VIT

Vellore Institute of Technology

Fall Semester 2019-2020

Continuous Assessment Test – I

Programme Name & Branch: B. Tech.
Course Code: MAT3004
Exam Duration: 90 minutes

Slot: A1+TA1+TAA1+V1
Course Title: Applied Linear Algebra
Maximum Marks: 50

Answer All the Questions $(5 \times 10 = 50)$

S.No.	Question	Course Outcome (CO)
1.	(a) Solve $Ax = b$ by Gauss-Jordan elimination method, where $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 4 & 5 \\ 1 & 4 & 7 \end{bmatrix}$, $x = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ and $b = \begin{bmatrix} 1 \\ 3 \\ 5 \end{bmatrix}$. [7]	CO1
	(b) Prove or disprove, if A and B are invertible matrices such that $A^2 = I$ and $B^2 = I$, then $(AB)^{-1} = BA$. [3]	CO1
2.	Investigate the values of λ and μ, so that the equations: $2x + 3y + 5z = 9, \quad 7x + 3y - 2z = 8, \quad 2x + 3y + \lambda z = \mu$ have (i) No solution (ii) A unique solution (iii) An infinite number of solutions. [10]	CO1
3.	(a) Let $A^{-1} = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 3 \\ 4 & 2 & 1 \end{bmatrix}$, then find the matrix B such that $AB = \begin{bmatrix} 1 & 2 \\ 0 & 1 \\ 4 & 1 \end{bmatrix}$. [3]	CO1
	(b) Let V be the vector space of polynomials of degree 3 over set of real numbers $\mathbb{R}$. Determine whether the polynomials $u = t^3 + 4t^2 - 2t + 3$, $v = t^3 + 6t^2 - t + 4$, $w = 3t^3 + 8t^2 - 8t + 7$ are linearly independent. [7]	CO2
4.	Let V be the vector space of all 3×3 matrices whose entries are real numbers. Let $W = \{A \in V : A \text{ is symmetric matrix}\}$. (i) Show that W is subspace of vector space V. (ii) Find a basis of W. (iii) Find the dimension of W. [10]	CO2
5.	(a) Let W be subspace of vector space $\mathbb{R}^4$ spanned by the vectors $(1,4,-1,3), (2,1,-3,-1)$, and $(0,2,1,-5)$. Find a basis for W and extend it to a basis for $\mathbb{R}^4$. [5]	CO2
	(b) Prove that if the vector space V is the direct sum of subspaces U and W then for any vector $v \in V$, there exist unique $u \in U$ and $w \in W$ such that $v = u + w$. [5]	CO2