COURSE CODE: 10B11MA211   Max Marks: 35

COURSE NAME: DISCRETE MATHEMATICS   Max Time: 2 Hrs

COURSE CREDITS: 4

Note: Attempt all parts of a question at one place.

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1. Let $A = \{1, 2\}$ and $B = \{a, b, c\}$. How many functions are there from A to B ? How many of these functions are one-one? How many of these functions are onto? (3 Marks)

2. Define a partition. Explain the concept of cross-partition by proving the necessary requirements. Also give an example in the support. (4 Marks)

3. (a) Consider $(D_{70}, \mid)$ under the relation of divisibility. Find atoms, join irreducible elements and complements of each and every element. (2 Marks)

    (b) Give examples of isomorphic lattices and justify. (2 Marks)

4. (a) Define the dual graph of a planar graph. If possible, find the dual graph of C_6. (2 Marks)

    (b) Express the algebraic expression $(2x - 3y)(x + 2y)^3$ by a rooted binary tree and write the preorder and postorder traversal. (2 Marks)

5. (a) If G has 21 edges, 3 vertices of degree 4 and remaining vertices are of degree 3, then find the number of vertices of G. (2 Marks)

    (b) A tree T has *2n* vertices of degree 1, *3n* vertices of degree 2 and *n* vertices of degree 3. Determine the number of vertices and edges in T. (2 Marks)

6. Give an example of the following (if possible): (4 Marks)

    (i) A finite field with 3 elements   (ii) A Finite integral domain

    (iii) A commutative ring without identity and without zero divisors

    (iv) A non-commutative ring with zero divisors

    (v) An unbounded lattice   (vi) An unbounded complemented lattice

    (vii) A non-distributive lattice   (viii) A lattice which is not a poset

7. Investigate whether the set G of all matrices of the form $\begin{bmatrix} a & a \\ a & a \end{bmatrix}$, where $a \in R^*$ (non zero reals), is a group under matrix multiplication. Also write the necessary and sufficient condition for a subset of a group to be a subgroup. (4 Marks)

8. (a) Define homomorphism of two groups. Also give an example of group homomorphism. (2 Marks)

    (b) Define Language of a Grammar. Find the Kleene closure of L, where $L = \{a, ab\}$. (2 Marks)

9. Construct the state diagram for the finite state machine with the state table shown below and find the output string by the machine for the input string 101011 and 111001: (4 Marks)

F	Inputs	
States	0	1
q_0	$q_1, 0$	$q_0, 1$
q_1	$q_3, 1$	$q_2, 0$
q_2	$q_2, 0$	$q_2, 0$
q_3	$q_1, 1$	$q_3, 1$

END