Roll No.

PRESIDENCY UNIVERSITY

BENGALURU

Make up Examinations –December 2025	
Date: 29 –12-2025	**Time:** 09:30am – 12:30pm

School: SOCSE	Program: B. TECH	
Course Code: MAT2004	Course Name: Discrete Mathematical Structures	
Semester: MK	Max Marks: 100	Weightage: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	24	24	28	24	-

Instructions:

(i) *Read all questions carefully and answer accordingly.*

(ii) *Do not write anything on the question paper other than roll number.*

Part A

Answer ALL the Questions. Each question carries 2marks.   **10Q x 2M=20M**

1.	State which rule of inference is the basis of the following argument: "It is below freezing now. Therefore, it is either freezing or raining now."	2 Marks	L1	CO1
2.	Write the following statement in symbolic form: "Something is good".	2 Marks	L1	CO1
3.	Define Power set with an example.	2 Marks	L1	CO2
4.	Define a one-to-one function with an example.	2 Marks	L1	CO2
5.	Define totally ordered set with an example.	2 Marks	L1	CO3
6.	In the poset $(Z^+, \backslash)$, are the integers 3 and 9 are comparable? Are 5 and 7 are comparable?	2 Marks	L1	CO3
7.	Define lattice.	2 Marks	L1	CO3
8.	Define Boolean algebra with an example.	2 Marks	L1	CO3
9.	What are the solutions of the linear congruence $y \equiv 4(mod7)$.	2 Marks	L1	CO4
10.	What are the solutions of the linear congruence $p \equiv 2(mod5)$.	2 Marks	L1	CO4

Part B

11.	a.	Construct the truth table for $(p \to q) \land (q \to r) \to (p \to r)$.	10 Marks	L3	CO 1
		Or			
12.	a.	Show using a truth table $(p \leftrightarrow q) \leftrightarrow (r \leftrightarrow s)$ is contingency	10 Marks	L3	CO 1

13.	a.	Obtain the Principal Conjunctive Normal Form (PCNF) for $p \lor (\neg p \to (q \lor (\neg q \to r)))$ using truth table.	10 Marks	L3	CO 1
		Or			
14.	a.	Obtain the Principal Disjunctive Normal Form (PDNF) for $[(p \land q)] \lor [(\neg p \land r) \lor (q \land r)]$ using truth table.	10 Marks	L	CO 1

15.	a.	Let A be the set {1, 2, 3, 4}. Which ordered pairs are in the relation R = {(a, b) | a divides b}, write the corresponding graphical and table representation of the relation.	10 Marks	L3	CO 2
		Or			
16.	a.	Consider the following relations on {1, 2, 3, 4}: (a) R_1 = {(2, 1), (2, 2), (3, 4), (4, 1), (4, 4)} (b) R_2 = {(1, 1), (1, 2), (2, 1)} (c) R_3 = {(1, 1), (1, 2), (1, 4), (2, 1), (2, 2), (3, 3), (4, 1)} (d) R_4 = {(2, 1), (3, 1), (3, 2), (4, 1), (4, 2), (4, 3)} Which of these relations are reflexive, symmetric, antisymmetric and transitive.	10 Marks	L3	CO 2

17.	a.	Let R = {(1,2), (3,4), (2,2)} and S = {(4,2), (2,5), (3,1), (1,3)}. Find $S \circ R$, $R \circ (S \circ R)$, $(R \circ S) \circ R$, $R \circ S$.	10 Marks	L4	CO 2
		Or			
18.	a.	Let A = {a, b, c}, and R and S be relations on A whose matrices are as given by $M_R = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ and $M_S = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$ Find the composite relations $R \circ S$, $S \circ R$, $R \circ R$, $S \circ S$ and their matrices.	10 Marks	L4	CO 2

19.	a.	Prove that $(P(S), \subseteq)$ is a Boolean algebra where $S = \{p, q, r\}$.	20 Marks	L3	CO 3
		Or			
20.	a.	Prove that $(D_{30}, |)$ is a distributive lattice where D_{30} is the set of all positive divisors of 30.	20 Marks	L3	CO 3

21.	a.	Use the Chinese remainder theorem to find all solutions to the system of congruences, $x \equiv 2(mod\,3),\ x \equiv 1(mod\,4), x \equiv 3(mod\,5)$	20 Marks	L3	CO 4
		Or			
22.	a.	Solve the system of congruences, $y \equiv 2(mod\,3),\ y \equiv 3(mod\,5), y \equiv 2(mod\,7)$	20 Marks	L3	CO 4