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

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

- 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 $(p \land q \land r)$ and $(p \lor r) \land (q \lor r)$ are equivalent or not.
- iii) Consider a ring (R, +, *) defined by a * a = a. Determine whether the ring is commutative or not.
- 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 $a_0 = 1$, $a_1 = 1$.