MONOGRAPHS

Professor
Jan AWREJCEWICZ

Dynamics and Stability of Shells with Thermal Excitations

(with V.A. Krysko)
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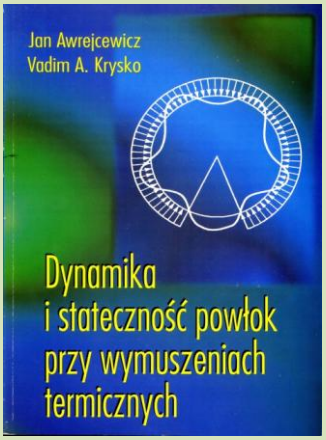
SUMMARY



[Preface & Contents]

[Book Review]

In this monograph dynamical problems of thermoelasticity of thin cylindrical shells thermally excited are analysed and the computational algorithms are proposed and illustrated.
The book is oriented on students of mechanical and civil engineering, Ph.D. students, researchers and engineers working in the field of dynamics of plates and shells thermally excited.
A state-of-the-art of the considered subject is reviewed in the Introduction, where a special emphasis is put on the Central and Eastern European Countries' achievements. The literature overview led to the following conclusions: (i) the influence of geometric parameters and the boundary conditions on the cylindrical shells with non-homogeneous thermoelastic load is not fully investigated; (ii) a buckling of thin cylindrical shell in conditions of both static and thermal loads is not satisfactorily analysed; (iii) there is a lack of satisfactory theoretical model within mechanical and thermal loads conditions.
In Chapter 1 dynamical problem of thermoelasticity of thin cylindrical shells is addressed. First of all, fundamental relations, variational coupled thermoelastic equations and hybrid variational equations governing dynamics of composite orthotropic and thermosensitive shallow shells are derived. Then a rigorous mathematical discussion on existence of a solution to the formulated problem is carried out.
The computational algorithms are reported in Chapter 2. First, the difference equations are formulated, and then a solution to the biharmonic equation with respect to the stress function F is given. Then, a discussion on the reliability of the obtained results follows. It includes a comparison of results with other researchers as well as with the experimental results. The application of the relaxation method in the statical and dynamical problems is addressed in Section 2.4.
In Chapter 3 dynamical stability of thin shells with non-uniform excitation is discussed and illustrated. First, dynamical stability criterions are overviewed, and then a stability loss of shells under non-uniform load action is investigated. Many computational results with the associated figures are given.
Dynamical stability loss and behaviour of thermosensitive shells in condition of non-uniform thermal load is studied in Chapter 4. In section 4.1 the singularities associated with thermal field computations are illustrated, whereas in section 4.2 an influence of geometrical parameters and loads duration on a thermosensitive shell dynamics is reported. The section 4.3 is devoted to analysis of dynamical stability loss of shells with imperfections under action of combined thermal and mechanical loads.