



**SCHOOL OF ADVANCED SCIENCES  
CONTINUOUS ASSESSMENT TEST - I  
FALL SEMESTER 2025-2026**

SLOT: C2+TC2+TCC2

**Programme Name & Branch : B.Tech**  
**Course Code and Course Name : BMAT201L - Complex Variables and Linear Algebra**  
**Class Number(s) : 0684, 0667, 0676, 0715, 0720, 0733, 0757, 0783, 0785, 0787, 0789**  
**Date of Examination : 19.08.2025**  
**Exam Duration : 90 minutes** **Maximum Marks: 50**

**General instruction(s):**

- Answer All Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyze, 5 - Evaluate, 6 - Create)
- Course Outcomes
  1. Construct analytic functions and find complex potential of fluid flow and electric fields.
  2. Find the image of straight lines by elementary transformations and to express analytic functions in power series.

Q. No	Question	M	CO	BL
1.	Verify whether $x^2 - y^2 + \frac{x}{x^2+y^2}$ can serve as a <u>stream function</u> for a two-dimensional incompressible, irrotational flow. If it does, determine the corresponding velocity potential and complex potential.	10	1	1
2. ✓	Let $w = \bar{z}$ , where $z = x + iy$ (a) Identify the real part $u(x, y)$ and the imaginary part $v(x, y)$ of $w$ . (b) Show that $u$ and $v$ do not satisfy the Cauchy-Riemann equations. (c) Determine whether the families of curves $u = c_1$ and $v = c_2$ are orthogonal in the $xy$ -plane. (d) Explain why orthogonality may still occur even if the function is not analytic.	10	1	1
3. ✓	Determine whether the transformation $f(z) = z + (2 + i)$ is conformal in the region $R$ bounded by the lines $x = 0, x = 1, y = 0$ , and $y = 1$ . If it is conformal, find the image of $R$ under this mapping. $f(z) = z + (2 + i)$ .	10	2	2
4. ✓	Let $f(z)$ be a bilinear transformation such that $f(\infty) = 1, f(i) = i$ and $f(-i) = -i$ . Find the bilinear transform and the image of the unit circle under the transformation $f(z)$ .	10	2	2
5. ✓	Expand $f(z) = \frac{z^2-1}{(z+2)(z+3)}$ as a Laurent's series if (i) $ z  < 2$ , (ii) $2 <  z  < 3$ . Also, a region outside a circle of radius 3 centred at the origin.	10	2	2

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