

# Kathmandu University

First In-Semester Exam-2025

Department of Artificial Intelligence, Panchkhal

Level: B.Tech Artificial Intelligence

Course: AIMA 104

Year: I

Semester: II

Time: 60 minutes

F.M. : 20

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*Write the answer according to the mark allocated to it. For short questions, write short answers, for long questions write long answers.*

1. For a matrix  $A$  of order  $m \times n$ . Show that  $\text{Null}(A)$  is a subspace of  $\mathbb{R}^n$ . [2]

2. Show that the transformation  $T(x) = x + 3$  is not linear. [2]

3. Describe the transformation of the following matrix geometrically:  $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ . [2]

4. Prove: The transformation  $T : V \rightarrow W$  is linear, then  $T(0) = 0$ . [2]

5. Verify Rank Nullity Theorem:  $\begin{bmatrix} 1 & 2 & 3 \\ 6 & 5 & 4 \\ 7 & 8 & 9 \end{bmatrix}$ . [4]

6. Show that the transformation that rotates each point in  $\mathbb{R}^2$ , about the origin, through an angle  $\phi$  counterclockwise, is a linear transformation by find the standard matrix of the transformation. [4]

7. Solve:  $x_2 + 4x_3 = -5$ ,  $x_1 + 3x_2 + 5x_3 = -2$ ,  $3x_1 + 7x_2 + 7x_3 = 6$ . [4]