

Module-5- Complex Variables

1. Show that given u or v is harmonic function and find corresponding an analytic function $f(z) = u + iv$ and their Harmonic conjugate functions.
 - i) $u = e^{-x}(y \sin y + x \cos y)$
 - ii) $v = x^2 - y^2 + \frac{x}{x^2 + y^2}$
2. Find an analytic function $f(z) = u + iv$ such that $u + v = \frac{2 \sin 2x}{e^{2y} + e^{-2y} - 2 \cos 2x}$
3. Find an analytic function $f(z) = u + iv$ such that $u + v = \frac{x-y}{x^2+y^2} + e^x(\cos y + \sin y)$
4. Find the orthogonal trajectories of the family of curves $u = 2x - x^3 + 3xy^2 = c$
5. Find the orthogonal trajectories of the family of curves $u = x^3y - xy^3 = c$ [CMPN, INFT-Dec-21]
6. Find the constants a, b, c, d, e , if $f(z) = (ax^4 + bx^2y^2 + dx^2 + cy^4 - 2y^2) + i(4x^3y - exy^3 + 4xy)$ is an Analytic function. [CMPN, INFT-Dec-21]
7. Find a, b, c, d If $f(z) = (x^2 + 2axy + by^2) + i(cx^2 + 2dxy + y^2)$ Is an analytic function? [EXTC- Dec-19, (5 M)]
8. Show that $f(z) = e^{2z} - z$ is an analytic function? [Dec-19, (5M)]
9. Find the constants k , if $f(z) = r^2 \cos 2\theta + ir^2 \sin k\theta$ is an Analytic function.
10. Prove that there does not exist an analytic function whose real part is $u = x^2 + 3x - 4y + y^2 + 7$. [May -21]