

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

CLASS: BTECH
BRANCH: ALL

SEMESTER: VII
SESSION: MO/2022

SUBJECT: MA430 DISCRETE MATHEMATICAL STRUCTURE

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 handbook/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q1	Let N be the set of all natural numbers. Define a relation R on N such that $a R b$ if and only if $a \equiv b \pmod{4}$. Show that R is an equivalence relation on N . (Note: $a \equiv b \pmod{4}$ means $a - b$ is divisible by 4).	[5]	2	1,2
	How many distinct equivalence classes are there in this relation?			
Q2	(a) Define a relation on the set $A = \{a, b, c, d\}$ that is reflexive and symmetric but not transitive.	[2]	2	2,3
Q2	(b) Find the number of solutions of the equation $x_1 + x_2 + \dots + x_{12} = 5$, where $x_i \geq 0$ are integers. Justify your answer.	[3]	2	1,3
Q3	(a) How many 6-digit number can be formed using the digits 1, 1, 2, 3, 3, 3?	[2]	1	3
Q3	(b) There are 12 students in a class. We want to give them 17 chocolates. Every student receives at least 1 chocolate. How many ways can we do it?	[3]	1	3
			1	3
Q4	(a) Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$ using characteristic equation method.	[2]	1	3,4
Q4	(b) Find the particular solution of the recurrence relation $a_n + a_{n-2} - 2a_{n-3} = 3n + 5$.	[3]	1	3,4
Q5	(a) Let $\{a_n\}$ be a sequence defined by the recurrence relation $a_n - 2a_{n-1} + a_{n-2} = 2^n$, with $a_0 = 2, a_1 = 1$. Find the generating function of the sequence.	[2]	1	3,4
Q5	(b) Solve the above recurrence relation using generating function.	[3]	1	3

:::::: 01/10/2022 :::::M