 Sub Code:RCA103

Paper Id: 214103 **Roll No:**

MCA
(SEM-I) THEORY EXAMINATION 2019-20
DISCRETE MATHEMATICS

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. Define the Inverse function with example.

b. Solve the recurrence relation: $a_n - 5a_{n-1} + 6a_{n-2} = 0$.

c. Write down all Possible subsets of $A = \{2,3\}$ and $B = \{a, b, c\}$.

d. Find two incomparable elements in the poset:({1 , 2, 4, 6, 8})

e. State complement axiom of Boolean algebra.

f. Write down the procedure for testing the validity of an Argument using Truth table.

g. Define the *Complete Lattice* with example.

SECTION B

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

a. If a relation R is defined as: "$R = \{(a, b) \in R^2 (a - b) \leq 3\}$" .Then determine whether relation R is *reflexive, symmetric, antisymmetric and transitive.*

b. Let L be the set of all factor of 30 and let '/' be the divisibility relation on L.Then show that (L, '/') is a lattice.

c. State and Prove the De-Morgan´s Laws of Boolean Algebra.

d. Consider $p : He\ is\ intelligent$, $q: He\ is\ tall$ be two propositions. Write each of the following statement in symbolic form using p and q :

i) He is tall but not intelligent.
ii) He is neither tall nor intelligent.
iii) He is intelligent or he is tall.

e. Find the minimum number of students in a class to be sure that *four* out them are born in the same month.

SECTION C

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

(a) Prove by mathematical induction : $n^4 - 4n^2$ is divisible by 3 for all n≥2

(b) Prove the Associative and Commutative laws for set theory.

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

(a) Define the "Distributive Lattice". Prove that in a Distributive Lattice, if an element has a complement then this complement is unique.

(b) If A ={1,2,3,4,6,8,12,16,24,48} be ordered by the relation "a divides b". Then draw the Hasse diagram.

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

(a) Draw Karnaugh map (K-map) and simplify the following Boolean expression:
$F = ABC + ABC' + A'BC' + A'B'C'$.

(b) In the Boolean algebra $(B, +, ., ', 0, 1)$ express the Boolean function:
$f(x, y) = (x + y')(x' + y)(x' + y')$ In its Disjunctive normal form.

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

(a) Show that $\sim r$ is a valid conclusion from the premises: $p \rightarrow \sim q, \quad r \rightarrow p, \quad q$
i) with truth table.
ii) without truth table.

(b) State identity law and De-Morgan's law of algebra of proposition and prove the Distributive law of algebra of proposition.

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

(a) Solve the following recurrence relation:
$a_n - 4a_{n-1} + 4a_{n-2} = 0$ with initial condition $a_0 = 1$ and $a_1 = 6$

(b) Find the number of possible ways in which the letters of the word *COTTON* can be arranged so that the two T's do not come together.