Started on	Thursday, 8 July 2021, 2:04 PM
State	Finished
Completed on	Thursday, 8 July 2021, 2:04 PM
Time taken	11 secs
Marks	0.00/50.00
Grade	**0.00** out of 10.00 (**0%**)

Question **1**

Not answered

Marked out of 1.00

Consider the function f: Z → N, f(n) = -2n if n ≤ 0 and f(n) = 2n + 1 if n > 0

Which statement is true?

Select one:
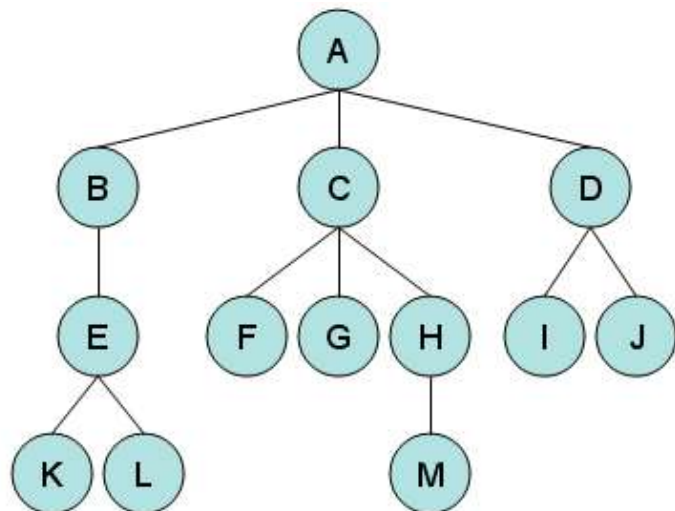
- a.   f is one-to-one, not onto
- b.   f is one-to-one, and onto
- c.   f is not one-to-one, but onto
- d.   f is not one-to-one, not onto

Question **2**

Not answered

Marked out of 1.00

If E is the **root** of the following tree, what is the **height** of the tree?

Select one:

- a. 5
- b. 4
- c. 3
- d. 2

Question **3**

Not answered

Marked out of 1.00

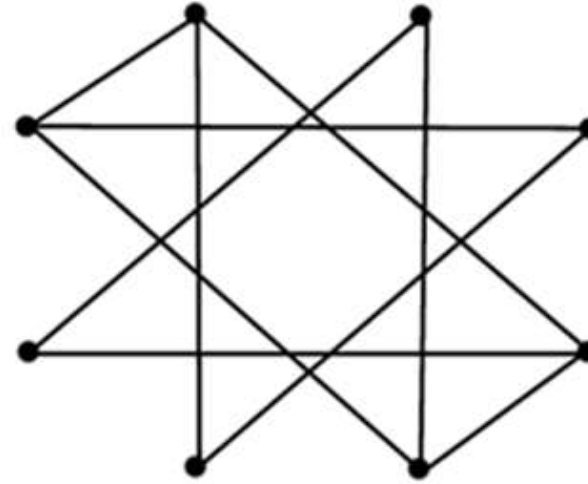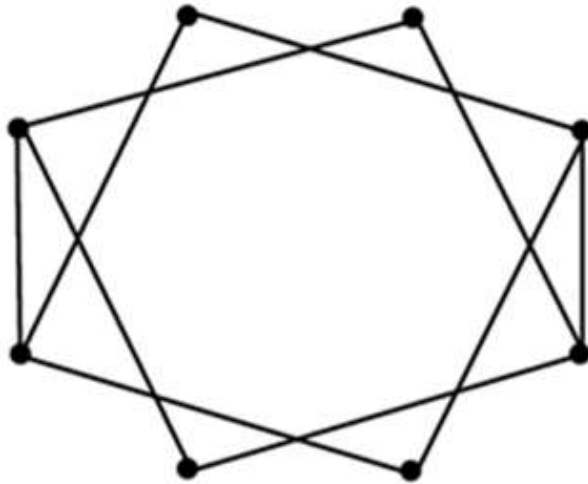Let A = {1, 2, x}. What is the cardinality of the power set of A?

Select one:

- a. 9
- b. 8
- c. 3
- d. 6

Question **4**

Not answered

Marked out of 1.00

Are these two graphs isomorphic? If not, what is the reason?

Select one:

○ a. No, they are not isomorphic because they do not have the same number of vertices of degree 3.

○ b. Yes, they are isomorphic.

○ c. No, they are not isomorphic because the graph on the left is connected, and the graph on the right is not.

○ d. No, they are not isomorphic because the vertices of degree 3 of the graph on the right form a circuit, and the graph on the left does not have that property.

Question **5**

Not answered

Marked out of 1.00

Determine the complexity of the following algorithm.

procedure giaithuat(a_1, a_2, a_3, ..., a_n: positive integers)

k:=0

for i: =1 to n do

    if $a_i < a_{i+1}$ then k:= k +1

print(k)

Select one:

- a. O(n)
- b. O(1)
- c. None of the others
- d. O(logn)

Question **6**

Not answered

Marked out of 1.00

Which of these codes are prefix codes?

(i) a: 11, b: 011, c: 01, d:101

(ii) a: 01, b: 101, c: 11, d: 00

Select one:

○ a. (ii) only

○ b. (i) only

○ c. Both (i) and (ii)

○ d. Neither (i) nor (ii)

Question **7**

Not answered

Marked out of 1.00

How many vertices in a full binary tree with 50 leaves?

Select one:

○ a. 99

○ b. 100

○ c. 101

○ d. 51

Question **8**

Not answered

Marked out of 1.00

n is any positive integer, which statements are true?

(i) $1^2 + 3^2 + 5^2 + ... + (2n-1)^2 = n^3$

(ii) $1! + 2! + ... + n! = (n+1)! - 1$

Select one:

- a. (ii) only
- b. both
- c. none
- d. (i) only

Question **9**

Not answered

Marked out of 1.00

Suppose you have 15 novels, 10 history books, and 7 math books.

In how many ways can you choose a book?

Select one:

- a. None of these
- b. 18
- c. 32
- d. 15.10.7

Question **10**

Not answered

Marked out of 1.00

Given $f(x) = x + 2$ and $g(x) = x^3$.

What is the composite function (fog)(x)?

Select one:

○ a. None of the others

○ b. $(fog)(x) = x^3(x+2)$

○ c. $(fog)(x) = (x+2)^3$

○ d. $(fog)(x) = x^3 + 2$

Question **11**

Not answered

Marked out of 1.00

Which of the following is/are true?

Select one:

○ a. If the graph has n edges, then minimum spanning trees have n-1 edges

○ b. The spanning trees can have a cycle.

○ c. Removing one edge from the spanning tree will not make the graph disconnected

○ d. None of the others

Question **12**

Not answered

Marked out of 1.00

Given $f(x) = x^2 \log x$, and $g(x) = x^2 + \log(x)$

Which of the following statements is TRUE?

(i) $f(x)$ is $O(g(x))$

(ii) $g(x)$ is $O(f(x))$

Select one:

○ a. none

○ b. both

○ c. (i) only

○ d. (ii) only

Question **13**

Not answered

Marked out of 1.00

Match the numbers a and b such that a ≡ b (mod 5)

a = 21   [Choose...]

a = 19   [Choose...]

a = 13   [Choose...]

Question **14**

Not answered

Marked out of 1.00

What is the value of the prefix expression + - * 2 3 5/↑ 6 1 4?

Select one:

- a. None of the others
- b. 1
- c. 2
- d. 3

Question **15**

Not answered

Marked out of 1.00

Let G be an undirected graph with 6 vertices, in which 2 vertices are of degree 4 and 4 vertices are of degree 2. How many edges does G have?

Select one:

- a. 10
- b. 6
- c. None of these
- d. 16
- e. 8

Question 16

Not answered

Marked out of 1.00

Find a proposition with the given truth table

p	q	?
T	T	F
T	F	F
F	T	T
F	F	T

(i) ¬p ∨ ¬q

(ii) p ∨ (¬p ∧ q)

(iii) (¬p ∧ q) ∨ (¬p ∧ ¬q)

Select one:

- a. (ii)
- b. (iii)
- c. (i)
- d. None of these

Question **17**

Not answered

Marked out of 1.00

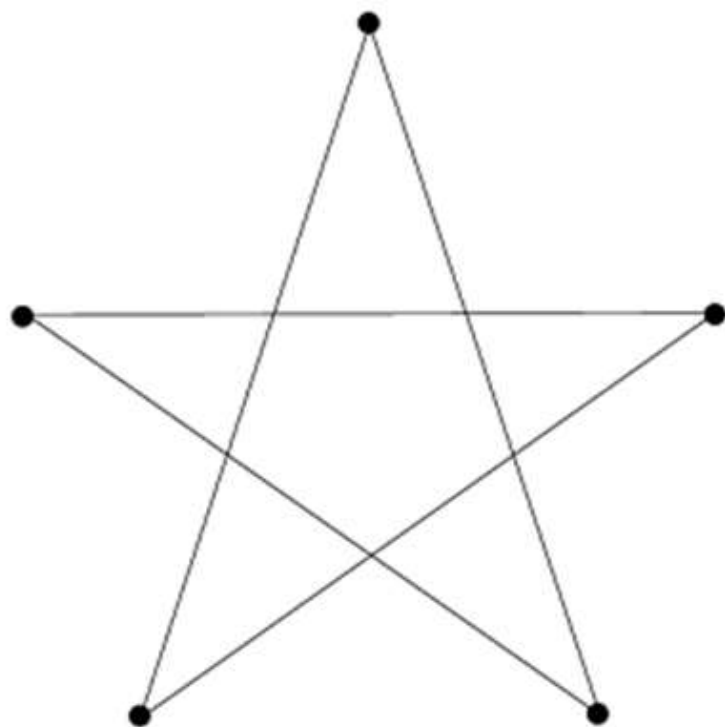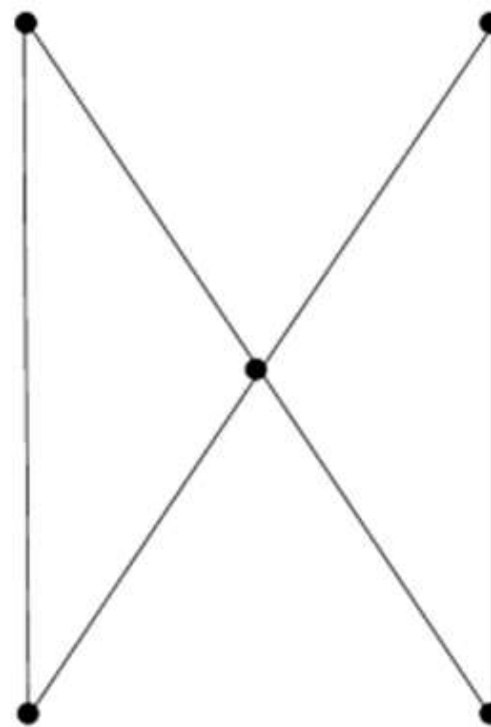How many positive integers not exceeding 100 are divisible by 3 or 11?

Select one:

- a. 39
- b. 40
- c. None of these
- d. 41
- e. 42

Question **18**

Not answered

Marked out of 1.00

Delete one edge from each graph to obtain 2 new graphs. How many cut-edges in total of the new graphs?

X

Y

Select one:

○ a. 4

○ b.　5

○ c.　2

○ d.　6

○ e.　3

Question **19**

Not answered

Marked out of 1.00

Given the function:
f: {a, b, c, d} → {1, 2, 3, 4};

f ={(a, 1), (b, 2), (c, 3), (d, 3)}.

Select correct statement(s).

Select one or more:

☐ a.　f is not an onto function

☐ b.　f is not 1-1

☐ c.　f is a bijection

☐ d.　f is an 1-1 function.

☐ e.　f is an onto function

Question **20**

Not answered

Marked out of 1.00

Suppose the product of two positive integers is $3.5^3.7^2$

and their **greatest common divisor** is 3.5^2,

what is their **least common multiple**?

Select one:

○ a. 5.7^2

○ b. 3.5^2

○ c.   None of these

○ d. $3.5^3.7^2$

Question **21**

Not answered

Marked out of 1.00

How many 1s are there in the adjacency matrix representing the graph K_6?
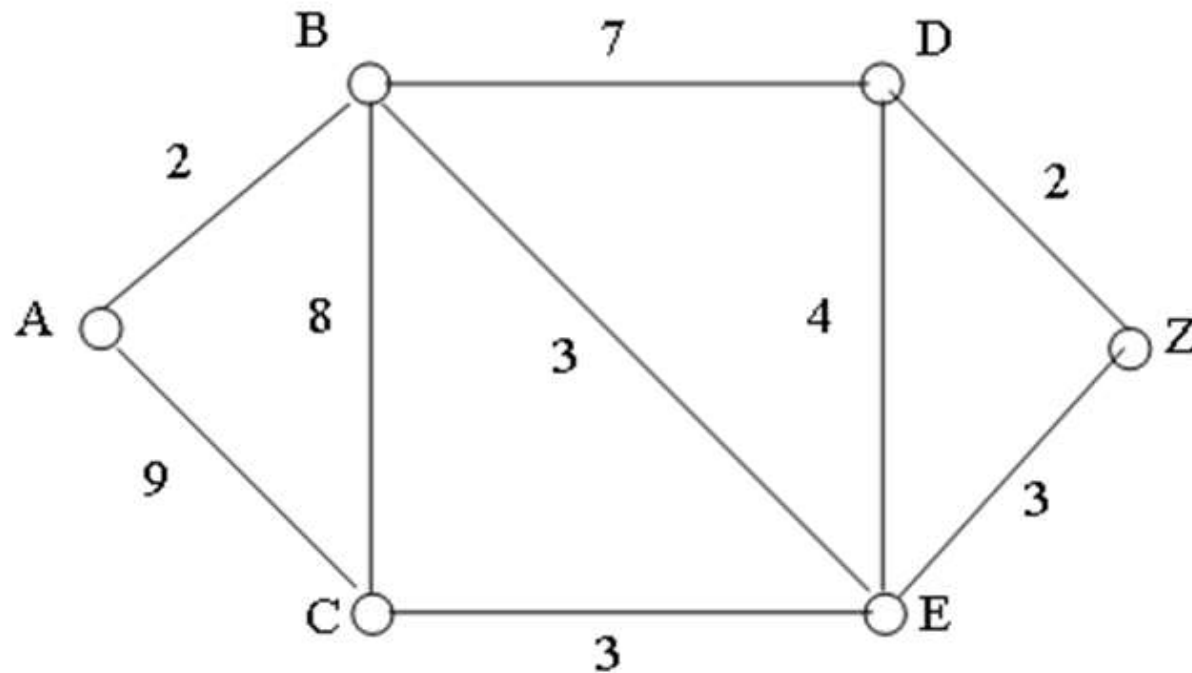
Select one:

- a. 36
- b. 15
- c. 5
- d. 30

Question **22**

Not answered

Marked out of 1.00

Apply the Prime algorithm to find the a minimum spanning tree for the following graph.

The minimum-cost is ____

Select one:

○ a.   8

○ b.   13

○

   c.   10

○ d.   None of the others

Question **23**

Not answered

Marked out of 1.00

Construct the binary search tree for the sequence 6, 12, 5, 8, 2, 9, 0, 3. How many comparisons are required to locate number 3 in the search tree?

Select one:

○ a.   4

○ b.   5

○ c.   None of the others

○ d.   3

○ e.   2

Question **24**

Not answered

Marked out of 1.00

Given the adjacency matrix of an undirected graph

```
  a b c
a 2 1 3
b 1 1 1
c 3 1 0
```

How many **paths of length 3** are there from the vertex **b** to the vertex **a** in this graph?

Select one:

- a. 27
- b. 21
- c. 33
- d. None of these
- e. 18

Question 25

Not answered

Marked out of 1.00
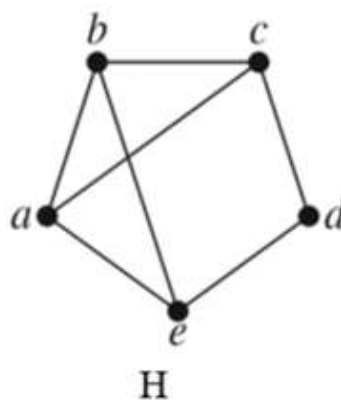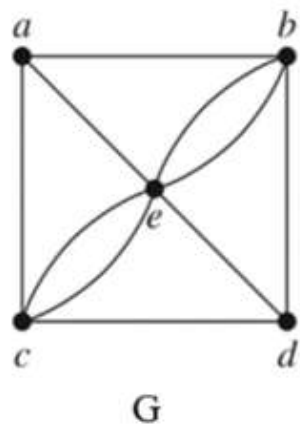

The function $f(x) = x^3 + 2^x$ is ___

Select one:

- a. $O(x^2)$
- b. None of these
- c. $O(x^3)$
- d. $O(3^x)$

Question **26**

Not answered

Marked out of 1.00

Which of the following graphs have an Euler circuit?

G   H

Select one:

- a. G only
- b. Neither G nor H
- c. H only
- d. Both G and H

Question **27**

Not answered

Marked out of 1.00

Convert $(A13)_{13}$ to decimal expansion.

Select one:

- a.   None of the others
- b.   1706
- c.   1996
- d.   1147
- e.   2017

Question **28**

Not answered

Marked out of 1.00

Convert $(23)_7$ to **binary format**

Select one:

- a.   11001
- b.   11111
- c.   None of these
- d.   10001
- e.   10101

Question **29**

Not answered

Marked out of 1.00

A full binary tree with 31 vertices has **height** at most ___

Select one:

- a.   16
- b.   15
- c.   30
- d.   5
- e.   None of tthese

Question **30**

Not answered

Marked out of 1.00

Suppose x, y are integers and

x mod 12 = 9

and

y mod 6 = 2,

Find

(i) x mod 6

(ii) xy mod 6

Select one:

○ a. (i): 3; (ii): 0

○ b. (i): 2; (ii): 1

○ c. (i): 1; (ii): 3

○ d. (i): 3; (ii): 6

Question **31**

Not answered

Marked out of 1.00

Match a with b so that **a is congruent to b modulo 7**.

a = 11 | Choose...

a = 17 | Choose...

a = 23 | Choose...

Question **32**

Not answered

Marked out of 1.00

Encrypt the message "LV" using the function f(p) = (3p + 11) mod 26.
What is the result?

Select one:

○ a.   SF

○ b.   SW

○ c.   XT

○ d.   None of the others

○ e.   VL

Question **33**

Not answered

Marked out of 1.00

How many rows appear in a truth table for each of these compound propositions?

(p ∧ r ∧ t) ↔ (p ∧ ¬t)

Select one:

   ○ a. 16

   ○ b. 8

   ○ c. 5

   ○ d. 32

Question **34**

Not answered

Marked out of 1.00

Let p, q be propositions. The proposition (p ^ ¬q) → q is equivalent to _____

Select one:

   ○ a. None of the others

   ○ b. ¬p ^ q

   ○ c. p ∨ ¬q

   ○ d. ¬p ∨ q

Question **35**

Not answered

Marked out of 1.00

Study the following arguments:

(i) Any computer science major must take Discrete Mathematics. Van is taking Discrete Mathematics. Therefore Van is a computer science major.

(ii) Any student of FPT university lives in the dorm. Van is living in a house. Therefore Van is not a student of FPT university.

Then, (i) is ___ and (ii) is ___

Select one:

- a. valid, invalid
- b. invalid, invalid
- c. invalid, valid
- d. valid, valid

Question **36**

Not answered

Marked 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:

- a. 2.35
- b. 2.5
- c. 2.45
- d. 2.25

Question **37**

Not answered

Marked out of 1.00

Find the *negation* of the statement "It is Thursday and it is cold."

Select one:

- a. It is not Thursday and it is not cold.
- b. It is Thursday and it is not cold.
- c. None of the others
- d. It is not Thursday or it is not cold.

Question **38**

Not answered

Marked out of 1.00

Study the following arguments:

(i) Anne is smart if she knows discrete mathematics. She doesn't know discrete mathematics. Therefore, she is not smart.

(ii) All parrots like fruit. My pet bird is not a parrot. Therefore, my pet bird does not like fruit.

Then (i) is ... and (ii) is ...

Select one:
- a. logical, illogical
- b. illogical, illogical
- c. logical, logical
- d. illogical, logical

Question **39**

Not answered

Marked out of 1.00

Find the sum

$$\sum_{i=1}^{3}\sum_{k=1}^{2}(i+k)$$

Select one:

○ a.   21

○ b.   30

○ c.   9

○ d.   None of these

○ e.   12

Question **40**

Not answered

Marked out of 1.00

In the adjacency matrix of a pseudograph, the sum of all entries in the row corresponding to the vertex A equals 5. Given that there are two loops at A. Find the degree of A.

Select one:

○ a.　5

○ b.　3

○ c.　7

○ d.　None of these

○ e.　9

Question **41**

Not answered

Marked out of 1.00

Study the function f (k) satisfying

f(k) = 3f(k-1) - f(k-2), and f (1) = 1, f(2) = 2.

Find f(5).

Select one:

- ○ a. None of the others
- ○ b. 21
- ○ c. 19
- ○ d. 15
- ○ e. 18

Question **42**

Not answered

Marked out of 1.00

Suppose that the connected graph G has 10 vertices and 10 edges. What is the least number of different spanning trees can be formed?

Select one:

- a. None of the others
- b. 10
- c. 3
- d. 45
- e. 2

Question 43

Not answered

Marked out of 1.00

Given a connected simple graph with adjacency matrix

01101
10010
10010
01101
10010

Which of the following statements is correct?

Select one:

- a.   None of these
- b.   G has Euler circuits
- c.   G has Euler paths, but no Euler circuits
- d.   G does not have Euler paths

Question **44**

Not answered

Marked out of 1.00

Which proposition is logically equivalent to $(p \rightarrow r) \wedge (\neg p \rightarrow r)$?

(i) r

(ii) p ∨ ¬p ∨ r

(iii) ¬r

(iv) p ∧ r

Select one:

○ a.   (iii)

○ b.   (iv)

○ c.   (ii)

○ d.   (i)

Question **45**

Not answered

Marked out of 1.00

Construct a binary search tree for the sentence

"Do not count your chickens before they are hatched"

then find how many comparisons are needed to search the word "hatched".

Select one:

- a. 5
- b. 4
- c. 2
- d. 3

Question **46**

Not answered

Marked out of 1.00

Which of the following statements is the *negation* of $\forall x \, (P(x) \to Q(x))$

(i) $\exists x \, (\neg P(x) \to \neg Q(x))$

(ii) $\exists x \, (P(x) \wedge \neg Q(x))$

(iii) $\forall x \, (Q(x) \to P(x))$

Select one:

○ a.   None of the others

○ b.   (ii)

○ c.   (iii)

○ d.   (i)

Question **47**

Not answered

Marked out of 1.00

Find the prefix notation for the expression

a / b + (c - d) * e

Select one:

- a.   + / a b * - c d e
- b.   None of these
- c.   a b / c d - e * +
- d.   / a b + c d - e *

Question **48**

Not answered

Marked out of 1.00

Which of the following functions is $\Theta(n^2)$?

Select one:

   a. $f(n) = 2017^{2017}n$

   b. $f(n) = 1^2 + 2^2 + 3^2 + ... + n^2$

   c. $f(n) = 2021n^3 + 2021n\log(n^{2021})$

   d. $f(n) = n^3 + 3n$

   e. $f(n) = 1+2+3 + ... + n$

Question 49

Not answered

Marked out of 1.00

Consider the statements for the graph Kn, n > 3

(i) K_8 has a Hamilton circuit.

(ii) If $K_{3,n}$ has a Hamilton circuit, then n = 3.

Then, (i) is ___, and (ii) is ___

Select one:

- a. false, false
- b. false, true
- c. true, true
- d. true, false

Question **50**

Not answered

Marked out of 1.00

The statement

$$\overline{p \wedge q} \equiv \overline{p} \vee \overline{q}$$

is called ...

Select one:

- a. De Morgan law
- b. double negation law
- c. domination laws
- d. idempotent law

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