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ON MATHEMATICAL PROBLEMS IN THE THEORY OF MULTILAYER SHELLS WITH TRANSVERSALLY SOFT FILLERS

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To investigate the mixed forms of the stability loss for the realization of a moment subcritical stressed-deformed state (SDS) in multilayer shells with transversally soft fillers, as well as to study the high-frequency dynamic characteristics of such shells after their preliminary static load, in [1] a refined theory was suggested, in which the components of the displacements vectors at the points of the middle surfaces of supporting layers and transversal tangent stresses in the fillers were taken as unknowns.

In this article, the related equilibrium equations and kinematic conditions for conjugacy of layers by tangential displacements on their contact boundaries are deduced from a stationary condition for a functional [2] belonging to a mixed class.

In the present article we shall consider both existence and uniqueness problems for a critical point of the functional. Methods for interior approximation will be constructed and then studied for boundary value problems stated on the basis of [1]. We shall study the questions of linearization of nonlinear dynamic equations for multilayer shells with transversally soft fillers obtained in [3] for a neighborhood of certain static SDS. It is shown that the linearized eigenvalue problem stated in [3] possesses a real discrete spectrum. An interior approximation of the problem will be studied as well.

1. *A problem of a stationary SDS for a multilayer shell.* Consider a multilayer shell with interlying rigid (supporting) layers and weakly rigid layers of the filler. Assume that the deformation components for supporting layers are computed on the basis of the Kirchhoff-Love hypothesis within the framework of geometrically nonlinear theory of the middle bending; to describe the SDS of the filler we use the model of transversally soft layers. Let us also assume that the butt-ends of the supporting layers are clamped whereas the butt-ends of the filler are stress-free.

Under the assumptions in accordance with [1] the problem of equilibrium for a shell, subjected to given exterior forces applied to supporting layers, may be stated as a problem of determining the critical points of a functional

$$L(u,\sigma) = \Phi(u) - f(u) + l(u,\sigma) - F(\sigma). \tag{1}$$

Here

$$\Phi(u) = \Phi_0(u) + \sum_{k=1}^{N} \Phi_k(u^k),$$

$$\Phi_k(u^k) = \int_\Omega (a^k(\varepsilon^k, \varepsilon^k) + b^k(\varkappa^k, \varkappa^k))d\Omega, \quad k = 1, \dots, N,$$

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