VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Winter Semester– 2019 ~ 2020

Continuous Assessment Test – I

Programme Name & Branch: B.Tech

Course Name & Code: Applied Linear Algebra & MAT 3004

Slot: A1+TA1+TAA1

Exam Duration: 90 min

Maximum Marks: 50

Answer all the Questions	
S.No.	**Questions**
1.	A. Consider the system of equations $$x_1 + 2x_2 + 3x_3 = b_1$$ $$2x_1 + 5x_2 + 3x_3 = b_2$$ $$x_1 + 8x_3 = b_3.$$ a) What are the pivots? b) List the free and basic variables for the above system. c) Under what conditions on b_1, b_2, b_3, the above system of equations is consistent? [10]
2.	A. Let $A = \begin{bmatrix} 1 & 0 & -2 \\ 0 & 4 & 3 \\ 0 & 0 & 1 \end{bmatrix}$. a) Find elementary matrices E_1, E_2 and E_3 such that $E_1E_2E_3A = I$ b) Write A as a product of elementary matrices. [7] B. Find the LU decomposition of $A = \begin{bmatrix} 1 & 3 & -1 \\ 2 & 5 & 1 \\ 3 & 4 & 2 \end{bmatrix}$. [8]
3.	Let $V = R^2$. Define an operation $(u, v) \oplus (x, y) = (u + x, 0)$, $\alpha \odot (x, y) = (\alpha x, \alpha y)$ for $(u, v), (x, y) \in V, \alpha \in R$. Under the operations $\oplus$ and $\odot$, determine whether V forms vector space over R or not. [5]
4.	A. Prove that a vector x in a vector space V has a unique additive inverse. [5] B. Let $S = \{(1,1,1,1), (1,-1,1,2), (1,1,-1,1)\} \subset R^4$. Check whether the vector $(1,1,2,1)$ is in $L(S)$ or not. [5]
5.	Let $W = \{(x, y, z, w) \in R^4 \mid x + y - z + w = 0, x + y + z + w = 0\}$. a) Prove that W forms a subspace of R^4. b) Find the basis and dimension of W. [10]