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-- 3.4.3 Variable Length Pendulum -- 3.5 Soap Bubbles -- 3.6 Elastic Beam -- 3.7 The ODE of an Evolutionary Microstructure -- 3.8 The Evolution of a Multi-Particle System -- 3.8.1 Conservation of Linear Momentum -- 3.8.2 Conservation of Angular Momentum -- 3.8.3 Energy Conservation -- 3.9 String Vibration -- 3.10 Membrane Vibration -- 3.11 The Schrödinger Equation in Quantum Mechanics -- 3.11.1 Quantum Harmonic Oscillator -- 3.12 Maple Application Topics -- 4 Variational Integrators -- 4.1 Discrete Single-time Lagrangian Dynamics. 4.2 Discrete Hamilton's Equations -- 4.3 Numeric Newton's Aerodynamic Problem -- 4.4 Discrete Multi-time Lagrangian Dynamics -- 4.5 Numerical Study of the Vibrating String Motion -- 4.5.1 Initial Conditions for Infinite String -- 4.5.2 Finite String, Fixed at the Ends -- 4.5.3 Monomial (Soliton) Solutions -- 4.5.4 More About Recurrence Relations -- 4.5.5 Solution by Maple via Eigenvalues -- 4.5.6 Solution by Maple via Matrix Techniques -- 4.6 Numerical Study of the Vibrating Membrane Motion -- 4.6.1 Monomial (Soliton) Solutions -- 4.6.2 Initial and Boundary Conditions -- 4.7 Linearization of Nonlinear ODEs and PDEs -- 4.8 Von Neumann Analysis of Linearized Discrete Tzitzeica PDE -- 4.8.1 Von Neumann Analysis of Dual Variational Integrator Equation -- 4.8.2 Von Neumann Analysis of Linearized Discrete Tzitzeica Equation -- 4.9 Maple Application Topics -- 5 Miscellaneous Topics -- 5.1 Magnetic Levitation -- 5.1.1 Electric Subsystem -- 5.1.2 Electromechanic Subsystem -- 5.1.3 State Nonlinear Model -- 5.1.4 The Linearized Model of States -- 5.2 The Problem of Sensors -- 5.2.1 Simplified Problem -- 5.2.2 Extending the Simplified Problem of Sensors -- 5.3 The Movement of a Particle in Non-stationary Gravitovortex Field -- 5.4 Geometric Dynamics -- 5.4.1 Single-time Case -- 5.4.2 The Least Squares Lagrangian in Conditioning Problems -- 5.4.3 Multi-time Case -- 5.5 The Movement of Charged Particle in Electromagnetic Field -- 5.5.1 Unitemporal Geometric Dynamics Induced by Vector Potential -- 5.5.2 Unitemporal Geometric Dynamics Produced by Magnetic Induction -- 5.5.3 Unitemporal Geometric Dynamics Produced by Electric Field -- 5.5.4 Potentials Associated to Electromagnetic Forms -- 5.5.5 Potential Associated to Electric 1-form -- 5.5.6 Potential Associated to Magnetic 1-form -- 5.5.7 Potential Associated to Potential 1-form. 5.6 Wind Theory and Geometric Dynamics -- 5.6.1 Pendular Geometric Dynamics and Pendular Wind -- 5.6.2 Lorenz Geometric Dynamics and Lorenz Wind -- 5.7 Maple Application Topics -- 6 Nonholonomic Constraints -- 6.1 Models With Holonomic and Nonholonomic Constraints -- 6.2 Rolling Cylinder as a Model with Holonomic Constraints -- 6.3 Rolling Disc (Unicycle) as a Model with Nonholonomic Constraint -- 6.3.1 Nonholonomic Geodesics -- 6.3.2 Geodesics in Sleigh Problem -- 6.3.3 Unicycle Dynamics -- 6.4 Nonholonomic Constraints to the Car as a Four-wheeled Robot -- trailer -- 6.5 Nonholonomic Constraints to the -- 6.6 Famous Lagrangians -- 6.7 Significant Problems -- 6.8 Maple Application Topics -- 7 Problems: Free and Constrained Extremals -- 7.1 Simple Integral Functionals -- 7.2 Curvilinear Integral Functionals -- 7.3 Multiple Integral Functionals -- 7.4 Lagrange Multiplier Details -- 7.5 Simple Integral Functionals with ODE Constraints -- 7.6 Simple Integral Functionals with Nonholonomic Constraints -- 7.7 Simple Integral Functionals with Isoperimetric Constraints -- 7.8 Multiple Integral Functionals with PDE Constraints -- 7.9 Multiple Integral Functionals With Nonholonomic Constraints -- 7.10 Multiple Integral Functionals With Isoperimetric Constraints -- 7.11 Curvilinear Integral Functionals With PDE Constraints -- 7.12 Curvilinear Integral Functionals With

Nonholonomic Constraints -- 7.13 Curvilinear Integral Functionals with
Isoperimetric Constraints -- 7.14 Maple Application Topics --
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