Reg. No.:

Name :

VIT®

Vellore Institute of Technology

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

Continuous Assessment Test II (CAT - II) October 2023

Programme	:	**B.Tech**	Semester	:	**Fall 2023-24**
Course Title	:	**Complex Variables and Linear Algebra**	Code	:	**BMAT201L**
			Slot(s)	:	**A1**
Faculty	:	**Dr. S. Balaji, Dr. Ashish Kumar Nandi, M Dhivya, Dr.Mohana N, Dr. G. Hannah Grace, Dr. Abhishek Kumar Singh, Dr. Sudip Debnath**	Class Nbr(s)	:	**CH2023240101002, 03,04,05,06,07,08.**
Duration	:	**1 ½ Hours**	Max. Marks	:	**50**

Answer all the Questions
(5x10 = 50 marks)

Q.No.	Sub. Sec.	Question Description	Marks
1	a	Find the value of the integral $\int_C \frac{z^3+z+1}{z^2+2z+5}dz$, where $C: \lvert z+1-i \rvert = \frac{1}{3}$	5
	b	Using Cauchy Integral formula, evaluate $\int_c \frac{e^{3z}}{(z-log2)^4}dz$, where C is the square with vertices at $\pm 1, \pm i$.	5
2		Evaluate $\int_0^{2\pi} \frac{d\theta}{13+5sin\theta}$ by using contour integration.	10
3		Eva invests a total Rs. 10,000 in three accounts, one paying 5% interest, another paying 8 % interest and third paying 9% interest. The annual interest earned on the three investments last year was Rs. 770. The amount invested at 9% was twice the amount invested at 5%. How much was invested at each rate.	10
4		Find the value of "a" such that the given matrix has 2,2,2 as eigen value. Also, find the inverse of the matrix using Cayley Hamilton theorem $A = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ a & 0 & 2 \end{pmatrix}$	10
5	a	Express the matrix $\begin{bmatrix} 5 & 1 \\ -1 & 9 \end{bmatrix}$ as a linear combination of $A_1 = \begin{bmatrix} 1 & -1 \\ 0 & 3 \end{bmatrix}, A_2 = \begin{bmatrix} 1 & 1 \\ 0 & 2 \end{bmatrix}$ $A_3 = \begin{bmatrix} 2 & 2 \\ -1 & 1 \end{bmatrix}$	5
	b	Verify whether the given set $\{(a,b) \in \mathcal{R}^2\}$ with usual vector addition and scalar multiplication defined by $k(a,b) = (ka, b)$ is a vector space or not.	5