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| Nota di contenuto | Finite Element Simulation of Heat Transfer; Table of Contents; Introduction; PART 1. Steady State Conduction; Chapter 1. Problem Formulation; 1.1. Physical modeling; 1.1.1. Thermal equilibrium equation; 1.1.2. Fourier law; 1.1.3. Boundary conditions; 1.2. Mathematical analysis; 1.2.1. Weighted residual method; 1.2.2. Weak integral formulation; 1.3. Working example; 1.3.1. Physical modeling; 1.3.2. Direct methods; 1.3.2.1. Analytical integration; 1.3.2.2. The finite difference method; 1.3.3. Collocation methods; 1.3.3.1. Point collocation; 1.3.3.2. Sub-domain collocation; 1.3.4. Galerkin method 1.3.4.1. Polynomial functions 1.3.4.2. Piecewise linear functions; Chapter 2. The Finite Element Method; 2.1. Finite element approximation; 2.1.1. Mesh; 2.1.2. Nodal approximation; 2.2. Discrete problem formulation; 2.2.1. Element quantities; 2.2.2. Assembly; 2.3. Solution; 2.3.1. Application of temperature boundary conditions; 2.3.2. Linear system solution; 2.3.2.1. Direct methods; 2.3.2.2. Iterative methods; 2.3.3. Storing the linear system matrix; 2.3.4. Analysis of results; 2.3.4.1. Smoothing the heat flux density; 2.3.4.2. Result accuracy; 2.4. Working example |

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Sommario/riassunto

This book introduces the finite element method applied to the resolution of industrial heat transfer problems. Starting from steady conduction, the method is gradually extended to transient regimes, to traditional non-linearities, and to convective phenomena. Coupled problems involving heat transfer are then presented. Three types of couplings are discussed: coupling through boundary conditions (such as radiative heat transfer in cavities), addition of state variables (such as metallurgical phase change), and coupling through partial differential equations (such as electrical phenomena).? A re
