



MONOGRAPHS

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Numerical Analysis of Shells Oscillations with Thermal Load

(with V.A. Krysko)
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monograph, 128 pages, in Polish

SUMMARY



This monograph is devoted to analysis of dynamical behaviour of shells with thermal excitations and consists of four parts. A state-of-art of the subject is reviewed in Introduction, where a special attention is paid to East European research. Many important results which are not widely known are outlined. It has been shown among others, that the problems of dynamical stability of shells subjected to thermal loads action and accounting nonlinear temperature distribution along their thickness are rarely discussed in the existing literature.

In Chapter 1 the fundamental dependencies and computational algorithms are formulated. The general considerations yield further considered differential equations, initial and boundary conditions of the thermoelasticity. In the next step the finite difference method is applied to solve the obtained partial and nonlinear differential equations including thermal and mechanical loads. Then, using both analytical and numerical (Bubnov-Galerkin approach) methods, the applied finite difference approach is verified. The relaxation technique is further used and both static and dynamic loads are analyzed and many practically useful conclusions are given.

In Chapter 2 stability of thin shells subjected to an action of transversal mechanical and thermal loads is analysed. First of all, the influence of heat stream magnitude on shells stability simultaneously thermally and transversally loaded is studied. Than, the analysis is extended into the case of sinusoidal transversal load action. Finally, the influence of thermal and mechanical material characteristics depending on the temperature on stability of thin shallow shells is reported.

Chapter 3 is oriented on stability investigation of thin shells subjected to longitudinal mechanical and heat stream actions. First, the influence of boundary conditions and surrounding medium on the critical compressing load is investigated. Then the stability of a shell under an action of a constant compressing load and a heat stream is analysed.

In Chapter 4 dynamical stability of thin shells under convective heat transfer is studied. Firstly, the problem is mathematically formulated and then the influence of boundary conditions and thermal loading on the stress-strain shells states are investigated, among others.

[Preface & Contents](#)

[Book Review](#)