Paper id: 252509

Roll No: | | | | | | | | | | | | |

BCA
(SEM II) THEORY EXAMINATION 2024-25
DISCRETE MATHEMATICS

TIME: 3 HRS   **M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. **Attempt *all* questions in brief.**   02 x 7 = 14

Q no.	Question	CO	Level
a.	Define Union and intersection of sets with suitable example.	1	K2
b.	What do you mean by recursively defined function? Give an example.	1	K1
c.	Find the generating function for the finite sequence $< 3, 3, 3, 3, 3, 3 >$.	2	K2
d.	On the set of integers $*$ is defined by $a * b = a + b + 2$. Find the inverse of 4.	3	K2
e.	Prove that every cyclic group is an abelian group.	3	K2
f.	Write the statement into symbols: A number x is less than 7 and greater than 5.	4	K1
g.	Define Lattices with suitable example.	5	K1

SECTION B

2. **Attempt any *three* of the following:**   07 x 3 = 21

Q no.	Question	CO	Level
a.	If in a city 1000 families, it was found that 40% families buy newspaper A, 20% families buy Newspaper B, and 10% buy C. Only 5% families buy A and B, 3% buy B and C and 4% buy A and C and 2% families buy all the three newspapers. Find the number of families which buy: (a) A only (b) B only (c) None of A, B and C.	1	K3
b.	Define Discrete Numeric function with suitable example.	2	K3
c.	Show that $G = \{1, -1, i, -i\}$ is a finite abelian multiplicative group of order four.	3	K3
d.	Show that $p \leftrightarrow q$ and $(p \to q) \wedge (q \to p)$ are logically equivalent.	4	K3
e.	Draw the Hasse diagram, for the partial ordering $\{(A, B): A \subseteq B\}$ on the power set $\wp(S)$, where $S = \{a, b, c\}$.	5	K3

SECTION C

3. **Attempt any *one* part of the following:**   07 x 1 = 07

Q no.	Question	CO	Level
a.	Let $f: R \to R$ be a function defined by $f(x) = ax + b\ where\ a, b, x \epsilon R$ and $a \neq 0$. Show that f is invertible and find inverse of f.	1	K4
b.	Given $A = \{1,2,3,4\}$. Consider the following relation in A: $R = \{(1,1), (2,2), (2,3), (3,2), (4,2), (4,4)\}$ (a) Draw its directed graph. (b) Is R (i) reflexive (ii) symmetric, (iii) transitive (c) Find $R^2 = R \circ R$.	1	K4

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4.   **Attempt any *one* part of the following:**   **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Use Mathematical Induction to prove that $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \cdots \ldots + \frac{1}{(2n-1)(2n+1)} = \frac{n}{2n+1}$ for n $\geq$ 1.	2	K4
b.	Solve the recurrence relation $a_r - 7a_{r-1} + 10a_{r-2} = 0$ with conditions $a_0 = 3, a_1 = 3$.	2	K4

5.   **Attempt any *one* part of the following:**   **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Let $\mathbb{Q}$ be the set of rational numbers and defined $a * b = a + b - ab$, then show that the structure ($\mathbb{Q}, *$) is Semi-group.	3	K4
b.	If $f: G \to G'$ is a homomorphism, then prove that $f(e) = e'$, where e and e' are identity element of G and G'.	3	K4

6.   **Attempt any *one* part of the following:**   **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Show that $[p \to (q \to r)] \to [(p \to q) \to (p \to r)]$ is a tautology.	4	K4
b.	Write the contrapositive, converse and inverse of statement "Indian team wins whenever match played in Kolkata, home town of Ganguly".	4	K4

7.   **Attempt any *one* part of the following:**   **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Prove that the set of integers with usual ordering $\leq$ read as "less than or equal to" is a poset.	5	K4
b.	Show that every chain is a Lattice.	5	K4