Reg. No.:

Name :

VIT

Vellore Institute of Technology

Continuous Assessment Test (CAT)- II– March 2023

Programme	:	B.Tech.	Semester	:	Winter 2022-2023
Course Title	:	Complex Variables and Linear Algebra	Code	:	BMAT201L
Faculty	:	Dr. Kalyan Banerjee, Dr. Jaganathan B, Dr. Radha S, Dr. Dhanasekar S, Dr. Manivannan A, Dr. Vijay Kumar P, Dr. M. Dhivya, Dr. Sudip Debnath, Dr. Durgaprasad P, Dr. M. Prasannalakshmi, Dr. Amit Kumar Rahul, Dr. P. Sushmitha, Dr. Kamalesh Acharya, Dr. Manoj Kumar Singh	Slot	:	A2+TA2+TAA2
			Class No.	:	CH2022235001045, 38, 50, 47, 48, 41, 49, 39, 40, 51, 44, 43, 42, 46
Duration	:	1 ½ Hours	Max. Marks	:	50

Answer all the questions (50 Marks)

Q.No.	Question Description	Marks
1.	(a) Let $\sum_{n=-\infty}^{\infty} b_n z^n$, be the Laurent series expansion of the function $\frac{1}{z^2 \sinh z}, 0 < \lvert z \rvert < \pi$ Then, find the value of b_{-1}. (b) Let the circle $\gamma = \{z \in \mathbb{C}: \lvert z \rvert = 2\}$ be oriented in the contour-clockwise direction. Then, evaluate $\frac{1}{2\pi i}\oint_{\gamma} z^7 \cos\left(\frac{1}{z^2}\right) dz$.	5+5
2.	(a) Evaluate $\oint_C \cot z \, dz$, where C is the circle $\lvert z \rvert = 5$. (b) Evaluate $\int_0^{2\pi} \frac{d\theta}{\sqrt{2}-\cos\theta}$.	5+5
3.	Apply Gauss Elimination method to determine the values of a and b for which the following system has infinite number of solutions and find the solution. $5x + 3y + 7z = 4$ $3x + 26y + 2z = 9$ $7x + 2y + az = b$	10
4.	(a) Find the value of p such that $\begin{bmatrix}1\\2\\3\end{bmatrix}$ is an eigen vector of the matrix $\begin{bmatrix}4 & 1 & 2\\ p & 2 & 1\\ 14 & -4 & 10\end{bmatrix}$. (b) Using Cayley-Hamilton theorem, for the given matrix $A = \begin{bmatrix}2 & 1 & 1\\ 0 & 1 & 0\\ 1 & 1 & 2\end{bmatrix}$, find A^{-1} and $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 7A^2 - 2A + I$.	5+5
5.	a) Verify if the set of all 2×3 matrices for which the sum of entries in the first row equals the sum of entries in the second row is a vector subspace with respect to Matrix addition and scalar multiplication of matrix. b) Let $V = C(\mathbb{R})$, be the vector space of all continuous functions on $\mathbb{R}$. Which of the following are subspaces of V? i)W is the set of all continuous odd functions. (a function f is said to be odd function if $f(-x) = -f(x)$ for all x) ii)W is the set of all differentiable functions on $\mathbb{R}$.	5+5