O.P.Code: 20HS0836	R20	H.T.No.									

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

MCA I Year I Semester Regular & Supplementary Examinations January/ February-2025

DISCRETE MATHEMATICS

Time: 3 Hours **Max. Marks: 60**

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1	a	Define converse, inverse contra positive with an example.	CO1	L3	6M
	b	Prove that $(P \wedge Q) \Leftrightarrow (\neg P \vee \neg Q)$ is a contradiction.	CO1	L3	6M

OR

2	a	Show that $S \vee R$ is a tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$	CO1	L4	6M
	b	Show that $P \rightarrow Q, P \rightarrow R, Q \rightarrow \neg R, P$ are inconsistent.	CO1	L4	6M

UNIT-II

3	a	Define an equivalence relation. If R be a relation in the set of integers Z defined by $R = \{(x, y) : x \in Z, y \in Z, (x - y)\ is\ divisible\ by\ 6\}$. Then prove that R is an equivalence relation.	CO2	L1	6M
	b	Draw the Hasse diagram representing the positive divisors of 36.	CO2	L1	6M

OR

4	a	Show that G={1,2,3,4,5} is not a group under addition & multiplication modulo 6.	CO2	L2	6M
	b	Let f and g be functions from R to R defined by $f(x) = ax + b$ *and* $g(x) = 1 - x + x^2$. *If* $(g \circ f)(x) = 9x^2 - 9x + 3$, determine a, b.	CO2	L1	6M

UNIT-III

5	a	A group of 8 scientists is composed of 5 psychologists and 3 sociologists. i) In how many ways can a committee of 5 be formed? ii) In how many ways can a committee of 5 be formed that has 3 psychologists and 2 sociologists?	CO3	L1	6M
	b	The question paper of mathematics contains two questions divided into two groups of 5 questions each. In how many ways can an examine answer six questions taking atleast two questions from each group.	CO3	L1	6M

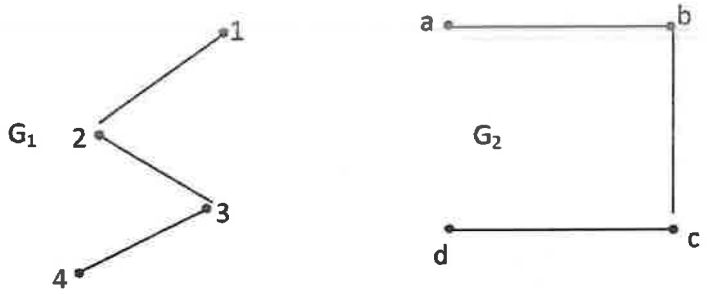
OR

6	a	Find the number of positive integers less than or equal to 2076 and divisible by 3or 4.	CO3	L1	6M
	b	Applying pigeon hole principle show that of any 14 integers are selected from the set S = {1, 2, 3… 25 } there are at least two whose sum is 26. Also write a statement that generalizes this result.	CO3	L4	6M

UNIT-IV

7	a	Find the sequence generated by the following generating functions (i) $(2x - 3)^3$ (ii) $\frac{x^4}{1-x}$.	CO4	L1	6M

	b	Determine the sequence generated by (i) $f(x) = 2e^x + 3x^2$ (ii) $\frac{1}{1-x} + 2x^3$.	**CO4**	**L1**	**6M**
		OR			
8	**a**	Show that $\{a_n\}$ is a solution of recurrence relation $a_n = -3a_{n-1} + 4a_{n-2}, if\ a_n = 1$.	**CO4**	**L6**	**6M**
	b	Solve $a_n = a_{n-1} + 2a_{n-2}$ with initial conditions $a_0 = 2, a_1 = 7$	**CO4**	**L6**	**6M**
		UNIT-V			
9	**a**	Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$.	**CO5**	**L4**	**6M**
	b	How many vertices will the graph contains 6 edges and all vertices of degree 3.	**CO5**	**L5**	**6M**
		OR			
10	**a**	Show that the two graphs shown in figure are isomorphic.	**CO5**	**L1**	**6M**



	b	Define Euler circuit, Hamilton cycle, Wheel graph.	**CO5**	**L2**	**6M**

***** END *****