Printed Pages:2 **Sub Code: RCA 103**

Paper Id: 214103 **Roll No.** | | | | | | | | | | |

MCA
(SEM I) THEORY EXAMINATION 2018-19
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 Power set .
If A= {1,2,3} find P(A) and n{P(A)}.

b. Define the Cartesian Product of sets.
If $U = \{1,2,3,4,5,6,7,8\}$, $A = \{2,4,6,8\}$, $and\ B = \{3,5,6,7\}$ then find A ×B, A – B ?

c. DefineComplemented lattice example.

d. Find the dual of the Boolean : $f = x'yz' + x'y'z$.

e. Consider the Poset S = ({1, 2, 3, 4, 6, 9, 12, 18, 36}, /).
Find the Greatest Lower Bound and Least Upper Bound of the sets {6,18} and {4,6,9}.

f. Define the term Tautology , and Contradiction .
Show that (p → (q ∧ r))→(~r → ~p) is a tautology.

g. State the "Pigeonhole Principle".

SECTION B

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

a. Define the Composite relation. And Let set A = {1,2,3) , B = {p,q,r}, C = {x,y,z} and the relations are, R = { (1,p), (1,r), (2,q), (3,q)} and S = {(p,y), (q,x), (r,z)}, then compute RoS.

b. Let D_m denote the positive divisors of integers m ordered by divisibility.
Draw the Hasse diagrams of : a) D_{24} , b) D_{15}

c. Convert the following Boolean Function in DNF as well as CNF : $f(x, y, z) = xy' + xz + xy$.

d. Define the terms converse , contrapositive , and inverse of a proposition .
Show that (p→ q) ∧ (r → q) ≡ (p ∨ r) → q

e. Everybody in a room shakes hands with everbody else. The total number of handshakes is 66.How many people are there in the room?

SECTION C

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

(a) Show that for any two sets A and B in set theory: $A - (A \cap B) = A - B$.

(b) State the Principle of Mathematical Induction. And show that $8^n - 3^n$ is divisible by 5 for $n \geq 1$.

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

(a) Let A = { 1, 2 ,3 ,6} and Let≤ the divisibility relation on A and let B= { ϕ, {a}, {b}, {a , b}} and the relation ≤ be the relation ⊆ . Then show that (A,≤) and (B, ⊆) are isomorphic posets .

(b) If A ={1,2,3,4,6,12,18,36} 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 fo Boolean function:
$$f(x, y, z, w) = \sum(0,1,2,3,4,5,6,7,8,9,11).$$

(b) State the De-Morgan's Laws of Boolean Algebra. And Express the following Boolean function in Sum of minterms and Product of maxterm:
$f(x, y, z) = x + y'z$

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

(a) Define the term Arguments.
Prove the 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 ".

(b) Construct the truth table ((p⇒ q) ∨ (q ⇒ p)) ⇔ p.
Is the preposition: Tautology, Contradiction or Contingency?

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

(a) Determine S^2a *and* $S^{-2}a$ for the following numeric functions:
$$a_r = \begin{cases} 2 & , 0 \leq r \leq 3 \\ 2^{-r} & , r \geq 4 \end{cases}$$

(b) Solve the following recurrence relation:
$$a_n + 6a_{n-1} + 9a_{n-2} = 3 . \text{ Given that : } a_0 = 0 \text{ and } a_1 = 1$$