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Path-Following of Limit Cycles and Periodic Solutions; 1.7.1 Nonlinearly Viscoelastic Structures Subject to Harmonic Excitations; 1.7.2 Shape-Memory Oscillators Under HarmonicExcitations; 1.7.2.1 Shape-Memory Thermomechanical Oscillators; 1.7.3 Flutter Control of an Airfoil; Problems; Chapter2 Stability and Bifurcation of Structures; 2.1 Stability of Motion; 2.2 Stability of Equilibrium States; 2.2.1 Static and Dynamic Bifurcations of EquilibriumStates; 2.2.2 Local Bifurcations of Equilibrium States
2.2.2.1 Static Bifurcations2.3 Stability of Limit Cycles and Periodic Solutions; 2.4 Stability of Conservative and Nonconservative Systemsand Structures; 2.5 Static Bifurcations of Conservative Structures; 2.5.1 Example of Supercritical Pitchfork Bifurcation; 2.5.2 Example of Subcritical Pitchfork Bifurcation; 2.5.3 Example of Transcritical Bifurcation; 2.5.4 Example of Fold Bifurcation and the Snap-ThroughPhenomenon; 2.6 The Buckling Problem; 2.7 Dynamic Bifurcations: Flutter of Lifting Airfoils; 2.8 Flutter of Wings: Reduced-Order Models
2.9 Dynamic Instabilities Due to Parametric Resonances2.10 Parametric Resonances of Conservative Systems with LinearDamping; 2.10.1 Multi-pendulum Systems and the AutoparametricTransfer of Energy; 2.10.2 Parametric Resonance of Spherical and CylindricalShells Under Pulsating Pressures; Problems; Chapter3 The Elastic Cable: From Formulation to Computation; 3.1 Introduction; 3.2 The Simplest One-Dimensional String/Cable Model; 3.2.1 The Prestressed Equilibrium; 3.2.1.1 Shallow Versus Nonshallow States: Parabola Versus Catenary; 3.2.1.2 Inclined Cables
3.2.2 The Incremental Problem: Total Versus UpdatedLagrangian Formulation3.2.3 Kinematics of the Incremental Problem; 3.2.4 Equations of Motion; 3.2.5 Weak Form of the Equations of Motion; 3.2.6 Linearization about the Prestressed Equilibrium; 3.3 Static Analysis: First-Order Sequential Continuation in Force Control; 3.3.1 The Galerkin Method for the Incremental Problem; 3.4 The Tethered Satellite System: A Space Application for Super-Long Strings; Problems; Chapter4 Nonlinear Mechanics of Three-Dimensional Solids; 4.1 Elements of the Theory of Deformation; 4.2 Elements of the Stress Theory
4.3 The Cauchy Equations of Motion

Sommario/riassunto

Nonlinear Structural Mechanics: Theory, Dynamical Phenomena and Modeling offers a concise, coherent presentation of the theoretical framework of nonlinear structural mechanics, computational methods, applications, parametric investigations of nonlinear phenomena and their mechanical interpretation towards design. The theoretical and computational tools that enable the formulation, solution, and interpretation of nonlinear structures are presented in a systematic fashion so as to gradually attain an increasing level of complexity of structural behaviors, under the prevailing assumptions on the geometry of deformation, the constitutive aspects and the loading scenarios. Readers will find a treatment of the foundations of nonlinear structural mechanics towards advanced reduced models, unified with modern computational tools in the framework of the prominent nonlinear structural dynamic phenomena while tackling both the mathematical and applied sciences. Nonlinear Structural Mechanics: Theory, Dynamical Phenomena and Modeling is an excellent reference for engineers of various disciplines, students, and researchers involved with nonlinear structural mechanics and dynamics.