

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: CS/IT

SEMESTER: III
SESSION: MO/2022

SUBJECT: MA205 DISCRETE MATHEMATICS

TIME: 2 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 25.
 2. Candidates attempt for all 25 marks.
 3. Before attempting the question paper, be sure that you have got the correct question paper.
 4. The missing data, if any, may be assumed suitably.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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|---|---------|-----|
| Q1 (a) Show that $(\sim p \wedge (p \vee q)) \Rightarrow q$ is a tautology | [2] CO1 | BT4 |
| Q1 (b) Find the least n for which the statement is true and then using mathematical induction prove that $(1 + n^2) < 2^n$ | [3] CO1 | BT1 |
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| Q2 (a) Find whether $(p \wedge q) \rightarrow q$ and $\overline{(p \wedge q)} \vee q$ is logically equivalent or not. | [2] CO1 | BT1 |
| Q2 (b) Prove or disprove. $\forall x \in R, x^3 > x^2$. | [3] CO1 | BT5 |
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| Q3 (a) Solve $a_{r+1} - \cos \alpha a_r + a_{r-1} = 0$ | [2] CO1 | BT3 |
| Q3 (b) Find the solution of the following recurrence relation $a_{r+1} - a_r = r^2$ | [3] CO1 | BT1 |
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| Q4 (a) Solve the recurrence relation $a_r - 2a_{r-1} + a_{r-2} = 2^r$; $r \geq 2$ by the method of generating function satisfying the boundary conditions $a_0 = 2, a_1 = 1$ | [2] CO1 | BT3 |
| Q4 (b) Solve the recurrence relation $a_{r+3} + 16a_{r-1} = 0$ | [3] CO1 | BT3 |
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| Q5 (a) Let $A = \{1, 2, 3, 4, 5\}$ and R be the relation defined by a R b if and only if a < b. Compute R^2 and R^3 | [2] CO2 | BT3 |
| Q5 (b) Determine whether the relation S on the set A is symmetric, antisymmetric and transitive. Set $A = \mathbb{R}^2 \setminus (0,0)$. The relation S is defined as $(x_1, y_1) S (x_2, y_2)$ if only if $x_1 \cdot y_2 = x_2 \cdot y_1$ | [3] CO2 | BT4 |

::: 30/09/2022 ::: M