# VIT

Vellore Institute of Technology

**School of Advanced Sciences**
**Fall Semester 2023-24**
**Continue Assessment Test -I**

**Programme Name and Branche:** B.Tech
**Course Code** : BMAT201L
**Course Name** : Complex Variables and Linear Algebra
**Slot** : A1+TA1+TAA1
**Duration** : 90 Minutes **Max. Marks:** 50M

| S. No | Questions | Max Marks |
|---|---|---|
| Q1 | Find the values of $a$ and $b$ such that the function $f(z) = (2x^2 + ay^2 - 2xy) + i(3bx^2 - y^2 + 4xy)$ is analytic. Also find its derivative $f'(z)$ in terms of z. | 10 |
| Q2 | In two dimensional fluid flow<br>i) Show that $\psi = (x + y)(-x^2 - y^2 + 4xy)$ can represent the stream function of incompressible fluid flow.<br>ii) Find the velocity potential $\phi$ and corresponding complex potential (as function of z). | 10 |
| Q3 | Determine the bilinear transformation which maps the points $z = 0, \infty, i$ into $w = \infty, 1, 0$. Also, determine and sketch the image of the region $\|z\| > 1$ under this transformation. | 10 |
| Q4 | Expand $f(z) = \frac{1}{z(1-z)}$, valid for the following regions:<br>$(i)\ \|z+1\| < 1$ (ii) $1 < \|z+1\| < 2$ | 10 |
| Q5 | Evaluate $\oint \frac{z+1}{(z^4-4z^3+4z^2)(z-1)} dz$, where C is the circle $\|z-2-i\| = 2$, using Cauchy's Integral formula. | 10 |