The Equilibrium State of a Hollow Horizontal Orthotropic Thick-walled Cylinder, which is Subject to a Nonuniform Internal Lateral Pressure and Weight Forces

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We use the decomposition of the components of the displacement vector along the hoop and radial coordinates in series in Legendre polynomials and generalized power series to obtain an exact analytical solution to the equilibrium problem of a hollow horizontal orthotropic thick-walled cylinder, which is subject to a nonuniform internal lateral pressure and weight forces. As an example of using the obtained analytical solution, we analyzed the influence of weight forces on distribution of independent invariants of the stress tensor in the cross section of a heavy reinforced concrete cylinder, which internal surface is free from pressure. Based on the multicriteria approach describing various loss of strength mechanisms (from tension or compression in the radial and hoop direction and interlayer shear), we found the regions of a heavy reinforced concrete cylinder, in which damage can be initiated.