BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – B.Tech.(CSE)-AIML-2021/B.Tech.(CSE)-DS-2021/B.Tech.(CSE)-AIML-2022/B.Tech.(CSE)-DS-2022
Course Name – Discrete Mathematics
Course Code - PCC-CSM405/PCC-CSD405
(Semester IV)

Full Marks : 60   **Time : 2:30 Hours**
[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question)   1 x 15=15

1.   *Choose the correct alternative from the following :*

(i)   Choose the correct option. A tree is a

a) any connected graph   b) minimally connected graph
c) Euler graph   d) none

(ii) Select the correct option. For all odd integer a, gcd $(3a,3a+2)=$

a) 1   b) 2
c) 3   d) None of these

(iii) Illustrate the number of three digit number that can be formed from the digits 1,3,5,7.

a) 24   b) 6
c) 4   d) None of these

(iv) An one-to-one function can be recognized as

a) injective function   b) surjective function
c) bijective function   d) none of these

(v)   Select the correct option. Let R be a symmetric and transitive relation on a set A. Then

a) R is reflexive and hence a partial order   b) R is reflexive and hence a equivalence relation

c) R is not reflexive and hence a equivalence relation   d) None of these

(vi) Select the correct option. The relation { (1,2), (1,3), (3,1), (1,1), (3,3), (3,2)} is

a) Reflexive   b) Symmetric
c) Transitive   d) Asymmetric

(vii) Select the correct option. If $S = \{\emptyset\}$ then power set of S is _____ .

a) $\{\emptyset\}$ b) $\emptyset$

c) $\{\emptyset, \{\emptyset\}\}$

d) None of these

(viii) Observe the following to find out the singleton set (whose cardinality is one).

a) $A = \{ x : 3x^2 - 27 = 0 , x \in Q \}$

b) $B = \{ x : x^2 - 1 = 0 , x \in R \}$

c) $C = \{ x : 30x - 59 = 0 , x \in N \}$

d) $D = \{ x : x^2 - 1 = 0 , x \in N \}$

(ix) Determine the number of committees of 2 boys and 3 girls that can be formed out of 7 boys and 6 girls.

a) 21

b) 20

c) 420

d) 50400

(x) In a Boolean algebra B, if $a + b = b$ then compute $a.b = ?$

a) a

b) b

c) a'

d) Cannot determined from the given data

(xi) Select the correct option. If in a ring R, $a^2 = a$ for all $a \in R$, then R

a) is commutative

b) is non-commutative

c) has characteristic 3

d) has characteristic 4

(xii) Select the correct option. Every vertex of a null graph is

a) Pendant

b) Isolated

c) odd

d) None of these

(xiii) Select the correct option. A statement T is called tautology if

a) T is true for all possible values of its variables

b) T is false for all values of its variables

c) T is true as well as false for few possible values of its variables

d) None of these

(xiv) Select the correct option. $P(n): 1 + 3 + 5 + \ldots + (2n - 1) = n^2$ is

a) true for $n > 1$

b) true $\forall n \in R$

c) true for no n

d) none of these

(xv) Choose the correct option. If $(G, .)$ is a group with identity e such that $a^2 = e$, $\forall a \in G$, then G is

a) an abelian group

b) a non-abelian group

c) non-associative

d) none of these

Group-B
(Short Answer Type Questions)

3 x 5=15

2. Compute the generating function for the sequence 1,3,9,27,... (3)

3. Show that the following compound proposition is a Tautology (using truth table) $(p \rightarrow (q \rightarrow p))$. (3)

4. Examine that the set {1, 2, 3, 4, 5} is not a group under multiplication modulo 6. (3)

5. Describe The Division algorithm. (3)

6. Illustrate complete graph with examples. (3)

OR

Illustrate bipartite graph with examples. (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

7. By using mathematical induction identify that the given equation is true for all positive integers (5)
$2+ 4+ 6+ \ldots +2n = n(n +1)$.

8. Explain adjacency matrix for a non-directed graph. Hence illustrate the (5)
adjacency matrix for the following graph
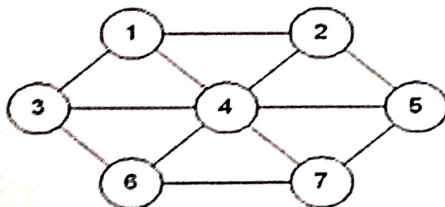
9. Use truth tables to illustrate the following commutative laws. (5)

   a) $p \vee q \equiv q \vee p$

   b) $p \wedge q \equiv q \wedge p$

10. Describe Disjunctive Normal Form and Conjunctive Normal Form with proper examples. (5)

11. Let G be a group and let H and K be two subgroups of G, then examine if $H \cap K$ a subgroup of (5) G?

12. There are 12 bulbs in a room each of which is operated independently by 12 different switches. (5) Write the number of ways the room can be illuminated.

OR

Justify that the generating function for $1,1,1,1,\ldots$ is $\frac{1}{1-x}$ and $1,-1,1,-1,\ldots$ is $\frac{1}{1+x}$. (5)

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