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**Started on** Tuesday, 20 July 2021, 2:20 PM

**State** Finished

**Completed on** Tuesday, 20 July 2021, 3:35 PM

**Time taken** 1 hour 14 mins

**Marks** 18.00/30.00

**Grade** 6.00 out of 10.00 (60%)

Question 1

Incorrect

Mark 0.00 out of 1.00

How many subgraphs with at least one vertex does  $K_2$  have?

- ☐ a. 5
- ☐ b. 4
- ☐ c. 2
- ☒ d. 3



The correct answer is: 4

Question 2

Correct

Mark 1.00 out of 1.00

Let  $G$  be a complete graph with 45 edges.  $G$  has:

Select one:

- ☐ 7 vertices.
- ☒ 10 vertices.
- ☐ 9 vertices.
- ☐ None of the others
- ☐ 8 vertices.



The correct answer is: 10 vertices.

## Question 3

Correct

Mark 1.00 out of 1.00

How many vertices does a full 5-ary tree with 100 internal vertices have?

- ☐ a. 499
- ☐ b. 1000
- ☐ c. 500
- ☒ d. 501



The correct answer is: 501

## Question 4

Correct

Mark 1.00 out of 1.00

Set up a binary tree for the following list, in the given order, using alphabetical ordering: SHE, SELLS, SEA, SHELLS, BY, THE, SEASHORE. How many comparisons with words in the tree are needed to determine if the word SHARK is in the tree?

Select one:

- ☐ 3
- ☒ 2
- ☐ 4
- ☐ 5



The correct answer is: 2

## Question 5

Incorrect

Mark 0.00 out of 1.00

$K_{m,n}$  has \_\_\_\_ edges and \_\_\_\_ vertices.

Select one:

- ☒  $\min(m, n), \max(m, n)$
- ☐  $\max(m, n), \min(m, n)$
- ☐  $mn, m + n$
- ☐  $m + n, mn$



The correct answer is:  $mn, m + n$

Question **6**

Correct

Mark 1.00 out of 1.00

What kind of graph can be used to model a highway system between major cities where there is an edge between the vertices representing cities for each interstate highway between them, and there is a loop at the vertex representing a city if there is an interstate highway that circles this city?

- ☐ a. simple graph
- ☐ b. multigraph
- ☒ c. pseudograph
- ☐ d. directed graph



The correct answer is: pseudograph

Question **7**

Correct

Mark 1.00 out of 1.00

How many edges are there in an undirected graph with degree sequence 5, 5, 4, 4, 3, 3, 2, 1?

Select one:

- ☒ 15
- ☐ No such a graph
- ☐ 18
- ☐ 30



The correct answer is: 15

Question **8**

Correct

Mark 1.00 out of 1.00

How many edges does a full binary tree with 1000 internal nodes have?

Select one:

- ☐ 2000
- ☐ 1001
- ☒ 2001
- ☐ 1000



The correct answer is: 2001

Question **9**

Correct

Mark 1.00 out of 1.00

A complete m-ary tree is a full m-ary tree, where every leaf is at the same level. How many leaves does a complete 3-ary tree of height 4 have?

Select one:

- ☐ 32
- ☐ 64
- ☐ 18
- ☒ None of the others



The correct answer is: None of the others

Question **10**

Incorrect

Mark 0.00 out of 1.00

If T is a tree with 599 nodes, then T has \_\_\_\_ edges.

Select one:

- ☒ 600
- ☐ 597
- ☐ 601
- ☐ 598



The correct answer is: 598

Question **11**

Incorrect

Mark 0.00 out of 1.00

Set up a binary search tree for the following list 5, 3, 6, 2, 4, 7. Write the preorder traversal of the tree.

Select one:

- ☐ None of the others
- ☐ 5, 3, 2, 4, 6, 7
- ☒ 5, 2, 3, 4, 6, 7
- ☐ 2, 3, 4, 5, 6, 7
- ☐ 2, 4, 3, 7, 6, 5



The correct answer is: 5, 3, 2, 4, 6, 7

Question **12**

Correct

Mark 1.00 out of 1.00

What kind of graph can be used to model a highway system between major cities where there is an edge between the vertices representing cities for each interstate highway between them?

- ☒ a. multigraph
- ☐ b. pseudograph
- ☐ c. directed graph
- ☐ d. simple graph



The correct answer is: multigraph

## Question 13

Incorrect

Mark 0.00 out of 1.00

Select correct statements:

Select one:

- ☒ The adjacency matrix for K10 has 45 columns
- ☐ The adjacency matrix for K5,6 has 11 columns.
- ☐ There are 100 1-entries in the adjacency matrix for K10
- ☐ None of the others



The correct answer is: The adjacency matrix for K5,6 has 11 columns.

## Question 14

Correct

Mark 1.00 out of 1.00

Which of the following statements is (are) correct?

Select one:

- ☐ The degree sequence of K4,3 is 3, 3, 3, 3, 2, 2, 2, 2
- ☒ The degree sequence of K4 is 3, 3, 3, 3
- ☐ The degree sequence of W6 is 5, 4, 4, 4, 4, 4
- ☐ The degree sequence of C6 is 2, 2, 2, 2, 2, 2



The correct answer is: The degree sequence of K4 is 3, 3, 3, 3

## Question 15

Correct

Mark 1.00 out of 1.00

How many edges does a graph have if its degree sequence is 4, 3, 3, 2, 2?

- ☐ a. 14
- ☐ b. 9
- ☒ c. 7
- ☐ d. 10



The correct answer is: 7

Question **16**

Incorrect

Mark 0.00 out of 1.00

Which codes are prefix codes?(i) a: 1010, b: 010, c: 1100, d: 100(ii) a: 10, b: 010, c: 1110, d: 1001

Select one:

- ☐ Both
- ☐ (ii)
- ☐ (i)
- ☒ None



The correct answer is: (i)

Question **17**

Correct

Mark 1.00 out of 1.00

Study a simple graph having the degree sequence  $\{5, 5, 4, 4, 4, 3, 3, 2, 2, 2, 2, 1, 1\}$ . This graph has \_\_\_\_ edges.

Select one:

- ☐ 38
- ☐ 17
- ☒ 19
- ☐ A number between 20 and 38.



The correct answer is: 19

Question **18**

Correct

Mark 1.00 out of 1.00

Use Huffman coding algorithm to encode the word "football". What is the average number of bits required to encode a character?

Select one:

- ☐ 2.5
- ☐ 2.25
- ☒ None of the others
- ☐ 2.45
- ☐ 2.35



The correct answer is: None of the others

Question **19**

Correct

Mark 1.00 out of 1.00

How many leaves does a full 3-ary tree with 100 nodes have?

Select one:

- ☒ 67
- ☐ 78
- ☐ 68
- ☐ 76



The correct answer is: 67



Question **20**

Incorrect

Mark 0.00 out of 1.00

Which statements are true? (i) Web graph can be modeled as a directed graph.(ii) Road-maps can be modeled as mixed graphs

Select one:

- ☐ Neither
- ☒ (i) only
- ☐ Both
- ☐ (ii) only



The correct answer is: Both

Question **21**

Correct

Mark 1.00 out of 1.00

What kind of graph can be used to model a highway system between major cities where there is an edge between the vertices representing cities if there is an interstate highway between them?

- ☐ a. directed graph
- ☐ b. pseudograph
- ☒ c. simple graph
- ☐ d. multigraph



The correct answer is: simple graph

Question **22**

Correct

Mark 1.00 out of 1.00

Select correct statement(s).

Select one:

- ☐ The graph  $W_n$  has  $n+1$  vertices and  $n.n$  edges.
- ☒ The graph  $K_n$  has  $n$  vertices and  $n(n-1)/2$  edges.
- ☐ The graph  $K_{m,n}$  has  $m.n$  vertices and  $m.n$  edges.



The correct answer is: The graph  $K_n$  has  $n$  vertices and  $n(n-1)/2$  edges.

Question **23**

Incorrect

Mark 0.00 out of 1.00

A chain letter starts when a person sends a letter to four others. Each person who receives the letter either sends it to five other people who have never received it or does not send it to anyone. Suppose that 10,000 people send out the letter before the chain ends and that no one receives more than one letter. How many people receive the letter?

- ☐ a. 40000
- ☒ b. 50001
- ☐ c. 50000
- ☐ d. 40001

✗

The correct answer is: 40001

Question **24**

Incorrect

Mark 0.00 out of 1.00

A chain letter starts when a person sends a letter to four others. Each person who receives the letter either sends it to five other people who have never received it or does not send it to anyone. Suppose that 10,000 people send out the letter before the chain ends and that no one receives more than one letter. How many people do not send it out?

- ☐ a. 40000
- ☒ b. 40001
- ☐ c. 30000
- ☐ d. 30001

✗

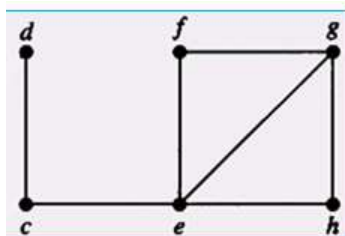
The correct answer is: 30001

Question **25**

Incorrect

Mark 0.00 out of 1.00

How many cut vertices does the graph below have?



Select one:

- ☐ 2
- ☒ 1
- ☐ 3
- ☐ 4

✗

The correct answer is: 2

Question **26**

Incorrect

Mark 0.00 out of 1.00

For which values of  $n$  do  $K_n$  have an Euler path but no Euler circuit?

Select one:

- ☐ None of the others
- ☒ 1
- ☐ 2
- ☐ 3

✗

The correct answer is: 2

Question **27**

Correct

Mark 1.00 out of 1.00

How many vertices does a complete 3-ary tree of height 5 have?

- ☒ a. 243
- ☐ b. 128
- ☐ c. 125
- ☐ d. 15



The correct answer is: 243

Question **28**

Correct

Mark 1.00 out of 1.00

A full binary tree with 4 leaves has \_\_\_ internal nodes.

Select one:

- ☐ 1
- ☐ 4
- ☒ 3
- ☐ 2



The correct answer is: 3

Question **29**

Correct

Mark 1.00 out of 1.00

Find the postfix form of the expression  $(3 * x + y) / (x - y)$ .

Select one:

- ☐ None of the others
- ☐  $/ + * 3 x y - x y$
- ☒  $3 x * y + x y - /$
- ☐  $3 * x y + - x y /$



The correct answer is:  $3 x * y + x y - /$

Question **30**

Incorrect

Mark 0.00 out of 1.00

How many leaves does a full 3-ary tree with 100 vertices have?

- ☒ a. 201
- ☐ b. 67
- ☐ c. 99
- ☐ d. 100



The correct answer is: 67

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