JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

B.Tech.-III Semester (CS/IT)

COURSE CODE (CREDITS): 25B11MA314 (3) MAX. MARKS: 15

COURSE NAME: Mathematical Foundations for Artificial Intelligence and Data Science

COURSE INSTRUCTOR: SST MAX. TIME: 1 Hour

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.

(c) Use of calculator is not allowed.

Q. No.	Question	CO	Marks
Q1	Determine whether the set $\{M \in \boldsymbol{M_{3\times3}}(\mathbb{R}): det(M) = 0\}$, is a subspace of a vector space of real matrices of order 3×3.	1	3
Q2	Examine whether or not the vectors (1,1,2), (1,2,5) and (5,3,4) are linearly independent.	2	3
Q3	If $T: \mathbb{R}^2 \to \mathbb{R}^2$ be defined by $T(x, y) = (3x + 5y, 2x - 3y)$. Verify that T is a linear transformation.	1	3
Q4	Given that M: $\mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation defined by $M(x, y) = (x + y, 3x - 2y)$. Obtain the matrix representation of M with respect to basis $\{(1, 1), (2, -1)\}$.	1	3
Q5	a) Find the kernel of the linear transformation $T: \mathbb{R}^3 \to \mathbb{R}^2$, defined by $T(x) = \begin{bmatrix} 1 & -1 & 2 \\ 3 & 2 & -5 \end{bmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$. b) What is the rank of linear transformation $T: \mathbb{R}^6 \to \mathbb{R}^{10}$, if the nullity of T is 3?	1	2+1