Q.P Code D134143	Total Pages	3	Name	**672270**
			Register No.	

THIRD SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025

(CUFYUGP)

MAT3MN204
Boolean Algebra and System of Equations

2024 Admission Onwards

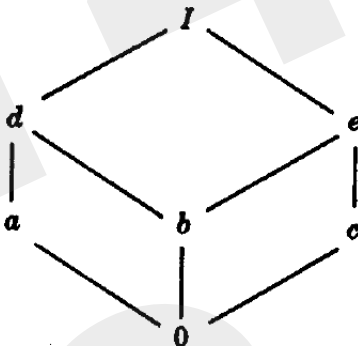| Maximum Time :2 Hours	Maximum Marks :70

Section A

All Question can be answered. Each Question carries 3 marks (Ceiling: 24 Marks)

1	Give an example of a partial ordering that has 1. a minimal element but no maximal element. 2. a maximal element but no minimal element. 3. neither a maximal nor a minimal element.
2	In Lattice define (a)Complements (b) Complemented Lattices
3	Give an example of an infinite lattice L with finite length.
4	Explain Boolean Algebra with an example
5	Reduce the following Boolean products to either 0 or a fundamental product: (a)$xyz'yx$ (b) $xyz'yx'z'$
6	If $A = \begin{bmatrix} 2 & 1 & -1 \\ 7 & 0 & 1 \\ -1 & 3 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 0 & 4 \\ 1 & 2 & 1 \\ -2 & -4 & 0 \end{bmatrix}$ and $C =, \begin{bmatrix} 0 & 2 & -1 \\ 8 & 0 & 2 \\ -2 & 3 & 3 \end{bmatrix}$ then show that $C(A + B)^T = CA^T + CB^T$
7	Find the rank of $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 5 & 6 & 0 \end{bmatrix}$

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8	Using Cramer's rule solve: $x + y + z = 3, \quad x + 2y + 3z = 4, \quad x + 4y + 9z = 6$
9	Find characteristic values of the matrix $\begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$
10	Evaluate the Determinant of $\begin{bmatrix} 1 & 5 \\ 3 & 2 \end{bmatrix}$ by Reduction to Triangular Form

Section B

All Question can be answered. Each Question carries 6 marks (Ceiling: 36 Marks)

11	Let the set $\{\{1\}, \{2\}, \{4\}, \{1, 2\}, \{1, 4\}, \{2, 4\}, \{3, 4\}, \{1, 3, 4\}, \{2, 3, 4\}\}$, be ordered by the relation "$A \subseteq B$." Draw its Hasse diagram and 1. Find the maximal elements and the minimal elements. 2. Find the greatest element and least element, if any. 3. Find the greatest lower bound of $\{\{1, 3, 4\}, \{2, 3, 4\}\}$ and least upper bound of $\{\{2\}, \{4\}\}$, if they exist
12	Consider the following Lattice L 1. Find all sublattices with five elements. 2. Find complements of a and b, if they exist. 3. Find all join-irreducible elements and atoms. 4. Is L distributive? Complemented?

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13	Show that the following are equivalent in a Boolean algebra: 1. $a * b' = 0$ 2. $a' + b = 1$
14	Express $E(x, y, z) = (x' + y)' + x'y$ in its complete sum-of-products form.
15	Determine whether the set $\left\{ \begin{bmatrix} 1 & 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 1 & 1 \end{bmatrix}, \begin{bmatrix} 1 & -1 & 1 \end{bmatrix} \right\}$ is linearly independent. Give reasons.
16	Solve the following system of equations with Gauss Elimination Method $$x + 2y + z = 9$$ $$2x - y + 3z = 1$$ $$3x + y + 2z = 4$$
17	Find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ by Gauss–Jordan Elimination
18	Find the eigen values and the corresponding eigen vectors of the matrix $\begin{bmatrix} 1 & -2 \\ -2 & 4 \end{bmatrix}$

Section C

Answer any ONE. Each Question carries 10 marks (1x10=10 Marks)

19	Find the number of subalgebras of $\mathbf{D}_{210}$.
20	Is the given set of vectors in R^3 with with $3v_1 - 2v_2 + v_3 = 0$ and $4v_1 + 5v_2 = 0$ a vector space? Give reasons. If your answer is yes, determine the dimension and find a basis.