1. Record Nr. UNINA9910784446703321

Autore	Zienkiewicz O. C
Titolo	The finite element method [[electronic resource]] : its basis and fundamentals / / O.C. Zienkiewicz, R.L. Taylor, J.Z. Zhu
Pubbl/distr/stampa	Amsterdam ; ; London, : Elsevier Butterworth-Heinemann, 2005
ISBN	1-281-01652-7 9786611016524 0-08-047277-X
Edizione	[6th ed.]
Descrizione fisica	1 online resource (753 p.)
Altri autori (Persone)	TaylorRobert L <1934-> (Robert Leroy) ZhuJ. Z ZienkiewiczO. C
Disciplina	620.00151825
Soggetti	Finite element method Engineering mathematics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Previous ed.: 2000. "In the present edition we have decided not to pursue the course of having three contiguous volumes but rather we treat the whole work as an assembly of three separate works, each one capable of being used without the others ... The two further volumes form again separate books ... The first of these is entitled The Finite Element Method in Solid and Structural Mechanics and the second is a text entitled The Finite Element Method in Fluid Dynamics."--Pref.
Nota di bibliografia	Includes bibliographical references and indexes.
Nota di contenuto	Front Cover; The Finite Element Method: Its Basis and Fundamentals; Copyright Page; Contents; Preface; Chapter 1. The standard discrete system and origins of the finite element method; 1.1 Introduction; 1.2 The structural element and the structural system; 1.3 Assembly and analysis of a structure; 1.4 The boundary conditions; 1.5 Electrical and fluid networks; 1.6 The general pattern; 1.7 The standard discrete system; 1.8 Transformation of coordinates; 1.9 Problems; Chapter 2. A direct physical approach to problems in elasticity: plane stress; 2.1 Introduction 2.2 Direct formulation of finite element characteristics 2.3 Generalization to the whole region- internal nodal force concept

abandoned; 2.4 Displacement approach as a minimization of total potential energy; 2.5 Convergence criteria; 2.6 Discretization error and convergence rate; 2.7 Displacement functions with discontinuity between elements - non-conforming elements and the patch test; 2.8 Finite element solution process; 2.9 Numerical examples; 2.10 Concluding remarks; 2.11 Problems
Chapter 3. Generalization of the finite element concepts. Galerkin-weighted residual and variational approaches 3.1 Introduction; 3.2 Integral or 'weak' statements equivalent to the differential equations; 3.3 Approximation to integral formulations: the weighted residual-Galerkin method; 3.4 Virtual work as the 'weak form' of equilibrium equations for analysis of solids or fluids; 3.5 Partial discretization; 3.6 Convergence; 3.7 What are 'variational principles'?; 3.8 'Natural' variational principles and their relation to governing differential equations
3.9 Establishment of natural variational principles for linear, self-adjoint, differential equations 3.10 Maximum, minimum, or a saddle point?; 3.11 Constrained variational principles. Lagrange multipliers; 3.12 Constrained variational principles. Penalty function and perturbed lagrangian methods; 3.13 Least squares approximations; 3.14 Concluding remarks - finite difference and boundary methods; 3.15 Problems; Chapter 4. 'Standard' and 'hierarchical' element shape functions: some general families of C0 continuity; 4.1 Introduction; 4.2 Standard and hierarchical concepts
4.3 Rectangular elements- some preliminary considerations 4.4 Completeness of polynomials; 4.5 Rectangular elements- Lagrange family; 4.6 Rectangular elements- 'serendipity' family; 4.7 Triangular element family; 4.8 Line elements; 4.9 Rectangular prisms - Lagrange family; 4.10 Rectangular prisms - 'serendipity' family; 4.11 Tetrahedral elements; 4.12 Other simple three-dimensional elements; 4.13 Hierarchic polynomials in one dimension; 4.14 Two- and three-dimensional, hierarchical elements of the 'rectangle' or 'brick' type; 4.15 Triangle and tetrahedron family
4.16 Improvement of conditioning with hierarchical forms

Sommario/riassunto

The Sixth Edition of this influential best-selling book delivers the most up-to-date and comprehensive text and reference yet on the basis of the finite element method (FEM) for all engineers and mathematicians. Since the appearance of the first edition 38 years ago, The Finite Element Method provides arguably the most authoritative introductory text to the method, covering the latest developments and approaches in this dynamic subject, and is amply supplemented by exercises, worked solutions and computer algorithms.The classic FEM text, written by the subject's leading authors