

Analytical solution of some 2D boundary value problems of elasticity in bipolar coordinates

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In the bipolar system of coordinates exact solutions of 2D static BVPs of elasticity are constructed for homogeneous isotropic bodies occupying domains bounded by coordinate lines of bipolar coordinates. These represent boundary value problems of elastic equilibrium of eccentric circular rings, half-planes with circular holes, etc. In the bipolar coordinates are written the equilibrium equation system and Hooke's law. The method of constructing the exact solutions discussed here (by the method of separation of variables) is simpler than the usual approach to solving the above problems. We solve the plane problems of elasticity in stresses, namely, all three plane stresses and the boundary conditions must be expressed by the biharmonic stress function. To do this, we use formulas known for stresses in curvilinear coordinates.