

Contents

1	Introduction	1
2	Coupled Thermoelasticity and Transonic Gas Flow	15
2.1	Coupled Linear Thermoelasticity of Shallow Shells	16
2.1.1	Fundamental Assumptions	16
2.1.2	Differential Equations	18
2.1.3	Boundary and Initial Conditions	21
2.1.4	An Abstract Coupled Problem	24
2.1.5	Existence and Uniqueness of Solutions of Thermoelasticity Problems	31
2.2	Cylindrical Panel Within Transonic Gas Flow	43
2.2.1	Statement and Solution of the Problem	43
2.2.2	Stable Vibrating Panel Within a Transonic Flow	85
2.2.3	Stability Loss of Panel Within Transonic Flow	99
3	Estimation of the Errors of the Bubnov–Galerkin Method	115
3.1	An Abstract Coupled Problem	115
3.2	Coupled Thermoelastic Problem Within the Kirchhoff–Love Model	134
3.3	Case of a Simply Supported Plate Within the Kirchhoff Model	146
3.4	Coupled Problem of Thermoelasticity Within a Timoshenko-Type Model	159
4	Numerical Investigations of the Errors of the Bubnov–Galerkin Method	165
4.1	Vibration of a Transversely Loaded Plate	165
4.2	Vibration of a Plate with an Imperfection in the Form of a Deflection	172
4.3	Vibration of a Plate with a Given Variable Deflection Change	176
5	Coupled Nonlinear Thermoelastic Problems	179
5.1	Fundamental Relations and Assumptions	179
5.2	Differential Equations	182

5.3	Boundary and Initial Conditions	188
5.4	On the Existence and Uniqueness of a Solution	189
6	Theory with Physical Nonlinearities and Coupling	217
6.1	Fundamental Assumptions and Relations	217
6.2	Variational Equations of Physically Nonlinear Coupled Problems	220
6.3	Equations in Terms of Displacements	224
7	Nonlinear Problems of Hybrid-Form Equations	229
7.1	Method of Solution for Nonlinear Coupled Problems	230
7.2	Relaxation Method	235
7.3	Numerical Investigations and Reliability of the Results Obtained	243
7.4	Vibration of Isolated Shell Subjected to Impulse	249
7.5	Dynamic Stability of Shells Under Thermal Shock	270
7.6	Influence of Coupling and Rotational Inertia on Stability	290
7.7	Numerical Tests	301
7.8	Influence of Damping ε and Excitation Amplitude A	305
7.9	Spatial–Temporal Symmetric Chaos	309
7.10	Dissipative Nonsymmetric Oscillations	327
7.11	Solitary Waves	332
8	Dynamics of Thin Elasto-Plastic Shells	349
8.1	Fundamental Relations	349
8.2	Method of Solution	355
8.3	Oscillations and Stability of Elasto-Plastic Shells	359
9	Unsolved Problems in Nonlinear Dynamics of Shells	391
	References	405
	Index	419

Nonclassical Thermoelastic Problems in Nonlinear
Dynamics of Shells

Applications of the Bubnov-Galerkin and Finite
Difference Numerical Methods

Awrejcewicz, J.; Krysko, V.A.

2003, X, 429 p., Hardcover

ISBN: 978-3-540-43880-9