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Identification of Properties of Inhomogeneous Plate in the Framework of the Timoshenko Model

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We consider an inverse problem on identification of properties of an inhomogeneous circular plate for the Timoshenko model. The identification procedure is based on the analysis of acoustical response at some point of the plate in the given set of frequencies. The vibrations are caused by a uniformly distributed load applied to the upper face of the plate. We have derived the oscillation equations for a symmetric circular plate and formulated the boundary conditions in the dimensionless form. To solve the inverse problem on a reconstruction of the inhomogeneous bending stiffness function, we have developed a special solving technique called the 'algebraization method' based on a decomposition of the sought-for functions by systems of linearly independent functions. After substitution of these decompositions in the original motion equations, the inverse problem is reduced to solving a system of linear equations with respect to the expansion coefficients for the deflection function and the normal rotation angle, and subsequent solving of a system of nonlinear equations with respect to the expansion coefficients for the bending stiffness function. The method developed is illustrated by a series of computational experiments on a reconstruction of monotonic and non-monotonic functions showing its efficiency.

Key words: plate, Timoshenko model, identification, method of algebraization.

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