

**VIT**

Vellore Institute of Technology

Winter Semester– 2019 ~ 2020

Continuous Assessment Test – I

Programme Name &amp; Branch: B.Tech

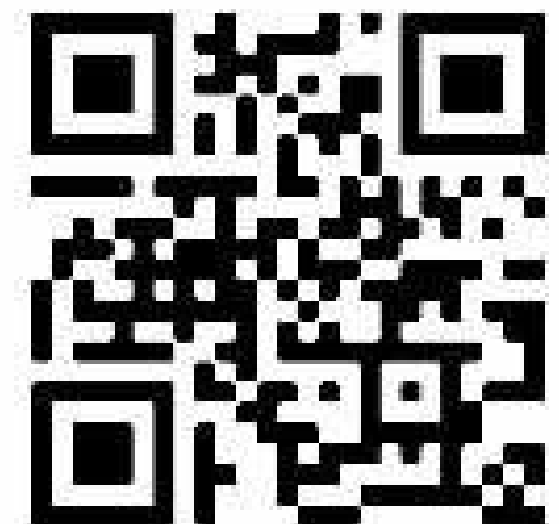
Course Name &amp; Code: Applied Linear Algebra &amp; MAT 3004

Exam Duration: 90 min

Slot: A1+TA1+TAA1

Maximum Marks: 50

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



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