QP CODE: D3BAM2403	**(Pages: 3)**	**Reg. No**	**: .....**
		Name	**: .....**

THIRD SEMESTER FYUGP EXAMINATION, NOVEMBER 2025

Discipline Specific Core (DSC) Course - Minor

AMA3MN204 : Boolean Algebra and System of Equations

(Credits: 4)

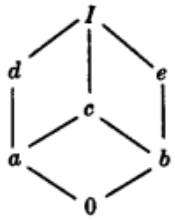
Time: 2 Hours **Maximum Marks: 70**

Section A

Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)

1.	Consider $C = \{2, 4, 8, 16, 32\}$ ordered by divisibility, draw the Hasse diagram of this totally ordered set.	BL3	CO1
2.	Write the dual of the following statements in lattice $(L, \vee, \wedge)$, (a) $a \wedge (b \vee c) = (a \wedge b) \vee (a \wedge c)$ (b) $a \wedge a = a$ (c) $a \vee (a \wedge b) = a$	BL3	CO1
3.	Consider the poset $P(\{x, y\})$ with subset inclusion $\subseteq$. Analyze the structure and determine the supremum and infimum of $\{\{x\}, \{y\}\}$. Justify your answer.	BL2	CO1
4.	Write the dual of each Boolean equation: (a) $(a * 1) * (0 + a') = 0$ (b) $a + a'b = a + b$	BL3	CO1
5.	State and prove Boundedness laws in Boolean algebra.	BL2	CO1
6.	Convert the Boolean expression $x' + x(x + y')(y + z')$ into sum of products form.	BL2	CO1
7.	Distinguish between Symmetric and Skew-symmetric matrices.	BL1	CO2, CO3
8.	Explain about Homogenous linear system of equations.	BL1	CO2, CO3
9.	Explain the Cramer's rule for system of three linear equations in three unknowns.	BL1	CO2, CO3

(PTO)

10.	Find the determinant of the matrices; (a) $\begin{bmatrix} 4 & 6 \\ 2 & 3 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & -1 & 3 \\ 4 & 0 & 6 \\ 1 & 1 & 0 \end{bmatrix}$	BL2	CO2, CO3
	Section B		
	Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)		
11.	Consider the English alphabet $A = \{a, b, c, \ldots, y, z\}$ with the usual (alphabetical) order. A^* consisting of all words in A. Consider the following list of words in A^*: "went, forget, to, medicine, me, toast, melt, for, we, arm" (a) Sort the list of words using the short-lex order. (b) Sort the list of words using the usual (alphabetical) order of A^*.	BL1	CO1
12.	What is a non-distributive lattice and give two examples.	BL2	CO1
13.	Consider the lattice L in given Hasse diagram, (a) Find complements, if they exist, for the elements, a, b and c. (b) Is L a complemented lattice? 	BL3	CO1
14.	Let $B = \{0, 1, 2, 3\}$, and define two binary operations on B: $a + b = max(a, b)$, $a.\, b = min(a, b)$ and complement of a is $1 - a$. Check whether the algebraic structure $(B, +, .,')$ forms a Boolean algebra. Justify your answer with appropriate properties.	BL3	CO1
15.	Show that a Boolean algebra B is a bounded, distributive and complemented lattice.	BL2	CO1
16.	(a) When a Boolean expression is said to be a complete sum-of-products expression. (b) Express $E(x, y, z) = x(y'z)'$ into its complete sum-of-products form.	BL3	CO1
17.	Find the rank of the matrix $C = \begin{bmatrix} 2 & 4 & 6 \\ 1 & -1 & 0 \\ 3 & 3 & 6 \\ 5 & 1 & 6 \end{bmatrix}$.	BL3	CO2, CO3

18.	Determine the eigen values and eigen vectors of $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$.	BL3	CO2, CO3
	Section C		
	Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)		
19.	Solve the homogenous system of linear equations, $2x + 4y + z = 0$ $-x + y - 2z = 0$ $4x + 6z = 0$	BL3	CO2, CO3
20.	Let $A = \begin{bmatrix} 1 & 3 & -2 \\ 2 & 0 & 4 \\ -4 & 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & 0 \\ -3 & 2 & -2 \\ 3 & -5 & 4 \end{bmatrix}$, then show that $det(AB) = detA.detB.$	BL3	CO2, CO3
	CO : Course Outcome		
	BL : Bloom's Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)		