Kathmandu University

Second In-Semester Exam-2025

Department of Artificial Intelligence

Level: B.Tech Artificial Intelligence	Course: AIMA 104
Year: I	Semester: II
Time: 60 minutes	F.M. : 20

1. Find the all the eigen-spaces of $A = \begin{bmatrix} 4 & 1 & 1 \\ 2 & 4 & 1 \\ 0 & 1 & 4 \end{bmatrix}$? [4]

2. Diagonalize the matrix, if possible: $\begin{bmatrix} 4 & 2 & 2 \\ 2 & 4 & 2 \\ 2 & 2 & 4 \end{bmatrix}$. [2]

3. Give an example of similar matrices [2].

4. For a subset W of a vector space V, show that $W^{\perp}$ is a subspace V. [2]

5. Let $\{u_1, ..., u_p\}$ be an orthogonal basis for a subspace W of $\mathbb{R}^n$. Prove that, for each y in W, the coordinates of y with respect to the orthogonal basis : $y = c_1u_1 + \ ... \ c_nu_n$ are given by $c_j = \dfrac{y.u_j}{u_j.u_j}$. [4]

6. Find an orthogonal basis for the column space of the matrix $\begin{bmatrix} -1 & 6 & 6 \\ 3 & -8 & 3 \\ 1 & -2 & 6 \\ 1 & -4 & -3 \end{bmatrix}$, given that the columns are linearly independent. [4]