REV-01 2022/07
BCA/01/03

BACHELOR OF COMPUTER APPLICATION
SECOND SEMESTER
DISCRETE MATHEMATICS
BCA – 203 [REPEAT]

(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 vertices of every planar graph can be properly colored with _____ colors
   a. 5
   b. 4
   c. 3
   d. 2

2. If a binary tree with n vertices then ,the number of pendent vertices will be ___
   a. (n+ 1)/2
   b. (n-1)/2
   c. n
   d. (n-3)/2

3. If $f:R \to R$ 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/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 $p \to (q \to p)$ is a ______
   a. tautology
   b. Contradiction
   c. contingency
   d. None of these

9. The negation of ($p \to q$) is ______
   a. $q \to p$
   b. $\sim p \vee q$
   c. ($p \wedge \sim q$)
   d. ($\sim p \vee \sim q$)

10. If ${}^{n}P_4 = 20 \times {}^{n}P_2$ then , n =________

a. 4 | b. 3
c. 5 | d. 7

11. If ${}^{15}C_r : {}^{15}C_{r-1} = 11 : 5$, then r = ________

a. 15 | b. 5
c. 11 | 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, ∧, v) is called a _____ lattice if it satisfies the following condition $x \le z \Rightarrow x \vee (y \wedge z) = (x \vee y) \wedge z$

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. 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_7 , the number of edges is ______

a. 49 | b. 7
c. 56 | d. 42

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 $K_{5,6}$ is ______ and ______

a. 5,6 | b. 11, 30
c. 30, 11 | d. 6,5

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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. If G is a group ,then prove that **10**
   i. for any a in G, $(a^{-1})^{-1} = a$
   ii. every element in G has unique inverse in G
   iii. for all a, b in G , $(a.b)^{-1} = b^{-1}.a^{-1}$

2. a. Define Euler and Hamiltonian graphs with figures **5**

   b. Prove that a tree T with 'n' vertices has 'n-1' edges . **5**

3. a. In how many ways can a cricket eleven be chosen out of batch of 15 players, if **2+2+2 =6**
   (i) there is no restriction on the selection ;
   (ii) a particular player is always chosen;
   (iii) a particular player is never chosen?

   b. Let f: R→R: $f(x) = x^2 + 4x +1$ and g:R→R: $g(x)= 2x -4$ Find : **1+1+1+1 =4**
   (i) fog (ii) gof (iii) fof (iv) gog

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

   b. Solve the recurrence relation by using the generating function $a_n = 2a_{n-1} -a_{n-2}$, $n \geq 2$,with the initial conditions: $a_o=3$, $a_1 =-2$

5. a. How many permutations can be formed by the letters of the word," VOWELS", when **5**
   (i) there is no restriction on the letters;
   (ii) each word begins with E;
   (iii) each word begins with O and end with L;
   (iv)all vowels come together
   (v) all consonants come together?

   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? 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. 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) Recurrence relation

(ii) Generating function

(iii) Palanar graph

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

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

(ii) $[\{p \rightarrow (q \vee r)\} \wedge (\sim q)] \rightarrow (p \rightarrow r)$

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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