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# Complex-Variable Methods Applied to Functionally-Graded Elastic Plate Problems

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Exact solutions have been found to the equations of elasticity in a thick plate of inhomogeneous linearly elastic material in which the elastic moduli are known functions of the coordinate normal to the plane of the plate.The upper and lower surfaces of the plate are assumed to be traction free.These solutions may be expressed in terms of four complex potentials which are analytic functions of a complex coordinate in the mid-plane of the plate. Whilst the solutions do not contain enough generality to satisfy the boundary conditions pointwise around the edge of the plate, resultant force and moment conditions or averaged displacement conditions may be specified over the edge of the plate. In general the bending and in-plane extensional behaviour of the plate is coupled. The solutions are illustrated by considering an infinite plate containing a cylindrical hole or a through-thickness line crack.

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