VIT

Vellore Institute of Technology

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

CHENNAI

Reg. Number:	22BAI1266

Continuous Assessment Test (CAT) – I - FEB 2024

Programme	:	B. Tech.	Semester	:	Winter
Course Code & Course Title	:	BMAT201L & Complex Variables and Linear Algebra	Slot	:	A1+TA1+TAA1
Faculty	:	Dr. Amit Kumar Rahul, Dr. Ashish Kumar Nandi, Dr. Jaganathan B, Dr. Kalyan Manna, Dr. Manivannan A, Dr. Sagithya, Dr. Somnath Bera.	Class Number	:	CH2023240500810 CH2023240500806 CH2023240500801 CH2023240500798 CH2023240500816 CH2023240500804 CH2023240500812
Duration	:	90 Minutes	Max. Mark		50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Use statistical tables supplied from the exam cell as necessary.
- Use graph sheets supplied from the exam cell as necessary.
- Only non-programmable calculator without storage is permitted.

Answer all questions.

Q. No	Sub Sec.	Description	Marks
1.		Determine the analytic function $f(z)=u+iv$ given that $u-v=\dfrac{\cos x+\sin x-e^{-y}}{2\cos x-e^{y}-e^{-y}}$ and $f\left(\dfrac{\pi}{2}\right)=0$.	10
2.	(a)	If $\phi(x,y)=x^2-y^2-2xy-2x-y-1$ is the velocity potential of an incompressible fluid flow through a channel, then calculate the complex potential $w=\phi(x,y)+i\psi(x,y)$.	6
	(b)	Check the condition for orthogonality for the family of curves $u(x,y)=c_1$ and $u(x,y)=c_2$, when $f(z)=u+iv=\left(x^4-6x^2y^2+y^4\right)+i\left(4x^3y-4xy^3\right)$.	4
3.	(a)	Find the points where the mapping $w=e^{-\sinh z}+2$ is not conformal.	4
	(b)	Find the image of the region $z\bar{z}<1$ under the transformation $w=\left(\frac{1}{2}e^{\frac{i\pi}{2}}\right)z$.	6
4.		Determine the bilinear mapping which maps the points $z=2i,-i,0$ onto the points $w=\frac{-i}{3},\infty,5i$ respectively. Find and sketch the image of the region $\lvert z-i\rvert\leq 1$ under this transformation. List the fixed points of this mapping.	10
5.	(a)	Expand the function $f(z)=\frac{z-1}{z+1}$ as a Taylor series about the point $z=1$. Determine the region of convergence.	4
	(b)	Expand the function $f(z)=\frac{1}{z(z-1)}$ in a Laurent series which is valid for $1<\lvert z-2\rvert<2$.	6

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