SM19S_10071

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

The Stress Analysis of the Multilayered Plates and Shells with Defects of the Structure

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The laminated composite shells have high strength properties. However technological processes of their manufacture are difficultly automated, that causes the increased probability of manufacturing of thin-walled elements of structures with local defects. Such local imperfections can produce essential influence on the strength of the total shell. The variant of the theory of laminated anisotropic plates and shells is offered for the analysis of such situations. The high order kinematics model reflects nonlinear character of distribution of displacements on thickness of rigid layers. These layers are connected by the thin glue layer. For glue layers the linear distribution of displacements is assumed. It is supposed, that on some local area of the shell glue layer is absent, therefore in this area the unilateral contact between rigid layers is taken into account. The problem is solved on a basis of the geometrically nonlinear theory of the shells The stress analysis is considered for anisotropic toroidal shell loaded by internal pressure. The numerical researches are executed for two examples. In the first two-layer shell with two rigid layers has no defects in glue layer, and in second example the connection is absent on some area of the shell. The characteristics of the stressed behavior of the shells are investigated in depending on the sizes and positioning of defects.

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