



# VIT\*

Vellore Institute of Technology  
(Deemed to be University under section 3 of U.A.C. Act, 1956)

SLOT: A2+TA2+TAA2

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 ( $5 \times 10 = 50$ ).

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 $[1 \ 0 \ 1]^T$ 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: $\begin{aligned} 2x + 2y + 3z &= a, \\ 3x - y + 5z &= b, \\ x - 3y + 2z &= c, \end{aligned}$ 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 $3 \times 3$ 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