VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act 1956)

DEPARTMENT OF MATHEMATICS

SCHOOL OF ADVANCED SCIENCES

Fall Semester - 2019 ~ 2020

Continuous Assessment Test – I, Aug – 2018

Course Code : MAT3004
Course Name : Applied Linear Algebra
Duration : 90 Minutes

Slot: C1+TC1
Date: 20.08.2018
Max. Marks: 50

1. Solve by Gauss Elimination method $x + 9y - z = 27$; $x - 8y + 16z = 10$; $2x + y + 5z = 37$. [10 marks]

2. Solve by LU decomposition method $x + 2y - z = -3$; $y - z = 1$; $3x - y + z = 4$. [10 marks]

3. (a) Find the inverse of the matrix using Gauss Jordan elimination

$$\begin{bmatrix} 7 & 2 & 1 \\ 0 & 3 & -1 \\ -3 & 4 & -2 \end{bmatrix}.$$

[5 marks]

(b) Let $x_1, x_2, \ldots, x_n$ be vectors in a vector space V. Then the set $W = \{a_1x_1 + a_2x_2 + \cdots + a_nx_n : a_i \in R\}$ of all linear combinations of $x_1, x_2, \ldots, x_n$ is a subspace of V. [5 marks]

4. Find a basis and dimension of the following subspaces of $M_{3\times3}(\mathcal{R})$

(1) The space of all 3×3 diagonal matrices

(2) The space of all 3×3 symmetric matrices

(3) The space of all 3×3 skew-symmetric matrices [10 marks]

5. (a) Consider the polynomials $p(x) = 1 + 3x + 2x^2$, $q(x) = 3 + x + 2x^2$, $r(x) = 2x + x^2$ in $\mathcal{P}_2$. Where $\mathcal{P}_2$ is collection of all polynomials of degree less than or equal to 2. Is $\{p(x), q(x), r(x)\}$ linearly independent? [5 marks]

(b) Determine the values for q such that the following set of vectors {(1, 1, 2, 1), (2, 1, 2, 3), (1, 4, 2, 1), (1, 3, 5, q)} span $\mathcal{R}^4$. [5 marks]

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