

1. Record Nr.	UNINA9910465791003321
Autore	Reddy J. N (Junuthula Narasimha), <1945->
Titolo	An introduction to nonlinear finite element analysis [[electronic resource] /] / J.N. Reddy
Pubbl/distr/stampa	Oxford ; ; New York, : Oxford University Press, 2004
ISBN	0-19-157467-8 9786612354779 1-282-35477-9
Descrizione fisica	1 online resource (482 p.)
Disciplina	518/.25
Soggetti	Finite element method Nonlinear mechanics Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Contents; Preface; 1 Introduction; 1.1 Mathematical Models; 1.2 Numerical Simulations; 1.3 The Finite Element Method; 1.4 Nonlinear Analysis; 1.4.1 Introduction; 1.4.2 Classification of Nonlinearities; 1.5 The Big Picture; References; 2 The Finite Element Method: A Review; 2.1 Introduction; 2.2 One-Dimensional Problems; 2.2.1 Governing Differential Equation; 2.2.2 Finite Element Approximation; 2.2.3 Derivation of the Weak Form; 2.2.4 Interpolation Functions; 2.2.5 Finite Element Model; 2.3 Two-Dimensional Problems; 2.3.1 Governing Differential Equation; 2.3.2 Finite Element Approximation 2.3.3 Weak Formulation2.3.4 Finite Element Model; 2.3.5 Interpolation Functions; 2.3.6 Assembly of Elements; 2.4 Library of Two-Dimensional Finite Elements; 2.4.1 Introduction; 2.4.2 Triangular Elements; 2.4.3 Rectangular Elements; 2.5 Numerical Integration; 2.5.1 Preliminary Comments; 2.5.2 Coordinate Transformations; 2.5.3 Integration Over a Master Rectangular Element; 2.5.4 Integration Over a Master Triangular Element; 2.6 Computer Implementation; 2.6.1 General Comments; 2.6.2 One-Dimensional Problems; 2.6.3 Two-Dimensional Problems; 2.7 Closure; Problems; References 3 Heat Transfer and Other Field Problems in One Dimension3.1 Model

Differential Equation; 3.2 Weak Formulation; 3.3 Finite Element Model; 3.4 Solution Procedures; 3.4.1 General Comments; 3.4.2 Direct Iteration Procedure; 3.4.3 Newton's Iteration Procedure; 3.5 Computer Implementation; 3.5.1 Introduction; 3.5.2 Preprocessor Unit; 3.5.3 Processor Unit; 3.6 Closing Remarks; Problems; References; 4 Nonlinear Bending of Straight Beams; 4.1 Introduction; 4.2 Euler-Bernoulli Beams; 4.2.1 Basic Assumptions; 4.2.2 Displacement Field and Strains; 4.2.3 Weak Forms; 4.2.4 Finite Element Model; 4.2.5 Iterative Solutions of Nonlinear Equations; 4.2.6 Load Increments; 4.2.7 Membrane Locking; 4.2.8 Computer Implementation; 4.3 Timoshenko Beams; 4.3.1 Displacement Field and Strains; 4.3.2 Weak Forms; 4.3.3 General Finite Element Model; 4.3.4 Shear and Membrane Locking; 4.3.5 Tangent Stiffness Matrix; Problems; References; 5 Heat Transfer and Other Fields Problems in Two Dimensions; 5.1 Model Equation; 5.2 Weak Form; 5.3 Finite Element Model; 5.4 Solution Procedures; 5.4.1 Direct Iteration; 5.4.2 Newton-Raphson Iteration; 5.5 Computer Implementation; 5.5.1 Introduction; 5.5.2 Numerical Integration; 5.5.3 Element Calculations; Problems; References; 6 Nonlinear Bending of Elastic Plates; 6.1 Introduction; 6.2 Classical Plate Theory; 6.2.1 Assumptions of the Kinematics; 6.2.2 Displacement Field and Strains; 6.3 Variational Formulation of CPT; 6.3.1 Virtual Work; 6.3.2 Weak Forms; 6.3.3 Equilibrium Equations; 6.3.4 Boundary Conditions; 6.3.5 Stress Resultant-Deflection Relations; 6.4 Finite Element Models of CPT; 6.4.1 General Formulation; 6.4.2 Tangent Stiffness Coefficients; 6.4.3 Some Plate Finite Elements; 6.5 Computer Implementation Aspects and Numerical Results of CPT Elements

## Sommario/riassunto

This book presents the theory and computer implementation of the finite element method as applied to nonlinear problems of heat transfer and similar field problems, fluid mechanics (flows of incompressible fluids), and solid mechanics (elasticity, beams and plates). Both geometric as well as material nonlinearities are considered, and static and transient (i.e. time-dependent) responses are studied. Although there exist a number of books on nonlinear finite elements that serve as good references for engineers who are familiar with the subject and wish to learn advanced topics or the latest developments