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LNCT UNIVERSITY, BHOPAL

Enrollment No. .....

CS-202
B.TECH II SEMESTER
EXAMINATION [JUNE-2025]
LINEAR ALGEBRA AND OPTIMIZATION

Maximum Marks: 70 **Time Allowed: 3Hours**

Note: - Attempt all questions internal choice are given.

(SECTION –A)

1. Short Answer Type Questions (Attempt Any Five) [5x6=30]

i. Show that the vectors (2, 1, 4), (1, -1, 2), (3, 1, -2) form a basis for R^3
ii. Write a short note on Eigen Decomposition
iii. Find whether the set of vectors $v_1 = (1, 2, 1)$, $v_2 = (3, 1, 5)$, $v_3 = (3, -4, 7)$ is linearly independent or dependent.
iv. What is difference of means and correlation coefficients.
v. Fit Poisson's distribution to the following and calculate theoretical frequencies ($e^{-.5}=0.61$)

Deaths: x	0	1	2	3	4
Frequency f	122	60	15	2	1

vi. Show that the set W= $\{(a, b, 0): a, b \in F\}$ is a subspace of $V_3(F)$.
vii. If the heights of 300 students are normally distributed with mean 64.5 inches and standard deviation 3.3 inches, find the height below which 99% of students lie.

(SECTION –B)

2. Long Answer Type Questions (Attempt Any Four) [4x10=40]

i. The intersection of any two subspaces of a vector space V(F) is also a subspace of V(F).
ii. Write a short note on the test of significance of correlation coefficient in case of small samples.
iii. Fit a straight line to the following data regarding x as the independent variable:

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

iv. Find the mean and variance of the Poisson's distribution.
v. Find the singular value Decomposition of the matrix $A = \begin{bmatrix} 2 & 2 \\ -1 & 1 \end{bmatrix}$.
vi. Show that the mapping $f: V_2(R) \to V_3(R)$ defined by $f(a, b) = (a, b, 0)$ is a linear transformation.
