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2.11 More of the Simple Example 2.12 Generalized Momenta in the q-System; 2.13 Ignorable Coordinates; 2.14 Some Remarks About Units; 2.15 The Generalized Energy Function; 2.16 The Generalized Energy and the Total Energy; 2.17 Velocity Dependent Potentials; 2.18 Exercises; 3 Lagrangian Theory of Constraints; 3.1 Constraints Defined; 3.2 Virtual Displacement; 3.3 Virtual Work; 3.4 Form of the Forces of Constraint; 3.5 General Lagrange Equations with Constraints; 3.6 An Alternate Notation for Holonomic Constraints; 3.7 Example of the General Method; 3.8 Reduction of Degrees of Freedom 3.9 Example of a Reduction 3.10 Example of a Simpler Reduction Method; 3.11 Recovery of the Forces of Constraint; 3.12 Example of a Recovery; 3.13 Generalized Energy Theorem with Constraints; 3.14 Tractable Non-Holonomic Constraints; 3.15 Exercises; 4 Introduction to Hamiltonian Mechanics; 4.1 Phase Space; 4.2 Hamilton Equations; 4.3 An Example of the Hamilton Equations; 4.4 Non-Potential and Constraint Forces; 4.5 Reduced Hamiltonian; 4.6 Poisson Brackets; 4.7 The Schroedinger Equation; 4.8 The Ehrenfest Theorem; 4.9 Exercises; 5 The Calculus of Variations; 5.1 Paths in an N-Dimensional Space 5.2 Variations of Coordinates 5.3 Variations of Functions; 5.4 Variation of a Line Integral; 5.5 Finding Extremum Paths; 5.6 Example of an Extremum Path Calculation; 5.7 Invariance and Homogeneity; 5.8 The Brachistochrone Problem; 5.9 Calculus of Variations with Constraints; 5.10 An Example with Constraints; 5.11 Reduction of Degrees of Freedom; 5.12 Example of a Reduction; 5.13 Example of a Better Reduction; 5.14 The Coordinate Parametric Method; 5.15 Comparison of the Methods; 5.16 Exercises; 6 Hamilton's Principle; 6.1 Hamilton's Principle in Lagrangian Form 6.2 Hamilton's Principle with Constraints

Sommario/riassunto

This book provides an innovative and mathematically sound treatment of the foundations of analytical mechanics and the relation of classical mechanics to relativity and quantum theory. It treats time as a transformable coordinate, and so moves the teaching of classical mechanics out of the nineteenth century and into the modern relativistic era. It also presents of classical mechanics in a way designed to assist the student's transition to quantum theory. - ;This book provides an innovative and mathematically sound treatment of the foundations of analytical mechanics and the relation of classic