

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2024)

CLASS: IMSC
BRANCH: MATH & COMP

SEMESTER : IV
SESSION : SP/2025

SUBJECT: MA210 DISCRETE MATHEMATICAL STRUCTURE AND GRAPH THEORY

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)	Find whether $(p \leftrightarrow q)$ and $((p \leftrightarrow q) \wedge (q \rightarrow p))$ are logically equivalent or not.	[2] 1	1
Q.1(b)	Check the validity of the arguments: If horses fly or cows eat grass then mosquito is the national bird. If mosquito is the national bird, then peanut butter tastes good on hotdogs. But peanuts butter tastes terrible on hotdogs. Therefore, cows do not eat grass.	[3] 1	2
Q.2(a)	Express the statement "If a person is female and is a parent, then this person is someone's mother" as a logical expression involving predicates, quantifiers with a domain consisting of all people, and logical connectives.	[2] 1	2
Q.2(b)	By mathematical induction prove/disprove: n sided convex polygon has $n(n-3)/2$ diagonals. $n \geq 4$.	[3] 1	2
Q.3	Solve the recurrence relation $a_r - 3a_{r-1} + 2a_{r-2} = 2^r$	[5] 2	2
Q.4	Solve the recurrence relation $a_{r+2} - 5a_{r+1} + 6a_r = 2$ by method of generating function satisfying initial conditions $a_0 = 1$ and $a_1 = 3$.	[5] 2	2
Q.5(a)	Given a $n \times n$ square. 5 points are to be placed inside the square. Prove/disprove two of them are at most $\frac{\sqrt{n}}{2}$ unit apart.	[2] 3	2
Q.5(b)	Find the number of integers between 1 and 1000 (both inclusive) divisible by any of the integers 2, 3 and 5 by principle of inclusion and exclusion.	[3] 2	2

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