Roll No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

PRESIDENCY UNIVERSITY
BENGALURU

School of Information Science PG
Make up Examinations – December 2025

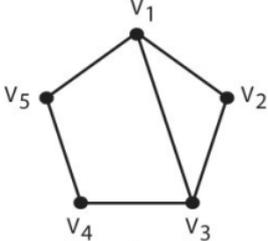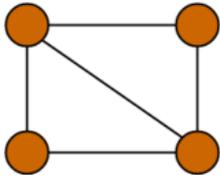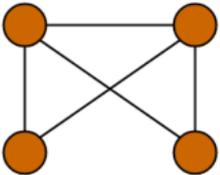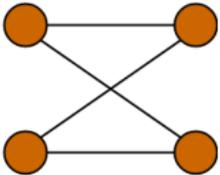|	
Semester: MK	**Date**: 31-12-2025
Course Code: MAT3001	**Time**: 09:30am – 12:30pm
Course Name: Mathematical Foundations for Computer Applications	**Max Marks**: 100
Program: MCA	**Weightage**: 50%

Instructions:

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

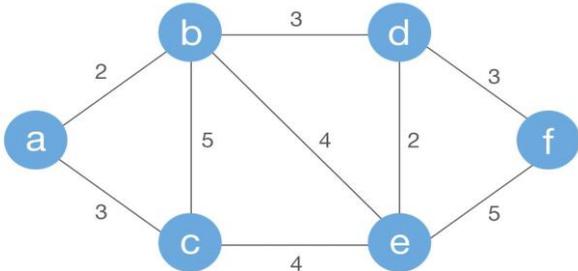(ii) *Do not write anything on the question paper other than roll number.*

Part A

	Answer ALL the Questions. Each question carries 2 marks.		2Mx10Q=20M		
1	Define tautology with example.	2 Marks	L1	CO1
2	What is the Modusponens rule?	2 Marks	L1	CO1
3	Write negation of the following statement: "Jan will take a job in industry or got o graduate school."	2 Marks	L1	CO1
4	Let X = {2, 3, 6, 12, 24, 36}, and the relation ≤ be such that x ≤ y if x divides y. Draw theHasse diagram of (X, ≤).	2 Marks	L1	CO2
5	Find the greatest lower bound and the least upper bound of {b, d, g}, if they exist intheposet shown in fig:	2 Marks	L1	CO2
6	Define complemented lattice.	2 Marks	L1	CO2
7	Find the tabular form of addition modulo 5 and multiplication modulo 5.	2 Marks	L1	CO3
8	If $p_1 = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & 4 & 2 \end{pmatrix}$ and $p_2 = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 1 & 2 \end{pmatrix}$ then find $p_1 \circ p_2$.	2 Marks	L1	CO3
9	Define order and size of a graph and explain with example.	2 Marks	L1	CO4
10	Define Handshaking Theorem for graphs.	2 Marks	L1	CO4

Part B

Answer ALL the Questions. Each question carries 10 marks.	10Mx5Q=50M		
11 Obtain the PDNF for (p ∧ q) ∨ (¬p ∧ r) ∨ (q ∧ r) by constructing truth table.	**10 Marks**	**L2**	**CO1**
or			
12a Show that s ∨ r is tautologically implied by (p ∨ q) ∧ (p → r) ∧ (q→ s).	**5 Marks**	**L2**	**CO1**
12b Show that(∃ x)M(x)follows logically from the premises(∀x)(H(x) → M(x))and(∃ x)H(x).	**5 Marks**		

13 Consider the poset$(X, \leq)$ where $X = \{1, 2, 3, 5, 30\}$ and the partial ordered relation $\leq$ is defined as i.e. if $x, y \in X$ then $x \leq y$ means "x divides y". Then show that poset $(X, \leq)$ is a lattice.	**10 Marks**	**L2**	**CO2**
or			
14 State and prove De Morgan's laws in a Boolean algebra.	**10 Marks**	**L2**	**CO2**

15 Determine whether the posets ({1, 2, 3, 4, 5}, |) and ({1, 2, 4, 8, 16}, |) are lattices.	**10 Marks**	**L2**	**CO2**
or			
16 Show that diamond lattice and pentagon lattice are not distributive.	**10 Marks**	**L2**	**CO2**

17 Let $G = \{1, -1, i, -i\}$ then prove that G is an abelian group under multiplication. Also, show that G is cyclic group with generator i.	**10 Marks**	**L2**	**CO3**
or			
18 Consider the (2, 5) encoding function defined by $e(00) = 00110$, $e(01) = 01110$, $e(10) = 11100$, $e(11) = 00011$. How many errors can e detect and how many errors can e correct.	**10 Marks**	**L2**	**CO3**

19a	State Handshaking theorem and verify it for the following graph.	5 Marks		
			L2	CO4
19b	How many edges are there in graph with 10 vertices each of degree six?	5 Marks		
	or			
20	Are the following graphs isomorphic? G1 G2 G3	10 Marks	L2	CO4

Part C

Answer ALL the Questions. Each Question carries 15 marks.			15Mx2Q=30M	

21	An encoding function $e: Z^2 \rightarrow Z^5$ is given by the generator matrix
	$G = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 & 1 \end{bmatrix}$
	  a) Determine all the code words.
	  b) Find the associated parity check matrix.
	  c) Decode the words i) 01011 ii) 11111.
		15 Marks	L3	CO3

22a	Apply Prim's algorithm to the graph given and find the minimum spanning tree along with its total weight. 	15 Marks	L3	CO4

22b

Apply Kruskal's algorithm to the graph given and find the minimum spanning treealong with its total weight.