from C is
   A) 15 hours.
   B) 12 hours.
   C) 7 hours.
   D) 20 hours.
   E) None of the above

28) The length of the critical path for the entire project is
   A) 18 hours.
   B) 15 hours.
   C) 37 hours.
   D) 30 hours.
   E) None of the above

29) Using the priority list, C, F, E, B, A, D and the priority-list model to schedule this project with two processors results in a completion time of
   A) 23 hours.
   B) 22 hours.
   C) 18 hours.
   D) 19 hours.
   E) None of the above

30) Using the decreasing time algorithm to schedule this project with two processors results in a completion time of
   A) 19 hours.
   B) 22 hours.
   C) 23 hours.
   D) 18 hours.
   E) None of the above
31) Using critical path algorithm to schedule this project with two processors results in a completion
time of
   A) 22 hours.
   B) 23 hours.
   C) 19 hours.
   D) 18 hours.
   E) None of the above

32) Using the critical path algorithm to schedule this project with three processors results in a
completion time of
   A) 19 hours.
   B) 18 hours.
   C) 22 hours.
   D) 23 hours.
   E) None of the above