



School of Advanced Sciences

Fall Semester 2024-2025

Continuous Assessment Test – I

Programme Name & Branch: B.Tech. Biotechnology

Slot: C1+TC1+TCC1

Course Name & code: Linear Algebra and Differential Equations & BMAT203L

Class Number (s): 2604

Exam Duration: 90 Min.

Maximum Marks: 50

General instruction(s): Answer ALL Questions.

Q.No.	Question	Max Marks
1.	Consider the following system of linear equations $\begin{aligned}2x + 2y - 2z + 2w &= 1 \\x + y + z + w &= 0 \\x + y - z + aw &= 2.\end{aligned}$ 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
2.	Find eigenvalues and eigenvectors of the matrix $A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix}$.	10
3.	(a) Let $A = \begin{pmatrix} 1 & 4 \\ 4 & 1 \end{pmatrix}$. Find the eigenvalues of $A^3 + 2A^2 + 3A$. (b) Let $A = \begin{pmatrix} 2 & 5 \\ 6 & 3 \end{pmatrix}$. Find the reduced row echelon form of A and hence find the rank of the matrix A .	10
4.	(a) Show that the sequence $\{S_n\}$, where $S_n = \frac{1}{n+1} + \frac{1}{n+2} + \dots + \frac{1}{n+n}, \forall n \in \mathbb{N}$ is convergent. (b) Discuss the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^2+3}}$.	10
5.	(a) Show that the sequence $\{\frac{n}{n+1}\}$ is monotonic. (b) Find the values of x , such that the series $\left\{\left(\frac{n^2-1}{n^2+1}\right)x^n\right\}_{n=1}^{\infty}$ is convergent.	10