1. Record Nr. UNINA9910778858603321

Autore	Shabana Ahmed A. <1951->
Titolo	Computational dynamics [[electronic resource] /] / Ahmed A. Shabana
Pubbl/distr/stampa	New York, : Wiley, c2001
ISBN	1-280-34124-6 9786610341245 0-471-05326-0
Edizione	[2nd ed.]
Descrizione fisica	1 online resource (521 p.)
Disciplina	531/.11
Soggetti	Dynamics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	"A Wiley-Interscience publication."
Nota di bibliografia	Includes bibliographical references (p. 493-495) and index.
Nota di contenuto	COMPUTATIONAL DYNAMICS; CONTENTS; 1 INTRODUCTION; 1.1 Computational Dynamics; 1.2 Motion and Constraints; 1.3 Degrees of Freedom; 1.4 Kinematic Analysis; 1.5 Force Analysis; 1.6 Dynamic Equations and Their Different Forms; 1.7 Forward and Inverse Dynamics; 1.8 Planar and Spatial Dynamics; 1.9 Computer and Numerical Methods; 1.10 Organization, Scope, and Notations of the Book; 2 LINEAR ALGEBRA; 2.1 Matrices; 2.2 Matrix Operations; 2.3 Vectors; 2.4 Three-Dimensional Vectors; 2.5 Solution of Algebraic Equations; 2.6 Triangular Factorization; 2.7 QR Decomposition; 2.8 Singular Value Decomposition Problems3 KINEMATICS; 3.1 Mechanical Joints; 3.2 Coordinate Transformation; 3.3 Position, Velocity, and Acceleration Equations; 3.4 Kinematics of a Point Moving on a Rigid Body; 3.5 Constrained Kinematics; 3.6 Formulation of the Joint Constraints; 3.7 Computational Methods in Kinematics; 3.8 Computer Implementation; 3.9 Kinematic Modeling and Analysis; 3.10 Concluding Remarks; Problems; 4 FORMS OF THE DYNAMIC EQUATIONS; 4.1 D'Alembert's Principle; 4.2 Constrained Dynamics; 4.3 Augmented Formulation; 4.4 Elimination of the Dependent Accelerations; 4.5 Embedding Technique 4.6 Amalgamated Formulation4.7 Open and Closed Chains; 4.8 Concluding Remarks; Problems; 5 VIRTUAL WORK AND LAGRANGIAN DYNAMICS; 5.1 Virtual Displacements; 5.2 Kinematic Constraints and Coordinate Partitioning; 5.3 Virtual Work; 5.4 Examples of Force

Elements; 5.5 Workless Constraints; 5.6 Principle of Virtual Work in Statics; 5.7 Principle of Virtual Work in Dynamics; 5.8 Lagrange's Equation; 5.9 Gibbs-Appel Equation; 5.10 Hamiltonian Formulation; 5.11 Relationship between Virtual Work and Gaussian Elimination; Problems; 6 CONSTRAINED DYNAMICS; 6.1 Generalized Inertia 6.2 Mass Matrix and Centrifugal Forces6.3 Equations of Motion; 6.4 System of Rigid Bodies; 6.5 Elimination of the Constraint Forces; 6.6 Lagrange Multipliers; 6.7 Constrained Dynamic Equations; 6.8 Joint Reaction Forces; 6.9 Elimination of Lagrange Multipliers; 6.10 State Space Representation; 6.11 Numerical Integration; 6.12 Differential and Algebraic Equations; 6.13 Inverse Dynamics; 6.14 Static Analysis; Problems; 7 SPATIAL DYNAMICS; 7.1 General Displacement; 7.2 Finite Rotations; 7.3 Euler Angles; 7.4 Velocity and Acceleration; 7.5 Generalized Coordinates; 7.6 Generalized Inertia Forces 7.7 Generalized Applied Forces7.8 Dynamic Equations of Motion; 7.9 Constrained Dynamics; 7.10 Formulation of the Joint Constraints; 7.11 Newton-Euler Equations; 7.12 Linear and Angular Momentum; 7.13 Recursive Methods; Problems; 8 OTHER TOPICS IN SPATIAL DYNAMICS; 8.1 Gyroscopes and Euler Angles; 8.2 Rodriguez Formula; 8.3 Euler Parameters; 8.4 Rodriguez Parameters; 8.5 Quaternions; 8.6 Rigid Body Contact; Problems; REFERENCES; INDEX

Sommario/riassunto

A practical approach to the computational methods used to solve real-world dynamics problems Computational dynamics has grown rapidly in recent years with the advent of high-speed digital computers and the need to develop simulation and analysis computational capabilities for mechanical and aerospace systems that consist of interconnected bodies. Computational Dynamics, Second Edition offers a full introduction to the concepts, definitions, and techniques used in multibody dynamics and presents essential topics concerning kinematics and dynamics of motion in two and th