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LNCT UNIVERSITY. BHOPAL

EnrolmentNo.....

CS-202UC

B.TECH (CS/AI ML) II SEMESTER

EXAMINATION [JULY-2024]

LINEAR ALGEBRA AND OPTIMIZATION

Maximum Marks:70

Time Allowed :3Hours

Note:-Attempt all questions internal choice are given.

(SECTION -A)

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

- Define Kernel of a homomorphism.
- Define Singular linear transformation.
- Find the rank and nullity of the linear transformation $T: R^3 \rightarrow R^3$ defined by $T(x_1, x_2, x_3) = (x_1 + x_2, 2x_3 - x_1)$.
- Solve the linear equations $2x - y = 17$, $3x + 5y = 6$ by Cramer's rule.
- Toss a balanced coin twice. Let X denote the number of heads. Find Probability Mass Function (pmf) of X . Define Standard deviation (S.D.).
- Fit a straight line $y = a + bx$ for the following data using least square method:

x	1	2	3	4	6	8
y	2.4	3	3.6	4	5	6

(SECTION -B)

2. Long Answer Type Question (Attempt Any Four). [04x10=40]

- Show that the transformation mapping $f: V_2(R) \rightarrow V_2(R)$ defined by $f(x, y) = (x + 2, y + 3)$ is not linear.
- Solve the system of linear equations by Cholesky Decomposition method;
 $x + 2y + 3z = 5$, $2x + 8y + 22z = 6$, $3x + 22y + 82z = -10$
- For the Binomial distribution, prove that:

$$P(r + 1) = \frac{(n-r)}{(r+1)} \cdot \frac{p}{q} \cdot P(r).$$

- Fit a curve of the form $y = a + bx + cx^2$ for the following data using least square method;

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

- In an Antimalarial campaign in India, quinine was administered to 500 persons out of a total population of 2000. The number of fever cases is shown below;

Treatment	Fever	No Fever	Total
Quinine	20	480	500
No Quinine	100	1400	1500
Total	120	1880	2000

Discuss the usefulness of quinine in checking malaria.

- Define the following;
 - Non-Singular linear transformation
 - Vector Space
 - Random Variable
 - Probability Mass Function
 - Continuous Distribution

