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

CLASS: BTECH **SEMESTER : III**
BRANCH: CSE/AIML **SESSION : MO/2025**

SUBJECT: MA24205 DISCRETE MATHEMATICS

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Identify which of the following propositions are statements? i. Rome is the capital of Spain ii. $x + 2 = 11$	[2]	CO1	2
Q.1(b)	Determine whether the given statement is a tautology, a contingency, or a contradiction. i. $q \vee (\sim q \wedge p)$ ii. $(p \wedge q) \Rightarrow p$	[3]	CO1	4
Q.2(a)	Find a truth table for $(p \vee q) \Rightarrow (p \wedge q)$	[2]	CO1	1
Q.2(b)	Let a and b be real numbers. Using mathematical induction prove that $(a.b)^n = a^n.b^n$ for all natural numbers n.	[3]	CO1	3
Q.3	Find a particular solution of the recurrence relation $a_{r+1} - a_r = r^2$	[5]	CO2	1
Q.4	Solve the recurrence relation $a_{n+2} - 5a_{n+1} + 6a_n = 2$ by the method of generating function with initial conditions $a_0 = 1,\ a_1 = 3$.	[5]	CO2	3
Q.5(a)	Define cartesian product of two sets A and B. If a set has 100 elements, what is the cardinality of its power set ?	[2]	CO3	1
Q.5(b)	Let A be the set of positive integers, and let R be the relation $R = \{(a,b) \in A \times A \mid a\ divides\ b\}$. Determine whether R symmetric, asymmetric, or antisymmetric?	[3]	CO3	4

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