



# MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi &amp; Affiliated to JNTUH, Hyderabad)

Accredited by NBA and NAAC with 'A' Grade &amp; Recognized Under Section 2(f) &amp; 12(B) of the UGC act, 1956

II B.Tech I Sem Regular End Examination, February-2022

**Discrete Mathematics****(CSM)****Time: 3 Hours.****Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.

2. In Part - A, answer all questions which carries 20 marks.

3. In Part - B, answer any one question from each unit.

Each question carries 10 marks and may have a, b as sub questions.

**PART- A****(10\*2 Marks = 20 Marks)**

- |       |   |    |     |     |
|-------|---|----|-----|-----|
| 1. a) | Define logical connectives?                                     | 2M | CO1 | BL1 |
| b)    | Write any two rules of inference?                               | 2M | CO1 | BL1 |
| c)    | What is an equivalence Relation?                                | 2M | CO2 | BL1 |
| d)    | Write about types of functions?                                 | 2M | CO2 | BL1 |
| e)    | Define Recursion?   | 2M | CO3 | BL1 |
| f)    | What is multinomial theorem?                                    | 2M | CO3 | BL1 |
| g)    | Define Recurrence relation?                                     | 2M | CO4 | BL1 |
| h)    | Solve $a_n = 7a_{n-1}$ , given $a_0 = 3$ .                      | 2M | CO4 | BL1 |
| i)    | Define Isomorphism?   | 2M | CO5 | BL1 |
| j)    | What are the algorithms used for finding minimum spanning tree? | 2M | CO5 | BL1 |

**PART- B****(10\*5 Marks = 50 Marks)**

- |       |  |    |     |     |
|-------|--|----|-----|-----|
| 2. a) | Use truth table to show that $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ | 5M | CO1 | BL3 |
| b)    | Prove that $\exists x(P(x) \wedge S(x)), \forall x(P(x) \rightarrow R(x)) \Rightarrow \exists x(R(x) \wedge S(x))$     | 5M | CO1 | BL3 |

**OR**

- |       |  |     |     |     |
|-------|--|-----|-----|-----|
| 3.    | Obtain the Principal Conjunctive Normal Form of the formula S given by $(\neg P \rightarrow R) \wedge (Q \rightleftharpoons P)$  | 10M | CO1 | BL3 |
| 4. a) | For any two sets A and B Prove the following Identity $A - (A \cap B) = A - B$   | 5M  | CO2 | BL3 |
| b)    | If $A = \{1, 2, 3, 4\}$ and $P = \{\{1, 2\}, \{3\}, \{4\}\}$ is a partition of A. Find the equivalence relation determined by P. | 5M  | CO2 | BL3 |

**OR**

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|----|--|-----|-----|-----|
| 5. | Let $A = \{6, 12, 18, 24, 36, 72\}$ , $a \leq b$ if and only if $a$ divides $b$ . Draw Hasse diagram for it. | 10M | CO2 | BL2 |
|----|--|-----|-----|-----|

- |           |    |   |     |     |     |
|-----------|----|---|-----|-----|-----|
| 6         | a) | How many ways can we distribute 14 indistinguishable balls in 4 numbered boxes so that each box is non empty  | 5M  | C03 | BL2 |
|           | b) | Find the number of arrangements of the letters of MISSISSIPPI   | 5M  | C03 | BL3 |
| <b>OR</b> |    |   |     |     |     |
| 7         |    | A group of 8 scientists is composed of 5-psychologists and 3-sociologists, In how many ways can a committee of 5 be formed that has 3- psychologists and 2-sociologists | 10M | C03 | BL3 |
| 8         | a) | Find the coefficient of $X^{10}$ in $(X^3 + X^4 + \dots)^2$   | 5M  | C04 | BL3 |
|           | b) | Solve the recurrence relation $a_n - 9a_{n-1} + 20a_{n-2} = 0$ with $a_0 = -3$ , $a_1 = -10$ using generating functions   | 5M  | C04 | BL3 |
| <b>OR</b> |    |   |     |     |     |
| 9         |    | Solve the following recurrence relation using characteristic roots $a_n + 6a_{n-1} + 8a_{n-2} = 0$ and $a_0 = 2$ , $a_1 = -7$   | 10M | C04 | BL3 |
| 10        | a) | Draw binary search tree for the list : 2,1,5,6,8,9,7,3,4  | 5M  | C05 | BL2 |
|           | b) | Find the chromatic number of the following i) $C_n$ ii) $K_n$ iii) $K_{m,n}$  | 5M  | C05 | BL3 |
| <b>OR</b> |    |   |     |     |     |
| 11        |    | State and prove Euler's formula for a plane connected graph   | 10M | C05 | BL3 |

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