Reg. Number: [illegible]

VIT

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

Continuous Assessment Test (CAT) – II OCTOBER 2025

Programme	:	**B.Tech**	Semester	:	**FALL 2025 - 2026**
Course Code & Course Title	:	**BMAT201L – Complex Variables and Linear Algebra**	Slot	:	**A1+TA1+TAA1**
Faculty	:	**Dr. Srutha Keerthi B, Dr. Manivannan A, Dr. Vijay Kumar P, Dr. Dhivya M, Dr. Hannah Grace G, Dr. Sowndarrajan P T, Dr. Ashis Bera, Dr. Padmaja N, Dr. Balaji S, Dr. Jayagopal R**	Class Number	:	**CH2025260100802,CH2025260100805, CH2025260100808, CH2025260100810, CH2025260100811, CH2025260100812, CH2025260100813, CH2025260100814, CH2025260102215, CH2025260102216**
Duration	:	**1 ½ hours**	Max. Mark		**50**

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks	CO	BT Level
1.	(a)	Classify the singular points of $f(z)=\dfrac{(z^2-4)(z+3)^2}{\sin^2 \pi z}$ and hence find the residue of $f(z)$ at $z=-3$.	4	3	K2
	(b)	Evaluate $\oint_C \frac{z^3-2z^2+1}{(z-2)^2(z+3)}dz$ by Cauchy's integral formula over the contour (i) $C: \lvert z-1\rvert = 2$ and (ii) $C: \lvert z+3\rvert = 1$.	6	3	K3
2.		Evaluate $\int_0^{2\pi} \dfrac{\cos^2\theta}{1+a^2+2a\cos\theta}d\theta, \quad \lvert a\rvert<1$.	10	3	K3
3.	(a)	Let $W_1 = \left\{\begin{bmatrix} a & b \\ 0 & c\end{bmatrix} : a,b,c \in \mathbb{R}\right\}$, $W_2 = \left\{\begin{bmatrix} a & 0 \\ d & c\end{bmatrix} : a,c,d \in \mathbb{R}\right\}$. Show that W_1 and W_2 are subspaces of $M_{2\times2}(\mathbb{R})$.	5	5	K2
	(b)	Check whether the given set of vectors $\{-x^2+x+2,\ 2x^2+2x+3,\ 4x^2+1\}$ from the vector space $P_2(\mathbb{R})$ (the set of all real polynomials of degree ≤ 2) forms a basis or not. Justify your answer.	5	5	K2
4.		Find a basis and the dimension of the solution space for $W = \{(x,y,z,r,s) \in \mathbb{R}^5 : x+2y-4z+3r-s=0,$ $x+2y-2z+2r+s=0, 2x+4y-2z+3r+4s=0\}$.	10	5	K2
5.	(a)	Let $B=\{b_1(t), b_2(t)\}$, where $b_1(t)=1+t, b_2(t)=t^2$ be a subset of the vector space of all real polynomials of degree ≤ 2.	5	5	K3

		Check whether $p(t) = 2 + 3t + 4t^2$ belongs to span(B). If yes, explain why.			
	(b)	Let $P_n(\mathbb{R})$ be the vector space (over $\mathbb{R}$) of all polynomials of degree $\leq n$. Define $T: P_2(\mathbb{R}) \to P_3(\mathbb{R})$ by $T(p(x)) = \frac{d}{dx}p(x) + 4\int_0^x p(x)dx$. Check whether T is a linear transformation or not?	5	5	K3

**********All the best *************