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Department of Mathematics
School of Advanced Sciences
Fall Semester 2022-2023
Continuous Assessment Test - I (August 2022)

Slot: X1+TX1+TXX1
Course Code: BMAT201L **Course Title:** Complex Variables and Linear Algebra
Max. Time: 90 minutes **Max. Marks: 50**

Answer ALL the questions

1. **Moderate** 10 marks **CO1** **BL2**
   Find the analytic function $f(z) = u + iv$, given that $u = e^{-x}\cos y + xy$. Also show that the level curves $u(x, y) = \alpha, v(x, y) = \beta$ cut orthogonally.

2. **Moderate** 10 marks **CO1** **BL3**
   Discuss the transformation $f(z) = z^2$ as the flow of fluid around a corner. Draw the equipotential lines and the stream lines. Also find the complex velocity and speed of the flow.

3. **Moderate** 10 marks **CO2** **BL3**
   Find the image of the region bounded by the lines $x - y < 2$ and $x + y > 2$ under the mapping $w = 1/z$. Sketch the regions in the $z-$ plane and their images in the $w-$ plane.

4. **Tough** 10 marks **CO2** **BL3**
   Determine the bilinear transformation that maps the points $z = 0, 1, \infty$ into the points $w = -i, 1, i$ respectively. Find the invariant points of this transformation. Find the image of $|z| < 1$ under this transformation.

5. **Easy** 10 marks **CO3** **BL1**
   Expand $\frac{1}{(z+2)^2(z-3)}$ in Taylor series about the origin. Indicate the region of validity.

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