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 $f(z) = \frac{1}{z^2+1z+3}$ valid in the region (i) $0 < \lvert z+1 \rvert < 2$, (ii) $1 < \lvert z \rvert < 3$ and (iii) $\lvert z \rvert > 3$.	10
5.	Evaluate the integral $\int_C \frac{z+4}{z^2+2z+5} dz$, where C is the circle $\lvert z+1+i \rvert = 2$ by using Cauchy's integral formula.	10