ABES Engineering College, Ghaziabad

Department of AS&H

Session: 2023-24 **Semester:** II **Section:** All

Course Code: BAS-203 **Course Name:** Engg.Maths-II

Tutorial-4 (Complex Variable - Differentiation)

S.No.	KL, CO	Question
1	K3, CO4	Find the constants a,b,c such that the function $f(z)$ where $f(z) = -x^2 + xy + y^2 + i(ax^2 + bxy + cy^2)$ is analytic. Express f(z) in terms of z.
2	K3, CO4	Show that $f(z) = z\|z\|$ is not analytic anywhere.
3	K3, CO4	Show that function $f(z) = \frac{x^3y^5(x+iy)}{x^6+y^{10}}, z \neq 0, f(0) = 0,$ is not analytic at the origin even though it satisfies Cauchy-Riemann equations at the origin.
4	K3, CO4	Show that $v(x,y) = e^{-x}(xcosy + ysiny)$ is harmonic. Find its harmonic conjugate without Milne's method.
5	K3, CO4	Find the regular function $f(z)$ in terms of z whose imaginary part is $\frac{x-y}{x^2-y^2}$ using Milne's Thomson method.
6	K3, CO4	If $f(z) = u + iv$ is an analytic function , find $f(z)$ in terms of z if $u - v = e^x(cosy - siny)$
7	K3, CO4	Find the image of $\|z - 2i\| = 2$ under the mapping $= \frac{1}{z}$.
8	K3, CO4	Find the bilinear transformation which maps the point $z = i, -i, 1$ into the points $w = 0,1, \infty$.
9	K3, CO4	Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$. Hence find the image of $\|z\| < 1$.

10	K3, CO4	Prove that $w = \frac{z}{1-z}$maps the upper half of the Z plane onto the upper half of the w plane.

Answers:

1. $a = \frac{-1}{2}; b = -2; c = \frac{1}{2}; f(z) = \frac{-1}{2}(2+i)z^2.$
4. $u(x,y) = e^{-x}(xsiny - ycosy) + c.$
5. $\frac{1+i}{z} + c$
6. $e^z + c$.
7. $4v + 1 = 0$
8. $w = \frac{(i-1)z+(i+1)}{-2z+2}$
9. $w = \frac{i-z}{i+z}$;u>0