Question Paper Code : 3365

BCA (Semester-IV) Examination, 2021-22

DISCRETE MATHEMATICS

[Paper : BCA-401]

Time : Three Hours] **[Maximum Marks : 70**

Note : Answer **five** questions in all. Question **No. 1** is **compulsory**. Besides this attempt **one** question from each unit.

1. Answer all questions in brief : [3×10=30]

(a) Define Multiset with two examples.

(b) If R be a relation in the set of integers z defined by $R=\{(x,y): x\in z, y\in z, (x-y) \text{ is divisible by } 6\}$. Then prove that R is an equivalence relation.

(c) Let $A=\{1,2,3,4\}$ and $B=\{a,b,c,d\}$ and let $f=\{(1,a),(2,a),(3,d),(4,c)\}$. Show that f is a function but f^{-1} is not a function.

(d) Define Semi group and Monoid.

(e) Show that the binary operation $*$ defined on $(R,*)$ where $x*y=x^y$ is not associative.

(f) Find the product of two permutations and show that it is not commutative.

(g) Define OR, AND and NOT gate.

(h) Define Modular and complete Lattice with examples.

(i) Construct truth table for

(1) $p\vee\sim q\rightarrow p$

(2) $\left(\sim\left(p\wedge q\right)\vee r\right)\rightarrow\sim p$

(j) Verify that the proposition $p\wedge\left(q\wedge\sim p\right)$ is a contradiction.

UNIT-I

2. Let R and S be relation from A to B, show that : [10]

(i) If $R\subseteq S$, then $R^{-1}\subseteq S^{-1}$

(ii) $\left(R\cap S\right)^{-1}=R^{-1}\cap S^{-1}$

(iii) $\left(R\cup S\right)^{-1}=R^{-1}\cup S^{-1}$

Note : Answer five qu... compulsory. Besides this attempt... in brief. [3x10=30]

3. Let $A = B = C = R$. Consider the function $f : A \to B$ and $g : B \to C$ defined by $f(a) = 2a + 1$, $g(b) = \frac{b}{3}$, verify $(gof)^{-1} = f^{-1}og^{-1}$. [10]

UNIT-II

4. Prove that the fourth root of unity $1, -1, i, -i$ form an Abelian multiplicative group. [10]

5. If R be the group of real numbers under addition and let R^+ be the group of positive real numbers under multiplication. Let $f : R \to R^+$ be defined by $f(x) = e^x$ then show that f is an isomorphism. [10]

UNIT-III

6. Define Hasse diagram. Draw a Hasse diagram from the directed graph G for a partial order relation on a set $A = \{1, 2, 3, 4\}$. [10]

7. Use Karnaugh map to simplify the following : [10]

(a) $X = ABC' + ABC$

(b) $X = A'B'C' + A'BC' + ABC' + AB'C$

(c) $X = A'B'C' + A'B'C + A'BC + A'BC' + AB'C + ABC$

UNIT-IV

8. Show that $[(p \vee q) \wedge \sim(\sim p \wedge (\sim q \vee \sim r))] \vee (\sim p \wedge \sim q) \vee (\sim p \wedge \sim r)$ is Tautology by using laws of logic. [10]

9. Prove that validity of the following argument "If I get the job and work hard, then I will get promoted. If I get promoted, then I will be happy. I will not be happy. Therefore, either I will not get the job or I will not work hard". [10]

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