

Reg. No.:

Name :



VIT

Vellore Institute of Technology

Postgraduate School of Technology, Vellore - 690019

Continuous Assessment Test (CAT)- II- June 2023

Programme	: B.Tech.	Semester	: Fall Inter2022-23
Course Title	: Complex Variables and Linear Algebra	Code	: BMAT201L
		Slot	: D2+TD2+TDD2
Faculty	: Dr. P. Durgaprasad, Dr. Tharasi Dilleswar Rao, Dr. C. Rajivganthi, Dr. Pankaj Shukla, Dr. B. Jaganathan	Class Nbr	: CH2022232500604, 05, 06, 07, 09
Duration	: 1 ½ Hours	Max. Marks	: 50

Answer all the Questions (50 marks)

- | Q.No. | Question Description | Marks |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1. | Using the complex variables techniques, evaluate the integral
$\int_{-\infty}^{\infty} \frac{x dx}{(x^2 + 1)(x^2 + 2x + 2)}$ | [10] |
| 2. | a) A complex function $f(z)$ is defined as follows
$f(z) = \begin{cases} z\bar{z}, & x \geq 0 \\ 2z, & x < 0 \end{cases}$
Evaluate $\int_C f(z) dz$, where C is the arc from $z = -1 - i$ to $z = 3 + 6i$ along the curve $y = x^3$. | [7+3] |
| 3. | b) Find the residue for $f(z) = z^3 e^{\frac{1}{z}}$
Find the value of m such that the vectors $S = \{(m, 7, -4), (-2, 2, 1), (2, 1, -2)\}$ will form a basis for R^3 . If so express any $(x, y, z) \in R$ as a linear combination of vectors in S . | [10] |
| 4. | Let $P_3(\mathbb{R})$ be a vector space of polynomials of degree less than or equal to 3 then prove that W is a subspace of $P_3(\mathbb{R})$ containing polynomials whose root is 2. And find the basis of W . | [10] |
| 5. | Consider the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ 1 & 1 & 1 & 1 \\ 3 & 5 & 7 & 9 \end{bmatrix}$ | [10] |
| | i) Find the bases and dimension for the row space, column space of A
ii) Is the row space equal to the column space?
iii) Find the null space of the transpose of matrix A . | |

