



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 $\psi$ , 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    |