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GENERAL THEORY OF ELASTIC MICROPOLAR THIN SHELLS

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The progress in micro and nanotechnology in case of creation of new materials and studying stress-deformable state in bodies made by these materials contribute to the actuality of researches on micropolar (momental, asymmetric) theory of elasticity. In present the mathematical model of micropolar theory of elasticity is closely connected with the development of modern mechanics of continua. In connection with this, the problem of construction of theory of micropolar elastic thin plates and shells contributes an actuality.

In the present work the boundary value problem of three-dimensional asymmetric theory of elasticity with free rotation is considered in three-dimensional thin sphere of a shell. It is stated, that the defined boundary value problem is referred to the category of problems with boundary layer. On this basis it is considered that the general stress-deformable state is formed from the interior and boundary components. To approximately define the interior and boundary stress-deformable state, the asymptotic method [1] of integration of three-dimensional boundary value problem of asymmetric theory of elasticity with independent fields of displacement and rotation in thin three-dimensional sphere of shell is applied. On the basis of the initial approximation results of asymptotic method for the interior problem the general applied, two-dimensional theory of elastic micropolar shells is constructed. It is shown that depending on the values of dimensionless physical constants of shell's material the construction of three different asymptotes is possible for the defined three-dimensional problem of asymmetric theory of elasticity in three-dimensional thin sphere of the shell. The first of these asymptotes brings to the applied, two-dimensional theory of micropolar shells with free rotation; the second brings to the applied, two-dimensional theory of micropolar shells with constraint rotation; and the third one - to the applied, two-dimensional theory of the type of force - shift theory of micropolar shells (with weak shift rigidity). The corresponding micropolar boundary layers are constructed and studied. The problems of interaction of the interior problem and boundary layer are studied with the aim to define the boundary conditions for the applied, two-dimensional theory of micropolar shells.