

**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 : BMAT2011

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 i) Show that $\psi = (x + y)(-x^2 - y^2 + 4xy)$ can represent the stream function of incompressible fluid flow. 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: (i) $ z + 1  < 1$ (ii) $1 <  z + 1  < 2$	10
Q5	Evaluate $\oint_C \frac{z+1}{(z^4-4z^3+4z^2)(z-1)} dz$ , where $C$ is the circle $ z - 2 - i  = 2$ , using Cauchy's Integral formula.	10