

QP CODE: 25050409



Reg No :

Name :

MSc DEGREE (CSS) EXAMINATION, DECEMBER 2025

First Semester

MSc CYBER FORENSICS

**Core Courses - CF010102 - LINEAR ALGEBRA AND NATURAL LANGUAGE
PROCESSING**

2019 Admission Onwards

105E6B5F

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

Answer any **eight** questions.

Weight 1 each.

1. Write the transpose of the matrix $M = \begin{bmatrix} \frac{5}{6} & \frac{1}{6} & 0 \\ \frac{5}{6} & 0 & \frac{1}{6} \\ 0 & \frac{5}{6} & \frac{1}{6} \end{bmatrix}$

2. $4x_1 + 6x_2 + 9x_3 = 6$

$6x_1 - x_3 = 20$

$5x_1 - 8x_2 + x_3 = 10$

Write the augmented matrix and coefficient matrix of the given linear system of equations.

3. Define a linear transformation.

4. Define similarity of matrices and similarity transformation.

5. "It is below freezing now, therefore it is either below freezing or raining now." Which rule of inference is used here?

6. Find the domain and range of the function $f(x) = \sqrt{x-1}$

7. If $f(x) = x^2 - 3x + 1$, find x such that $f(2x) = f(x)$

8. Explain regular expressions.

9. What is DFA?

10. What do you mean by deadlock, final state, starting state?

(8×1=8 weightage)





Part B (Short Essay/Problems)

Answer any **six** questions.

Weight 2 each.

11. Find the rank of a matrix $M = \begin{bmatrix} 5 & -2 & 1 & 0 \\ -2 & 0 & -4 & 1 \\ 1 & -4 & -11 & 2 \\ 0 & 1 & 2 & 0 \end{bmatrix}$
12. If $A=\{1,2,3\}$, $B=\{3,4\}$ and $C=\{4,5,6\}$
 i). Find $A \times (B \cup C)$
 ii). $A \times (B \cap C)$
 iii). $(A \times B) \cap (B \times C)$
13. Find the determinant of $\begin{vmatrix} 2 & 0 & -4 & 6 \\ 4 & 5 & 1 & 0 \\ 0 & 2 & 6 & -1 \\ -3 & 8 & 9 & 1 \end{vmatrix}$
14. Determine whether $S=\{[x \ y \ z] \in \mathbb{R}^3 / y=0\}$ is a vector space under regular addition and scalar multiplication.
15. Verify that the "transpose A^T of a square matrix A has same eigen value as A ". If $A = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$
16. Define eigen values and eigen vectors. Describe the characteristics of eigen values of symmetric, skew-symmetric and orthogonal matrices.
17. i) What is the condition for $p \Rightarrow q$?
 ii) Write the 2 associative laws.
18. What are formal languages and grammar?

(6×2=12 weightage)

Part C (Essay Type Questions)

Answer any **two** questions.

Weight 5 each.

19. Solve the linear system of equation using Gauss Elimination method.
 $x+y-z=9$
 $8y+6z=-6$
 $2x+4y-6z=40$
20. Verify the triangle inequality for the vectors $[3 \ 1 \ -4]^T$ and $[-4 \ 8 \ -1]^T$.
21. Explain set and its operations. Also explain different types of sets with examples.





22. a) What do the statement $\forall x < 0 (x^2 > 0)$, $\forall y \neq 0 (y^3 \neq 0)$ and $\exists z > 0, (z^2 = 2)$. Mean where the domain in each case consist of real number.

b) Show the hypothesis.

"It is not sunny this afternoon and it is colder than yesterday." "We will go swimming only if it is sunny." "If we donot go swimming then we will take a triop." and "If we take a trip then we will be home by sunset."

"Lead to the conclusion we will be home by sunset."

c) Use the rules of inference to show that if the premises " All zebras has stripes" and " Mark is a zebra" are true, then conclusion " Mark has stripes" is true.

(2×5=10 weightage)

