PAPER ID-421466

Printed Page: 1 of 2
Subject Code: RAS207

Roll No:

MCA(Integrated)
(SEM II) THEORY EXAMINATION 2021-22
DISCRETE MATHEMATICS FOR MCA

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a.	Let A *and* B be two finite sets such that $n(A) = 20, n(B) = 28$ *and* $n(A \cup B) = 36$, *find* $n(A \cap B)$.
b.	What do you mean by Identity Relation? Write down the Identity Relation for the Set $A = \{1, 2, 3\}$.
c.	What do you mean by Non-homogeneous recurrence relation?
d.	Define the Commutative group.
e.	What is the difference between Tautology and Contradiction?
f.	State the De-Morgan's Law of Propositional Logic.
g.	What do you mean by Complemented Lattice?

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a.	Define the function and Relation. Explain the difference between function and Relation with example.
b.	Define the Permutation group. If A= {1,2,3,4,5} then: find (1 3) 0 (2 4 5) 0 (2 3)
c.	If p, q *and* r are any three statements, then using the truth table prove that: i) $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$ ii) $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$
d.	Solve the following: $a_n - 5a_{n-1} + 6a_{n-2} = 7^n$.
e.	If set A = {1,2,3,6,12} and R bo the relation in set A which is defined by " a divides b " then show that R is a Poset in set A and also draw the Hasse diagram.

SECTION C

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

(a)	In a group of 100 persons, 72 people can speak English and 43 can speak French. How many can speak English only? How many can speak French only and how many can speak both English and French?
(b)	Consider the following relation on set $A = \{1,2,3,4,5,6,7\}$, *given by* $:R = \{(i, j): \lvert i - j \rvert = 2\}$ *on set* A. Determine whether R is reflexive, symmetric and transitive.

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

(a)	Prove by Mathematical Induction: $n^3 - 4n + 6$ is divisible by 3 for all $n \geq 1$.
(b)	Solve the following Recurrence Relation Using Generating Functions: $a_n - 9a_{n-1} + 20a_{n-2} = 0$ with *initial conditions* $a_0 = -3$ and $a_1 = -10$.

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

(a)	Prove that the inverse of the product of two element of a group is the product of the inverse taken in the reverse order.
(b)	Show that the set of Fourth root of unity form an abelian group under the binary operation multiplication.

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

(a)	Using truth table, show that: $p \rightarrow (q \vee r) \equiv (p \rightarrow q) \vee (p \rightarrow r)$.
(b)	Represent the following argument symbolically and determine whether the argument is valid: Either Ram is not guilty or Shyam is telling the truth. Shyam is not telling the truth. ..... Therefore, Ram is not guilty.

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

(a)	Define the Distributive Lattice and Modular Lattice with example. Also prove that every Distributive Lattice is Modular.
(b)	Define the Poset and draw the Hasse diagram for the Partial ordering $\{(A,B): A \subseteq B\}$ on the power set P(S) where S = {a,b,c}.

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