

Paper Id:

214103

Roll No:

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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 A1. 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 B2. 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 ' \mid ' be the divisibility relation on L. Then show that (L, \mid) 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 C3. 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 $n \geq 2$
- (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 $(B, +, \cdot, ', 0, 1)$ 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: $p \rightarrow \sim q$, $r \rightarrow p$, 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.