REV-01 2022/08
BCA/57/62

BACHELOR OF COMPUTER APPLICATION
SECOND SEMESTER
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. A graph consisting of only isolated vertices is _______ chromatic
   a. 1 b. 4
   c. 3 d. 2

2. Every tree with two or more vertices is _______ chromatic
   a. 2 b. 4
   c. 3 d. 1

3. If f:R → 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. If A= { x: x^2 -5x +6 =0}, B= { 2, 4 } ,C = { 4,5} , find (A-B)x (B-A)
   a. { (3,2)} b. {(2,3)}
   c. { (2,4)} d. {(4,2)}

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/3, 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. 9

7. If R is a Boolean ring then, R is a ________ring
   a. Associative b. Distributive
   c. Commutative d. Division

8. The statement p→(q →p) is a ______
   a. tautology b. Contradiction
   c. contingency d. None of these

9. The statement ~(p ∧ q) is logically equivalent to ______
   a. ~p ∧ ~q b. ~p V ~q
   c. (p vq) d. (~ p ∧ q)

10. If $^{n}P_4 = 2x\ ^{5}P_3$,then n =________

a. 4 b. 15

c. 10 d. 5

11. If $^{20}C_r = ^{20}C_{r+6} = 11$, then r = ________

a. 7 b. 20

c. 6 d. 26

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, ∧, v) is called a _____ lattice if it satisfies the following condition $x \leq z \Rightarrow xv (y \wedge z) = (x \vee y) \wedge z$

a. Distributive b. Commutative

c. Associative d. Modular

14. If L is a distributive lattice , then it is a _________ lattice

a. Modular b. Commutative

c. Associative d. Absorption law

15. Write down the domain of the relation R , where R= { (x, y) :x and y 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. A tree in which one vertex is distinguished from all the other vertices is called a _____ tree

a. Binary b. Rooted

c. Spanning d. None of these

17. In a complete graph K_8, the number of edges is ______

a. 64 b. 28

c. 56 d. 8

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 $K_{3,4}$ is ______ and ________

a. 9,16 b. 3,7

c. 7,12 d. 4,7

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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 five vertices is non-planar 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. a. A committee of 5 is to be formed out of 6 gents and 4 ladies . In how many ways this can be done , when 3+3=6
   (a) at least 2 ladies are included;
   (b) at most 2 ladies are included

   b. Let f: R→R: $f(x) = 8x^3$ and g:R→R: $g(x) = x^{1/3}$ Find : 2+2=4
   (i) fog (ii) g o f

4. a. Solve the recurrence relation $a_n = -3a_{n-1} + 10a_{n-2}$, for $n \geq 2$ with the initial conditions $a_0 = 1$ and $a_1 = 4$. 5+5=10

   b. Solve the recurrence relation by using the generating function $a_n = 3a_{n-1}$, $n \geq 1$,with the initial conditions: $a_0=1$

5. a. How many permutations can be formed by the letters of the word," TRIANGLE" ? How many of these will begin with T and end with E 5

   b. Define injective and surjective function . Show that the function f: R →{√2} defined by $f(x) = x/(x^2 - 2)$, $x \neq \sqrt{2}$ is surjective but not injective . 1+1+3 =5

6. a. What do you mean by Hasse diagram of a poset? 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 5

   b. In a distributive lattice L, for any a, b, c ∈ L , prove that 5

$$(a \vee b) \wedge (b \vee c) \wedge (c \vee a) = (a \wedge b) \vee (b \wedge c) \vee (c \wedge a)$$

7. **a.** Prove that a lattice is a partial ordered set 4

b. Define : 2+2+2 =6

i. Spanning tree

ii. Binary tree

iii. Planar graph

8. **a.** Verify whether the following propositions are tautology , contradiction and contingency 3+ 3= 6

(i) $(p \wedge q) \rightarrow (p \vee q)$

(ii) $\sim p \wedge (p \wedge q)$

b. In an examination , a candidate has to pass in each of the 5 subjects . In how many ways can he fail? 4

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