National Forensics Sciences University, Goa Campus
TA-1 Examination

Program Name – MTECH AIDS   Sem – I   Date- 09-09-2024

Subject Name- Mathematical and Computational Foundations for AI   Subject Code - CTMTAIDS SI 1

Time- 45 mins   Max. Marks- 25

Instructions - 1) Answer all questions. 2) Assume suitable data.

Q.1 Multiple Choice Questions (1 mark each) — 10 marks

1. Which of the following is not a property of a vector space?
   - A. Closure under addition
   - B. Existence of additive inverse
   - C. Existence of multiplicative identity
   - D. Commutative property of scalar multiplication
2. Given a set of vectors in R^2, which condition is necessary for the set to be a vector space?
   - A. It contains the zero vector
   - B. All vectors have the same magnitude
   - C. All vectors point in the same direction
   - D. It contains at least one non-zero vector
3. If V is a vector space, which of the following must hold true for any vector $v \in V$ and scalar $a \in R$?
   - A. $v+v=v$
   - B. $a \cdot v \in V$
   - C. $v \cdot v=1$
   - D. $v+0=0$
4. Which of the following sets is a vector space?
   - A. The set of all 2x2 matrices with determinant 1
   - B. The set of all polynomials of degree 2 or less
   - C. The set of all real numbers greater than zero
   - D. The set of all vectors with integer coordinates
5. For a set of vectors to form a basis for a vector space V, the vectors must be:
   - A. Linearly dependent
   - B. Orthogonal
   - C. Linearly independent and span V
   - D. Linearly independent but not spanning V

$-2+2 = 0$

Q.2 Answer any 4 questions (4x5 marks each) — 20 Marks

2(1) $R_3 - R_2$

A. Define Vector spaces and write 5 properties.

$-2+2 = 0$

$-2(-2)$

$-2+2$

0

B. Solve the following system of equations using the row echelon method:

$$x + 2y + 3z = 9$$
$$2x + 3y + z = 8$$
$$3x + y + 2z = 7$$

Find the values of x, y, and z by reducing the system to row echelon form.

C.

. Let $A = \begin{bmatrix} 1 & 5 & -2 & 0 \\ -3 & 1 & 9 & -5 \\ 4 & -8 & -1 & 7 \end{bmatrix}$, $\mathbf{p} = \begin{bmatrix} 3 \\ -2 \\ 0 \\ -4 \end{bmatrix}$, and $\mathbf{b} = \begin{bmatrix} -7 \\ 9 \\ 0 \end{bmatrix}$. It can be shown

$\mathbf{p}$ is a solution of $A\mathbf{x} = \mathbf{b}$. Use this fact to exhibit $\mathbf{b}$ as a specific linear combina of the columns of A.

D. Write a brief over view of Simple Linear Regression.

E. Draw two vectors u(2,3) and v(-1,-2) on a graph. Then, perform vector addition to find u+v and show them on a graph sheet.

END