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**Журнал  
ТЕОРЕТИЧЕСКОЙ  
И ПРИКЛАДНОЙ  
МЕХАНИКИ**

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# ЖУРНАЛ ТЕОРЕТИЧЕСКОЙ И ПРИКЛАДНОЙ МЕХАНИКИ

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between the ratio of the semi-axes of the elliptical contour of the cavity section and the ratio between the shear moduli of the orthotropic material of the layer with the directions of mechanical symmetry collinear to the semi-axes.

**Keywords:** *orthotropic elastic layer, internal tunnel cavity, elliptical cross section, normal shear waves, diffraction scattering, theoretical numerical-analytical algorithm, image method, affine coordinate transformations, generalized metaharmonic equations, basic solutions in cylindrical functions.*

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*Определение напряженного состояния вблизи горизонтальной выработки*

materials on time, the article proposes a solution to creep problems under conditions of generalized plane deformation of an anisotropic half-space with an extended working. Numerical studies are presented for free and rigidly fixing excavation of an elliptical section.

**Keywords:** *creep, relaxation, anisotropic rock mass, horizontal excavation.*

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**S.V. Storozhev, S.B. Nombre, S.A. Priyenko**

**Methodology of obtaining fuzzy-set estimates of normal waves in anisotropic rectangular waveguides with combined mixed conditions on boundary.**

For an long waveguide of prismatic geometry made of an anisotropic monocrystalline material of a cubic system, on one of the pairs of opposite faces of which there are thin absolutely flexible inextensible coatings, and on the second pair of opposite faces, slip anchoring conditions are specified, a fuzzy-set method for obtaining estimates of the influence of uncertainty factors in the form of scatter errors of the exogenous physical, mechanical and geometric parameters on the frequency distributions of the phase velocities of the traveling normal waves has been developed. The technique is based on the description of parameters with scatter errors in the form of fuzzy interval values and of the transition to fuzzy set arguments in analytical representations for the wave numbers of normal waves from different branches of the considered dispersion spectrum. The alpha-level form of the heuristic generalization principle in fuzzy set theory is used. Examples of fuzzy-set description of a number of characteristics of frequency distributions of phase velocities of traveling normal waves for a waveguide made of a silicon single crystal with the type of boundary conditions under consideration are given.

**Keywords:** *normal elastic waves, anisotropic prismatic waveguides, materials of a cubic system, rectangular cross sections, mixed boundary conditions of a combined type, slipping fixings of opposite faces, flexible inextensible coatings of opposite faces, frequency dependencies of phase velocities, influence of scatter errors of exogenous parameters, fuzzy-multiple technique, heuristic generalization principle.*

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**I.A. Moiseyenko**

**Normal torsional waves in functionally gradient cylinders of circular and annular cross-sections.**

The process of propagation of torsional waves is described on the basis of a complete system of linear dynamical equations of elasticity theory. The shear modulus and density of the isotropic material of the waveguide are taken as an exponentially-power functions of the radial coordinate. Basic solutions of the model equations for two cases of the law of exponential-power inhomogeneity are determined through special functions. The dispersion relations describing the harmonic spectra of normal waves in the case of free and rigidly fixed of boundary surface, is presented.

**Keywords:** *FGMs, isotropy, solid waveguide, hollow waveguide, normal waves, basic solutions, dispersion relations, special functions.*

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