Roll No. ……… Total Pages: **10418**

MCA/D-12
DISCRETE MATHEMATICAL STRUCTURES
Paper-MCA-103

Time allowed: 3 hours Maximum marks: 80

Note: Attempt five questions in all. Question no. 1 is compulsory. Attempt one Questions from each unit. Assuming any missing data.

Compulsory Question

1. (a) Give the multiplication table of the symmetric group S_3.
(b) Write down regular expression and design deterministic finite automaton over An alphabet {0, 1} that will accept all string having substring 001.
(b) Write down the formal definition of grammar.
(c) Check whether the set G = {1, 5, 7, 11} is a group under multiplication modulo 12.
(d) Check whether the divisibility relation on set of integers is a partial ordered relation or not?
(e) What do you mean by integral domain?
(f) Prove that a subgroup of an abelian group is a normal subgroup.
(g) Define complete graph and Bi-partite graph. Give example for same.

Unit-I

2. (a) Define a group. Show that the following latin square of order 5 is not a group table.

1	A	B	C	D
A	B	1	D	C
B	C	D	A	1
C	D	A	1	B
D	1	C	B	A

(b) Given H be a subgroup and k be a normal subgroup of a group G. prove that HK is a subgroup of G. 7+7

3. (a) Consider the group G = {1, 2, 3, 4, 5, 6} under the multiplication modulo. 7
Give the multiplication table of group G .find the inverse of each element. 7
(b) Given H be a subgroup of a group G. Then the right cosets Ha form a partition of G. 7+7

Unit-II

4. (a) Given x and y be nodes in graph G. if there are two different path in G from x to y, then G contains a proper circuit.
(b) Define Edge connectivity. Prove that the edge connectivity of G is less than or equal to d. 7+7

5. (a) Define a planer graph. Given G be a connected planer graph and r be the number of regions defined by planer graph G then R=IEI-IVI+2.
(b) Define minimal spanning tree. Give an example for the same. Give Prim's algorithm for finding the minimum spanning tree. 7+7

Unit-III

6. Define a partial ordered relation. Give example. Draw Hasse diagram for partial ordered Set {(1, 2, 4, 6, 8, 12),}. Find the minimal, maximal, lower and upper bound for the same. Check whether it is a lattice or not. 14

7. (a) Prove that if a lattice is complement and distributive then complement of each element is unique.

(b) Write short note on Boolean algebra. 7+7

Unit-IV

8. (a) Define integral domain. Check whether the Z_{105} and Z_{29} is integral domain or not. Give reason in support of your answer.

(b) Define an irreducible element in an integral domain D. Express 12 in Z as a Product of irreducible elements. 7+7

9. (a) Define a field. Give an example. Show that a field F has an integral domain.

(b) Given S be the set of real numbers of the form $a+b\sqrt{3}$, where a and b are rational numbers. Show that S is a field. 7+7