Roll No. .....

8303

Printed Pages : 3

BT–3 / D–13

DISCRETE STRUCTURES

Paper–CSE-205-E

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *Attempt any **five** questions.*

1. (a) Prove that for any three sets A, B and C

(i) $A \cap (B - C) = (A \cap B) - (A \cap C)$ 10

(ii) $A - (B - C) = (A - B) \cup (A \cap C)$

(b) Prove that for any three sets A, B and C

(i) $A \times (B \cap C) = (A \times B) \cap (A \times C)$

(ii) $(A - B) \times C = (A \times C) - (B \times C)$ 10

2. (a) Show that the set $A = \{2, 3, 4, 6\}$ is not a lattice with the relation of divisibility. Also, draw the Hasse diagram of the poset A. 10

(b) Prove that $(N, \leq)$ is a lattice where '$\leq$' is the relation of divisibility. N is set of natural numbers. 10

3. (a) In how many ways 5 boys and 3 girls can be seated in a row so that no two girls are together ? 10

(b) Out of 9 subjects two subjects are compulsory. In how many ways a student can make a selection of 5 subjects out of these 9 subjects ? 10

4. (a) Solve the following recurrence relation 10

$a_n = a_{n-1} + 2a_{n-2}$, $a_0 = 2$, $a_1 = 7$

(b) Solve the recurrence relation : 10

$f_n = f_{n-1} + f_{n-2}$, $n \geq 2$ with initial conditions $f_0 = f_1 = 1$

5. (a) Consider the operation * on the set of rational numbers Q defined by

$a * b = ab/4$ for all $a, b \in Q$

Determine whether operation is

(i) commutative

(ii) associative

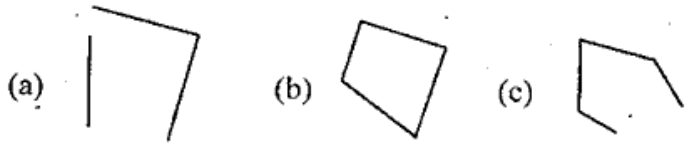
(b) Consider the binary operation * on I_+, the set of positive integers defined by :

$a * b = ab / 4$

Determine the identity for the binary operation *, if exists. 10

6. Let (I, +) be a group where I is the set of all the integers and + is the ordinary addition operation and let $H = \{--, -6, -3, 0, +3, +6, --\}$ be a subgroup which consists of multiples of 3. Determine all the left cosets of H in I. 20

7. (a) Which of the following graphs are trees ? 10



(b) Describe various methods of representation for graphs. 10

8. Consider the binary tree T in Figure

(a) Find the depth d of T.

(b) Traverse T using the preorder algorithm.

(c) Traverse T using the inorder algorithm.

(d) Traverse T using the postorder algorithm.

(e) Find the terminal nodes of T, and the order that they are traversed in (b), (c), and (d). 4× 5