



VIT

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

REG.NO.: 24BBT0057

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - I
FALL SEMESTER 2025-2026

SLOT:A1+TA1+TAA1

Programme Name & Branch : B.Tech & Biotechnology
Course Code and Course Name : BMAT203L & Linear Algebra and Differential Equations
Faculty Name(s) : Dr. A. G. Vijaya Kumar, Dr. K. Raghavendar
Class Number(s) : VL2025260100708, VL2025260100702
Date of Examination : 17-08-2025
Exam Duration : 90 minutes Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- CO1-Solve a system of equations by matrix method.
- CO2-Apply concepts of sequences and series to model real life problems.

Q. No	Question	M	CO	BL
1.	Consider the following system of linear equations. $\begin{aligned} x_1 + 2x_2 + 2x_3 + ax_4 &= 1 \\ x_1 + 3x_2 + 3x_3 - ax_4 &= 1 \\ x_1 - x_2 - x_3 + a^2x_4 &= 3. \end{aligned}$ Determine the conditions on the parameter a such that the system of linear equations have (a) unique solution (b) No solution (c) Infinitely many solutions.	10	1	3
2.	Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.	10	1	3
3.	a) Given $A = \begin{pmatrix} 1 & 4 \\ 3 & 2 \end{pmatrix}$, Find the eigenvalues of $A^3 - 3A + I$.	5	1	2
	b) Let $B = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}$, Find the reduced row echelon form of the matrix $[B I_{2 \times 2}]$ and hence find the inverse of the matrix B . Here $I_{2 \times 2}$ is the identity matrix.	5		
4.	a) Discuss the monotonicity of the sequence $\{\log(n) - n\}_{n=1}^{\infty}$.	5	2	3
	b) Discuss the convergence of the series $\sum_{n=1}^{\infty} \left(\frac{2^n - 1}{3^n}\right)$. If the series converges, find the sum of the series.	5		
5.	a) Determine whether the following series converge or diverge. $\sum_{n=1}^{\infty} \left(\frac{(-1)^{n-1}}{2n+5}\right)$	5	2	3
	b) Does the series $\sum_{n=1}^{\infty} \left(\frac{ \sin(n) }{n^2}\right)$ converge?	5		