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

CLASS: BTECH **SEMESTER : VII**
BRANCH: IT **SESSION : SP/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**

			CO	BL
Q.1(a)	Define well ordering Principle.	[2]	1	1
Q.1(b)	Show that $\forall x(P(x) \wedge Q(x))$ and $\forall x P(x) \wedge \forall Q(x)$ are logically equivalent.	[3]	2	3
Q.2(a)	Using Tautologies prove that $(\sim(p \wedge \sim q) \wedge (\sim q \vee r) \wedge (\sim r)) \rightarrow \sim p$.	[2]	1	2
Q.2(b)	Use the Principle of Mathematical Induction to verify that for any positive integer n, $6^n - 1$ is divisible by n.	[3]	2	4
Q.3(a)	Find the generating function for the given recurrence relation $a_r - 8a_{r-1} + 15a_{r-2} = 0$ with the initial condition $a_0 = 0$ and $a_1 = 3$.	[2]	2	3
Q.3(b)	Solve the recurrence relation $a_r - 2a_{r-1} - 15a_{r-2} = r^2$.	[3]	2	3
Q.4(a)	Find the generating function for the sequence $0^2, 1^2, 2^2, 3^2, 4^2, 5^2 \ldots$	[2]	2	1
Q.4(b)	Find the generating function for the given recurrence relation $a_r = -2a_{r-2} + 3a_{r-1}; r \geq 2$ with the initial condition $a_0 = 2$ and $a_1 = 3$.	[3]	3	3
Q.5(a)	Define equivalence relation with example.	[2]	3	1
Q.5(b)	Using Warshall's algorithm compute transitive closure of the relation $R = \{(1,1), (1,4), (2,1), (2,2)\ (3,4)(4,4)\}$ defined over non empty set $A = \{1,2.3.4\}$.	[3]	2	4

::::::24/02/2023::::::M