REV-01
BCA/02/07

2022/08

BCA
SECOND SEMESTER (SPECIAL REPEAT)
DISCRETE MATHEMATICS
BCA-203

(Use separate answer scripts for Objective & Descriptive)

Duration : 3 hrs. **Full Marks : 70**

[PART-A : Objective]

Time : 20 min. **Marks : 20**

Choose the correct answer from the following: ***1X20=20***

1. The complete graph K_p is regular of degree _____
   a. p b. p-1
   c. P + 1 d. p(p-1)/2

2. Every _____ chromatic graph may not be a tree.
   a. 1 b. 2
   c. 3 d. 4

3. If $f:R \rightarrow R$ is defined by $f(x) = x^2 - 3x+5$ then $f^{-1}(3)$ = _____
   a. {1,2} b. 5
   c. 3 d. {-2,5}

4. What is the value of n{P[P(P(ϕ)]]?
   a. 0 b. ϕ
   c. 4 d. 3

5. A and B be two sets having two elements in common. If n(A)=5 and n(B)=3, then n {(A x B) ∩ (B x A)} = _____
   a. 15 b. 3
   c. 5 d. 4

6. If ' * ' is a binary operation in Q^+ defined by a*b = a b/2, Where a, b∈ Q^+ (Set of all positive rational). If $(Q^+, *)$ is an abelian group, then the inverse of a is _____
   a. 4/a b. 9/a
   c. 2 d. 3

7. A finite integral domain is a _____
   a. Ring b. Group
   c. Field d. Vector space

8. The statement [p∧ (p∨q)] ∨~p is a _____
   a. Tautology b. Contradiction
   c. Contingency d. None of these

9. The negation of p→(p∨ ~ q) is _____
   a. p ∧ (~p ∧ q) b. p ∨ (~p ∧ q)
   c. p ∨ (p ∧~q) d. p ∨ (~ p ∨ q)

10. If ${}^{n}P_4 = 2\,{}^{5}P_3$, then _____
    a. 4 b. 3
    c. 5 d. 2

11. If ${}^{2n}C_3 : {}^{n}C_3 = 11:1$, then n = _____
    a. 6 b. 11
    c. 3 d. 12

12. A _____ is a set S with relation R on S which is reflexive, anti-symmetric and transitive.
    a. Equivalence relation b. Partially ordered set
    c. Both (a) and (b) d. None of these

13. A lattice $(L, \wedge, \vee)$ is called a modular lattice if it satisfies the following condition $x \leq z \Rightarrow x \vee (y \wedge z) =$ _____
    a. $(x \vee y) \wedge (x \vee z)$ b. $(x \vee y) \wedge z$
    c. $(x \vee y) \vee z$ d. $(x \wedge y) \vee z$

14. If L is a _____ lattice, then it is a modular lattice.
    a. Distributive b. Commutative
    c. Associative d. Absorption law

15. Write down the domain of the relation R, where $R = \{(x, y) : x \text{ and } y \text{ are integers}, xy = 4\}$
    a. $\{-2, 2, 1, -1, 4, -4\}$ b. $\{1, 2, 4\}$
    c. $\{-4, 4\}$ d. $\{-2, 2, 1, 4, -4\}$

16. If there is one and only one path between every pair of vertices in G, then G is a _____
    a. Isolated b. Pendent
    c. Complete d. Tree

17. In a complete graph K_8, the number of edges is _____
    a. 28 b. 8
    c. 56 d. 64

18. If the function f and g are given by $f = \{(1,2), (3,5), (4,1)\}$ and $g = \{(2,3), (5,1), (1,3)\}$, then gof = _____
    a. $\{(1,3), (3,1), (4,3)\}$ b. $\{(3,1), (1,3), (3,4)\}$
    c. $\{(2,5), (5,2), (5,1)\}$ d. $\{(5,2), (2,5), (1,5)\}$

19. A tree contains at least _____ vertices.
    a. One b. Two
    c. Three d. Four

20. The number of points and lines in the complete bipartite graph $K_{7,8}$ is _____ and _____
    a. 7,8 b. 8, 7
    c. 15, 56 d. 15, 64

-- --- --

(PART-B : Descriptive)

Time : 2 hrs. 40 min. Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. Prove that the complete graph of 5 vertices (denoted by K_5) is a non-planar graph. 10

2. a) Define Euler and Hamiltonian graphs with figures. 5+5=10
   b) Prove that a tree T with 'n' vertices has 'n-1' edges.

3. Define contradiction. Verify that $(p \wedge \sim q) \wedge (\sim p \vee q)$ is a contradiction. 10

4. a) Solve the recurrence relation $a_n = a_{n-1} + a_{n-2}$, for $n \geq 2$ with the initial conditions $a_0 = 1$ and $a_1 = 1$. 5+5=10
   b) Solve the recurrence relation by using the generating function $a_{n+2} - 6a_{n+1} + 8a_n = 0$, with the initial conditions: $a_0 = 1$, $a_1 = 4$

5. Prove that the inverse of each element of a group is unique. 10

6. a) What do you mean by Hasse diagram of a poset? 5
   Let P = { 1, 2, 3, 4, 6, 8 ,9, 12, 18, 24} be ordered by the relation ' a divides b'. Draw the Hasses diagram of P.
   b) Prove that a lattice is a partially ordered set. 5

7. a) If R is a Boolean ring, then prove that R is a commutative ring. 4
   b) If G is a group ,then prove that 3+3=6
   (i) the identity element of G is unique.
   (ii) every element in G has unique inverse in G.

8. Define: 10
   i) Bipartite graph with figure
   ii) Chromatic number with figure
   iii) Spanning tree

= = *** = =