1. Record Nr. UNINA9911007194203321

Autore	Hughes Thomas J. R.
Titolo	The finite element method : linear static and dynamic finite element analysis / / Thomas J.R. Hughes
Pubbl/distr/stampa	Mineola, New York, : Dover Publications, 2000
ISBN	9780486135021 0486135020 9781621985884 1621985881
Descrizione fisica	1 online resource (1246 pages)
Collana	Dover Civil and Mechanical Engineering
Disciplina	620/.001/51535
Soggetti	Problemes de valor límit Finite element method Boundary value problems Elements finits, Mètode dels
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record. Originally published by: Englewood Cliffs, NJ : Prentice Hall, 1987
Nota di contenuto	Cover; Title Page; Dedication; Copyright Page; Contents; Preface; A Brief Glossary of Notations; Part One Linear Static Analysis; 1 Fundamental Concepts; A Simple One-Dimensional Boundary-Value Problem; 1.1 Introductory Remarks and Preliminaries; 1.2 Strong, or Classical, Form of the Problem; 1.3 Weak, or Variational, Form of the Problem; 1.4 Eqivalence of Strong and Weak Forms; Natural Boundary Conditions; 1.5 Galerkin's Approximation Method; 1.6 Matrix Equations; Stiffness Matrix K; 1.7 Examples: 1 and 2 Degrees of Freedom; 1.8 Piecewise Linear Finite Element Space; 1.9 Properties of K 1.10 Mathematical Analysis1.11 Interlude: Gauss Elimination; Hand-calculation Version; 1.12 The Element Point of View; 1.13 Element Stiffness Matrix and Force Vector; 1.14 Assembly of Global Stiffness Matrix and Force Vector; LM Array; 1.15 Explicit Computation of Element Stiffness Matrix and Force Vector; 1.16 Exercise: Bemoulli-Euler Beam Theory and Hermite Cubics; Appendix 1.I An Elementary Discussion of Continuity, Differentiability, and Smoothness; References;

2 Formulation of Two- And Three-Dimensional Boundary-Value Problems; 2.1 Introductory Remarks; 2.2 Preliminaries
2.3 Classical Linear Heat Conduction: Strong and Weak Forms Equivalence; 2.4 Heat Conduction: Galerkin Formulation; Symmetry and Positive-definiteness of K; 2.5 Heat Conduction: Element Stiffness Matrix and Force Vector; 2.6 Heat Conduction: Data Processing Arrays ID, IEN, and LM; 2.7 Classical Linear Elastostatics: Strong and Weak Forms; Equivalence; 2.8 Elastostatics: Galerkin Formulation, Symmetry, and Positive-definiteness of K; 2.9 Elastostatics: Element Stiffness Matrix and Force Vector; 2.10 Elastostatics: Data Processing Arrays ID, IEN, and LM
2.11 Summary of Important Equations for Problems Considered in Chapters 1 and 22.12 Axisymmetric Formulations and Additional Exercises; References; 3 Isoparametric Elements and Elementary Programming Concepts; 3.1 Preliminary Concepts; 3.2 Bilinear Quadrilateral Element; 3.3 Isoparametric Elements; 3.4 Linear Triangular Element; An Example of "Degeneration"; 3.5 Trilinear Hexahedral Element; 3.6 Higher-order Elements; Lagrange Polynomials; 3.7 Elements with Variable Numbers of Nodes; 3.8 Numerical Integration; Gaussian Quadrature
3.9 Derivatives of Shape Functions and Shape Function Subroutines3.10 Element Stiffness Formulation; 3.11 Additional Exercises; Appendix 3.I Triangular and Tetrahedral Elements; Appendix 3.II Methodology for Developing Special Shape Functions with Application to Singularities; References; 4 Mixed and Penalty Methods, Reduced and Selective Integration, and Sundry Variational Crimes; 4.1 "Best Approximation" and Error Estimates: Why the standard FEM usually works and why sometimes it does not; 4.2 Incompressible Elasticity and Stokes Flow; 4.2.1 Prelude to Mixed and Penalty Methods
4.3 A Mixed Formulation of Compressible Elasticity Capable of Representing the Incompressible Limit

Sommario/riassunto

This text is geared toward assisting engineering and physical science students in cultivating comprehensive skills in linear static and dynamic finite element methodology. Based on courses taught at Stanford University and the California Institute of Technology, it ranges from fundamental concepts to practical computer implementations. Additional sections touch upon the frontiers of research, making the book of potential interest to more experienced analysts and researchers working in the finite element field.In addition to its examination of numerous standard aspects of the finite element me