

Code No: R22A0028

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech II Semester Regular/Supplementary Examinations, April 2025**Discrete Mathematics**

(CSE,IT,CS&IT,CSE-CS,CSE-AIML,CSE-DS,CSE-IOT & B.Tech-AIML)

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Time: 3 hours**Max. Marks: 60****Note:** This question paper contains two parts A and B

Part A is compulsory which carries 10 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

<u>PART-A (10 Marks)</u>			BCLL	CO(s)	Marks
<u>(Write all answers of this part at one place)</u>					
1	A	Write converse, inverse, and contrapositive of “If quadrilateral is a parallelogram, then diagonals bisect each other”.	L2	CO-I	[1M]
	B	Write about Conjunction and Conditional.	L1	CO-I	[1M]
	C	Define Power set of set A and write the cardinality of the Power set.	L1	CO-II	[1M]
	D	Define Equivalence relation.	L1	CO-II	[1M]
	E	Define Monoid.	L1	CO-III	[1M]
	F	For any two elements a, b in a Group G, prove that $(ab)^{-1} = b^{-1}a^{-1}$.	L3	CO-III	[1M]
	G	How many different words can be formed with the letters of the word ‘MISSISSIPPI’?	L5	CO-IV	[1M]
	H	State Binomial theorem.	L1	CO-IV	[1M]
	I	Define Binary tree.	L1	CO-V	[1M]
	J	What is a complete bipartite graph?	L1	CO-V	[1M]
<u>PART-B (50 Marks)</u>					
<u>SECTION-I</u>					
2	A	Prove whether the following is tautology: $((P \vee (Q \wedge R)) \vee \sim(P \vee (Q \wedge r)))$	L5	CO-I	[5M]
	B	Prove that $S \vee R$ is logically implied to $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$ OR	L3 L5	CO-I	[5M]
3	A	Obtain the PCNF of $(\sim P \rightarrow R) \wedge (Q \leftrightarrow P)$	L5	CO-I	[5M]
	B	Verify the validity of the following argument “every living thing is a plant or an animal. Joe’s gold fish is alive and it is not a plant. All animals have hearts. Therefore Joe’s gold fish has a heart.”	L4	CO-I	[5M]
<u>SECTION-II</u>					
4		Let $A = \{1, 2, 3, 5, 6, 10, 15, 30\}$ and a relation R is defined as aRb iff ‘a divides b’, then show that (A, R) is a POSET. Also draw the Hasse diagram. OR	L6	CO-II	[10M]
5	A	Let $A = \{2, 4, 8, 16, 32\}$ show that the relation ‘divides’ is partial ordering on A and draw Hasse diagram.	L6	CO-II	[5M]
	B	Explain i) Reflexive ii) Irreflexive iii) Symmetric iv) Transitive relations with suitable examples.	L2	CO-II	[5M]
<u>SECTION-III</u>					
6	A	If $S = \{1, 0, -1\}$ then Is S a Group under Usual addition? Is S a group under usual multiplication? Explain.	L2	CO-III	[5M]
	B	Prove that the group G is abelian if and only if $(ab)^2 = a^2b^2$, for all a, b in G.	L2	CO-III	[5M]

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| 7 | A | Let G be a set of all non-zero real numbers and $a * b = (ab)/2$ | L1 | CO-III | [5M] |
| | | Show that $\langle G, * \rangle$ is an abelian group. | | | |
| | B | Show that $\langle G, \times_5 \rangle$ is a Group, where $G = \{1, 2, 3, 4\}$ | L1 | CO-III | [5M] |

SECTION-IV

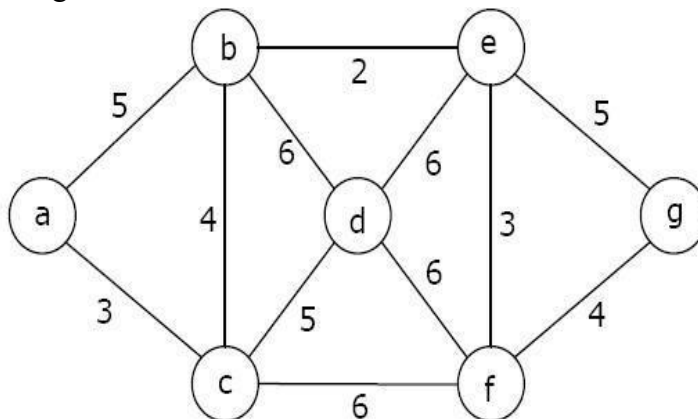
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| 8 | How many integers between 1 and 300 (inclusive) are divisible by
At least one of i) 5, 6, 8 ii) None of 5, 6, 8 | L1 | CO-IV | [10M] |
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OR

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| 9 | A | Out of 5 men and 2 women, a committee of 3 is to be formed. In how many ways Can it be formed if at least one woman is to be included? | L3 | CO-IV | [5M] |
| | B | Solve the recurrence relation $a_n - 3a_{n-1} + 2a_{n-2} = 0$, $n \geq 3$, $a_0 = 1$, $a_1 = 0$. | L3 | CO-IV | [5M] |

SECTION-V

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| 10 | Explain Kruskal's algorithm and hence find a Minimum Spanning Tree in the weighted graph shown in figure below | L3 | CO-V | [10M] |
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OR

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| 11 | Prove that the following graphs are isomorphic. | L4 | CO-V | [10M] |
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