VIT
Vellore Institute of Technology

FALL SEMESTER 2023-2024
SCHOOL OF ADVANCED SCIENCES
DEPARTMENT OF MATHEMATICS

CONTINUOUS ASSESSMENT TEST – I

Programme Name & Branch	: B. Tech	
Course Code	: BMAT201L	
Course Name	: Complex Variables and Linear Algebra	
Slot	: C2+TC2+TCC2	
Duration	: 90 Minutes	**Max. Marks: 50**

General Instructions: **Answer all the following questions.** **5*10=50 Marks**

Q.No.	Question	Marks
1.	Prove that the function $f(z) = \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}, z \neq 0, f(0) = 0$, is not analytic even though Cauchy-Riemann equations are satisfied at the origin.	10
2.	Find if $\phi = (x-y)(x^2+4xy+y^2)$ can represent the equipotential for an electric field. Find the corresponding complex potential $w = \phi + i\psi$ and also ψ, if possible.	10
3.	Find the bilinear transformation which maps the points $(1, i, -1)$ onto the points $(0, 1, \infty)$. Show that the transformation maps the interior of the unit circle of the z - plane onto the upper half of the w – plane.	10
4.	Find the Laurent's series expansion of $f(z) = \frac{1}{z^2+4z+3}$ valid in the region (i) $0 < \|z+1\| < 2$, (ii) $1 < \|z\| < 3$ and (iii) $\|z\| > 3$.	10
5.	Evaluate the integral $\int_C \frac{z+4}{z^2+2z+5} dz$, where C is the circle $\|z+1+i\| = 2$ by using Cauchy's integral formula.	10