VIT®

Vellore Institute of Technology

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REG. NO.:

SLOT: B2+TB2

SCHOOL OF ADVANCED SCIENCES
DEPARTMENT OF MATHEMATICS
FALL SEMESTER – 2024-2025

Continuous Assessment Test – II

Programme Name & Branch	:	BCA/BCS
Course Code & Course Name	:	UMAT201L & Linear Algebra
Class Number(s)	:	VL2024250102594/2598/2596
Faculty Name(s)	:	Dr. Arun Choudhary/ Dr. Prakash M/ Dr. Radhika T
Date of Examination	:	14-10-2024
Exam Duration	:	90 Minutes Maximum Marks : 50

General Instruction(s):

- Answer ALL Questions.
- Statistical tables can be permitted.
- Non-programmable calculator is permitted.

Q. No.	Questions	Marks
1.	Find (a) the null space of A, and (b) Find the row space and column space of A, where the matrix A is $$A = \begin{pmatrix} 2 & 4 & 1 & 3 \\ 1 & 2 & 0 & 1 \\ 0 & 0 & 3 & 6 \\ 1 & 3 & 1 & 5 \end{pmatrix}$$	10
2.	Let V and W be a subspace of $\mathbb{R}^4$ spanned by $v_1 = (1,2,0,1), v_2 = (0,1,1,1), v_3 = (1.3,1,2)$ and $w_1 = (2,5,0,3), w_2 = (0,2,1,2), w_3 = (1,2,1,1)$. Find the (a) $dim(V)$, (b) $dim(W)$, (c) $dim(V+W)$ and (d) $dim(V \cap W)$	10
3	(a). Find the rank and nullity of the matrix $$A = \begin{pmatrix} 1 & 1 & 4 & 1 & 2 \\ 0 & 1 & 2 & 1 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & -1 & 0 & 0 & 2 \\ 2 & 1 & 6 & 0 & 1 \end{pmatrix}$$	5
	(b). Show that the linear transformation $T : P_3 \to P_2$ given by $T(p) = p'$ where p' is the derivative of p, is not one-to-one but is onto.	5

4.	Determine the linear mapping $T : \mathbb{R}^3 \to \mathbb{R}^2$ which maps the basis vectors $\mathbf{v_1} = (1,1,0), \mathbf{v_2} = (0,1,1), \mathbf{v_3} = (1,0,1)$ of $\mathbb{R}^3$ to the vectors $\mathbf{w_1} = (2,3), \mathbf{w_2} = (1,4), \mathbf{w_3} = (5,0)$ respectively. Then (i) Find $T(6,0,-1)$, (ii) Find $T(3,-2,-1)$.	10
5.	A linear mapping $T : \mathbb{R}^3 \to \mathbb{R}^3$ is defined by $T(x,y,z) = (x-y, x+2y, y+3z), (x,y,z) \in \mathbb{R}^3$. Show that T is non-singular and determine its inverse.	10

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