VIT

Vellore Institute of Technology

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

Continuous Assessment Test –II

Programme Name & Branch: B.Tech All | **Exam Duration: 90 mins** | **Slot:A2+TA2**

Semester: Winter Semester-2019-20 | **Maximum Marks: 50**

Course Code: MAT3004 | **Course Title: Applied Linear Algebra**

Exam Mode: Closed book

Answer any FIVE questions (5 x 10 = 50 Marks)

S.No.		Question	Marks
1.		Find row space, column space and null space of the following matrix $$A = \begin{bmatrix} -1 & 2 & 0 & 4 & 5 & -3 \\ 3 & -7 & 2 & 0 & 1 & 4 \\ 2 & -5 & 2 & 4 & 6 & 1 \\ 4 & -9 & 2 & -4 & -4 & -7 \end{bmatrix}$$	[10]
2.	(a)	Find the rank of a 5×7 matrix A for which Ax=0 has a 2-dimensional solution space. Also, find the number of solutions of Ax=0 if A is a 5×7 matrix of rank 3.	[5]
	(b)	Find the equation of a circle that passes through the three points $(2,-2)$, $(3,5)$, $(-4,6)$) in the plane R^2.	[5]
3.	(a)	Find the basis and dimension of $U \cap V$, where $U = \{(x,y,z); 2x+3y+z=0\}$ and $V = \{(x,y,z); x+2y-z=0\}$ are the subspaces of R^3.	[5]
	(b)	Check whether $T: R^3 \to R^3$ defined by $T(x,y,z) = (\lvert x \rvert + 1, y+z, 0)$ is a linear transformation or not.	[5]
4.		Consider the linear transformation $T: R^2 \to R^3$ defined by $T(x,y) = (3x-2y, 0, x+4y)$. Find the matrix of T w.r.t. bases $\alpha = \{(1,1),(0,2)\}$ and $\beta = \{(1,1,0),(1,0,1),(0,1,1)\}$. Also, Prove $[T(v)]_\beta = [T]_\alpha^\beta [v]_\alpha$	[10]
5.	(a)	If the matrix of linear transformation on R^2 relative to the standard bases of R^2 is given by $\begin{bmatrix} 2 & -3 \\ 1 & 1 \end{bmatrix}$. Find the linear transformation of T on R^2.	[5]
	(b)	Let V and W be the vector spaces. If $T: V \to W$ is an invertible linear transformation. Prove that the inverse $T^{-1}: W \to V$ is also linear.	[5]
6.		Let α be the standard basis for R^3 and $S,T: R^3 \to R^3$ be two linear transformations given by $S(e_1) = (2,2,1)$, $S(e_2) = (0,1,2)$, $S(e_3) = (1,2,1)$ and $T(e_1) = (1,0,1)$, $S(e_2) = (0,1,1)$, $S(e_3) = (1,1,2)$. Compute the following $[S+T]_\alpha$, $[2T-S]_\alpha$, $[T \circ S]_\alpha$.	[10]