# VIT

Vellore Institute of Technology

## School of Advanced Sciences

**Fall Semester 2024-2025**

**Continuous Assessment Test- I**

**Programme Name & Branch :** M.Tech
**Slot** : C1+TC1+TCC1
**Course Name &code** : Complex Variables and Linear Algebra & IMAT201L
**Class Number(s)** : Common to all C1+TC1+TCC1
**Exam Duration** : 90 Min **Max. Marks** : 50

Answer ALL the Questions

| Q. No | Question | Marks |
|---|---|---|
| 1. | Find the analytic function $f(z) = u + iv$ given that $2u - 3v = 3y^2 - 2xy - 3x^2 + 3y - x$ and $f(0) = 0$. | 10 |
| 2. | Show that $\psi = x^2 - y^2 - 3x - 2y + 2xy$ can represent the stream function of an incompressible fluid flow. Also find the corresponding velocity potential $\varphi$ and complex potential $f(z)$. | 10 |
| 3. | Find the bilinear transformation which maps the points $z_1 = 0, z_2 = -1, z_3 = i$ into the points $\omega_1 = i, \omega_2 = 0, \omega_3 = \infty$. Hence find its invariant points. | 10 |
| 4. | Find the image in the $w$-plane of the region in the $z$-plane bounded by the straight lines $x = 1, y = 1$ and $x + y = 1$ under the transformation $w = z^2$. Also discuss the conformality of the transformation. | 10 |
| 5. | Find the Laurent's series for $f(z) = \frac{1}{z(z-1)}$ valid in (i) $0 < \lvert z \rvert < 1$ (ii) $1 < \lvert z \rvert$ (iii) $0 < \lvert z - 1 \rvert < 1$ | 10 |