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LNCT UNIVERSITY, BHOPAL

Enrollment No. .. ....

CS-305 / 302 (OLD) / AL - 302 (OLD)
B.TECH (CSE/ AIML) III SEMESTER EXAMINATION [DECEMBER-2024]
DISCRETE STRUCTURE

Maximum Marks: 70 **Time Allowed: 3Hours**

Note:- Attempt all questions. Internal choice is given.

(SECTION –A)

1. Short Answer Type Questions (Attempt Any Five) [5x6=30]

i) Show by mathematical induction

$$1^2 + 3^2 + 5^2 + \cdots \ldots \ldots + (2n-1)^2 = \frac{n(2n+1)(2n-1)}{3}$$

ii) Find complete disjunction normal form in three variables and show that its value is 1.

iii) Let $(\{a, b\}, *)$ be Semi group, where $a * a = b$. Show that:
(a) $a * b = b * a$
(b) $b * b = b$

iv) Explain the Followings:
(a) Connected graphs
(b) Disconnected graph

(v) Show that there are only five distinct Hasse diagram for partial order sets that contains three elements.

(vi) Apply the generating function technique to solve the initial value problem

$$y_{n+1} - 2y_n = 0 \; with \; y_0 = 1.$$

(vii) Solve the recurrence relation

$$a_r - 7a_{r-1} + 10a_{r-2} = 0 \;\; given \; a_0 = 0, a_1 = 3.$$

(SECTION –B)

2. Long Answer Type Questions (Attempt Any Four) [4x10=40]

i) Write the short note on -
(a) Reflexive Relation
(b) Symmetric Relation
(c) Identity Relation
(d) Inverse function

ii) Show using truth table whether $(p \wedge q \wedge r)$ *and* $(p \vee r) \wedge (q \vee r)$ are equivalent or not.

iii) Consider a ring $(R, +, *)$ defined by $a * a = a$. Determine whether the ring is commutative or not.

iv) Let G be a connected planar graph with v vertices, e edges and r be the number of regions in a planar representation of G. Then prove that $v - e + r = 2$.

v) Prove that the necessary and sufficient condition for a connected graph G to be an Euler graph in that all vertices of G are of even degree.

vi) Solve the recurrence relation

$$a_r = a_{r-1} + a_{r-2}, given \; that \; a_0 = 1, a_1 = 1.$$