

[07 - 2217]

II/IV B.Tech. DEGREE EXAMINATION.

Second Semester

Computer Science and Technology

DISCRETE MATHEMATICAL STRUCTURES – II

(Common with I.T and Dual Degree Programme in CSE)

(Effective from the admitted batch of 2006–2007)

Time : Three hours

Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal mark.

Answer all parts of any question at one place.

PART A

1. (a) Define partial ordering relation.
- (b) Give an example of relation which is symmetric, transitive but not reflexive on $\{a, b, c\}$.
- (c) Find the subgroup of order two of the group $(\mathbb{Z}_8, +)$
- (d) What is meant by bounded lattices?

8. Write short note on

(a) Regular grammar

(b) Polish notation

(c) Partial recursive functions.

- (e) Define duality principle.
- (f) Define isomorphism. Give an example for isomorphism.
- (g) Give the mathematical description of Turing machine.

PART B

2. (a) Define the relation P on $\{1, 2, 3, 4\}$ by

$$P = \{(a, b) \mid |a - b| = 1\}$$
. Determine the adjacency matrix of P^2 .
- (b) Show that relation \subseteq (subset or equal) defined on the power set $P(A)$ of the set A is partial order relation.
3. (a) Show that $f(x) = \begin{cases} \frac{x}{2} & \text{when } x \text{ is even} \\ \frac{(x-1)}{2} & \text{when } x \text{ is odd} \end{cases}$ is primitive recursive.
- (b) Let R be a binary relation defined as $R = \{(a, b) \in R : a - b \leq 3\}$, determine whether R is reflexive, symmetric, anti symmetric and transitive.
4. (a) Show that the set $G = \{1, w, w^2\}$, where $1, w, w^2$ are cube roots of unity, form an abelian group under the operation of ordinary multiplication.

- (b) Let the operation $*$ be defined on the set of real number R as follows:

$$a * b = |a - b| \text{ for all } a, b \in R$$

prove that $*$ is commutative binary operation on R but $(R, *)$ is not semi groups.

5. (a) In a distributive lattice prove that $a * b = a * c$ and $a \oplus b = a \oplus c$ implies that $b = c$.

- (b) Draw Hasse diagram of the poset (S, \leq) where $S = \{1, 2, 4, 8, 24, 48\}$ and $x \leq y$, if x divides y . If $A = \{4, 8\}$ is subset of S . Find upper and lower bounds of A .

6. (a) Simplify the Boolean function.

$$f(x, y, z) = \Sigma(0, 2, 4, 5, 6).$$

- (b) Simplify the following Boolean function using K- maps.

$$f(x, y, z) = \Sigma(2, 3, 6, 7)$$

7. (a) Write about NFA and DFA.

- (b) Construct Turing machine for the acceptance of language

$$L = \{a^n b^n / n \geq 1\}.$$