Roll No.											

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations –MAY 2025

Date: 30-05-2025 **Time:** 01.00 pm – 04:00 pm

School: SOCSE	**Program**: B. Tech	
Course Code : MAT2004	**Course Name:** DISCRETE MATHEMATICAL STRUCTURES	
Semester: IV	**Max Marks**:100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4
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.	Define contingency with example.	2 Marks	L1	CO1
2.	What is the truth value of $(\forall x)Q(x)$ and $(\exists x)Q(x)$, where $Q(x)$ is the statement " $x^2 < 10$" and the domain consists of the positive integers not exceeding 4?	2 Marks	L2	CO1
3.	Define Power set with example.	2 Marks	L1	CO2
4.	Represent each of these relations on {1, 2, 3, 4} with a matrix a) {(1, 2),(1, 3), (1, 4), (2, 3), (2, 4), (3, 4)} b) {(1, 1), (1, 4), (2, 2), (3, 3), (4, 1)}	2 Marks	L2	CO2
5.	Verify that the divisibility relation | is a partial ordering on the set of integers.	2 Marks	L4	CO3
6.	Let P = {2, 4, 8, 16, 32} and ≤ be the relation "less than or equal to" . Draw the Hasse diagram.	2 Marks	L2	CO3
7.	Let the poset ({1, 2, 3, 4, 5}, |), find $2 * 3$ and $2 \oplus 3$.	2 Marks	L1	CO3
8.	Determine whether the poset ({1, 2, 3, 4, 5}, |) is a lattice.	2 Marks	L4	CO3
9.	How many strings of length 4 can be formed from the Vowels of the English alphabet?	2 Marks	L1	CO4
10.	How many ways are there to place 5 indistinguishable balls into three distinguishable bins?	2 Marks	L2	CO4

Part B

Answer the Questions. **Total Marks = 80M**

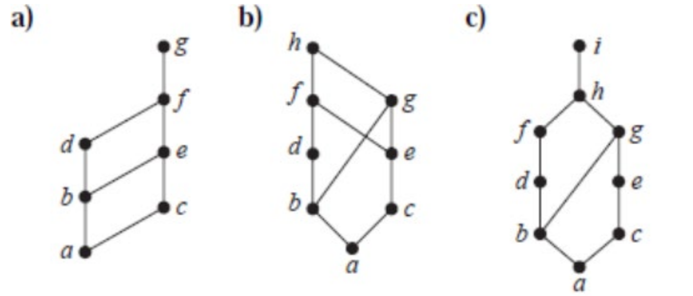
11.	Construct a Truth Table for $((\mathbf{p} \to \mathbf{r}) \leftrightarrow (\mathbf{s} \to \mathbf{q}))$	10 Marks	L3	CO1
	Or			
12.	Obtain PDNF and PCNF of $p \vee (\neg p \to (q \vee (\neg q \to r)))$ without constructing truth table	10 Marks	L5	CO1

13.	Show that the following set of premises is inconsistent: “If the contract is valid, then John is liable for penalty. If John is liable for penalty, he will go bankrupt. If the bank will loan him money, he will not go bankrupt. As a matter of fact, the contract is valid, and the bank will loan him money.”	10 Marks	L4	CO1
	Or			
14.	Verify the validity of the following arguments. “Every living thing is a plant or an animal. David’s dog is alive and it is not a plant. All animals have heart. Therefor, David’s dog has a heart.”	10 Marks	L4	CO1

15.	List the ordered pairs in the relation R from A = {0, 1, 2, 3, 4} to B = {0, 1, 2, 3}, where (a, b) ∈ R if and only if (i) a + b = 4. (ii) a>b. (iii) b - a = odd number. Decide Whether it is reflexive, symmetric, antisymmetric and transitive.	10 Marks	L4	CO2
	Or			
16.	Let f(x) = 6x + 2, g(x) = 3x − 4 and h(x) = 3x for x ∈ R, where R is the set of real numbers. Find g ∘ f; f ∘ g; f ∘ f; g ∘ g and f ∘ h.	10 Marks	L3	CO2

17.	Let R = {(1, 2), (2, 4),(3, 4), (2, 2) } and S = {(4, 2), (2, 5), (3, 1), (1, 3)}. Find R ∘ S, R ∘ (S ∘ R), (R ∘ S) ∘ R and R ∘ R.	10 Marks	L3	CO2
	Or			
18.	Let X = {1, 2, 3, ..., 6} and R ={(x, y)| x − y is divisible by 4}. Show that R is an equivalence relation.	10 Marks	L4	CO2

19.	Determine whether (P(S), ⊆) is a lattice where S = {**1**, **2**, **3** }.	10 Marks	L3	CO3
	Or			
20.	Determine whether the posets with these Hasse diagrams are lattices with proper reason.	10 Marks	L4	CO3



21.	Prove that (D_{10}, |) is a Boolean algebra, where D_{10} is the set of all positive divisors of 10.	10 Marks	L3	CO3

Or				
22.	Show that Cancellation laws holds in Boolean Algebra.	10 Marks	L4	CO3

23.	How many solutions does the equation $x_1 + x_2 + x_3 + x_4 = 30$ have, where x_1 , x_2 , x_3 and x_4 are non negative integers a) $x_1 \geq 1$ b) $x_i \geq 2$ for i = 1, 2, 3, 4, 5?	10 Marks	L4	CO4
Or				
24.	How many different strings can be made by reordering the letters of the word MISSISSIPPI and ABRACADABRA?	10 Marks	L4	CO4

25.	A bagel shop has onion bagels, poppy seed bagels, egg bagels, salty bagels, pumpernickel bagels, sesame seed bagels, raisin bagels, and plain bagels. How many ways are there to choose a) a dozen bagels b) a dozen bagels with at least one of each kind? c) a dozen bagels with at least three egg bagels and no more than two salty bagels? d) No salty bagels e) One salty bagel	10 Marks	L4	CO4
Or				
26.	How many ways are there to put five different employees into three indistinguishable offices, when each office can contain any number of employees?	10 Marks	L4	CO4