

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2023)

CLASS: BTECH
BRANCH: CS & AIML

SEMESTER : III
SESSION : MO/2023

SUBJECT: MA205 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
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|--------|---|-------|----|
| Q.1(a) | Let p: Ajay is a computer science student; q: Ajay is a sportsman | [2] 1 | 1 |
| | Write following statement in symbolic form | | |
| | (i) Ajay is not a computer science student or sportsman | | |
| | (ii) Ajay is not a computer science student or Ajay is not a computer science student and sportsman | | |
| Q.1(b) | Find the truth table of $(p \wedge q) \rightarrow (p \vee r)$ | [3] 1 | 1 |
| Q.2(a) | Verify whether $(p \vee q) \wedge \sim p$ and $(\sim p \wedge q)$ are equivalent or not. | [2] 1 | 1 |
| Q.2(b) | Use mathematical induction to prove that for all positive integer n; $n < 2^n$; | [3] 1 | 2 |
| Q.3 | Solve the recurrence relation by generating function method $a_n - 6a_{n-1} = 2^{n-1}$; $n \geq 1$; $a_0 = 1$ | [5] 2 | 3 |
| Q.4 | After solving the recurrence relation $a_n - a_{n-1} = 6n^2 + 2n$, $n \geq 2$; find a_{99} . If $a_{99} = 22 \times A^4 \times B^2$ where A and B are positive integers, then find the value of A and B, given that $a_1 = 8$ | [5] 2 | 3 |
| Q.5(a) | A relation R on the set of integer is defined as $(x, y) \in R$, if and only if x - y is divisible by 7. Determine whether the given relation is reflexive, symmetric, anti-symmetric and transitive or not. | [2] 3 | 2 |
| Q.5(b) | Let R be the relation represented by the matrix $M_R = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$. Find the matrices that represent R^3 and R^4 . Also draw corresponding digraphs. | [3] 3 | 2 |

:::26/09/2023 E:::