VIT

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

SCHOOL OF ADVANCED SCIENCES
DEPARTMENT OF MATHEMATICS
FALL SEMESTER 2023-24
CONTINUOUS ASSESSMENT TEST – II

Programme Name & Branch	: B.Tech.
Course Code	: BMAT201L
Course Name	: Complex Variables and Linear Algebra
Exam Duration	: 90 minutes **Maximum Marks: 50**

General instruction(s): Answer All Questions (5 × 10 = 50).

Q. No.	Question	Marks
1.	By using contour integration, evaluate the integral $$\int_0^\infty \frac{1 - \cos x}{x^2}\,dx.$$	10
2.	Find the values of b and c for which the matrix: $$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 3 & b \\ 0 & b & c \end{bmatrix}$$ has $\begin{bmatrix} 1 & 0 & 1 \end{bmatrix}^T$ as an eigen vector. For these values of b and c calculate all the eigen values and corresponding eigen vectors of the matrix A.	10
3.	Find an equation relating a, b and c so that the linear system: $$2x + 2y + 3z = a,$$ $$3x - y + 5z = b,$$ $$x - 3y + 2z = c,$$ is consistent for any values of a, b and c. Find all solutions when that condition holds.	10
4.	Let V be the vector space of all 3×3 matrices whose entries are real numbers. Let $$W = \left\{ A = \begin{bmatrix} a & 0 & b \\ -e & d & -c \\ -b & c & e \end{bmatrix} \in V : \text{Trace }(A) = 0 \right\}.$$ Determine whether the set W is subspace of vector space V or not. If it is, then find the basis and dimension of W.	10
5.	If the matrix A is given as follows: $$A = \begin{bmatrix} 1 & 2 & 0 & 3 \\ 3 & 2 & -1 & 0 \\ 2 & -1 & 0 & 1 \end{bmatrix}.$$ (i) Find the bases for row space and column space of matrix A, and also determine rank of A. (ii) Find a basis for null space of matrix A, and also determine nullity of A.	10