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Nota di contenuto	Essential Computational Fluid Dynamics; Contents; Preface; 1 What Is CFD?; 1.1. Introduction; 1.2. Brief History of CFD; 1.3. Outline of the Book; References and Suggested Reading; I Fundamentals; 2 Governing Equations of Fluid Dynamics and Heat Transfer; 2.1. Preliminary Concepts; 2.2. Mass Conservation; 2.3. Conservation of Chemical Species; 2.4. Conservation of Momentum; 2.5. Conservation of Energy; 2.6. Equation of State; 2.7. Equations in Integral Form; 2.8. Equations in Conservation Form; 2.9. Equations in Vector Form; 2.10. Boundary Conditions; 2.10.1. Rigid Wall Boundary Conditions 2.10.2. Inlet and Exit Boundary Conditions 2.10.3. Other Boundary Conditions; References and Suggested Reading; Problems; 3 Partial Differential Equations; 3.1. Model Equations; Formulation of a PDE Problem; 3.1.1. Model Equations; 3.1.2. Domain, Boundary, and Initial Conditions; 3.1.3. Equilibrium and Marching Problems; 3.1.4. Examples; 3.2. Mathematical Classification of PDE of Second Order; 3.2.1. Classification; 3.2.2. Hyperbolic Equations; 3.2.3. Parabolic Equations; 3.2.4. Elliptic Equations; 3.3. Numerical Discretization: Different Kinds of CFD; 3.3.1. Spectral Methods 4.2.7. Truncation Error of Linear Interpolation 4.3. Approximation of Partial Differential Equations; 4.3.1. Approach and Examples; 4.3.2. Interpretation of Truncation Error: Numerical Dissipation and

Dispersion; 4.3.3. Boundary and Initial Conditions; 4.3.4. Consistency of Numerical Approximation; 4.3.5. System of Difference Equations; 4.3.6. Implicit and Explicit Methods; 4.4. Development of Finite Difference Schemes; 4.4.1. Taylor Series Expansions; 4.4.2. Polynomial Fitting; References and Suggested Reading; Problems; 5 Finite Volume Method; 5.1. Introduction and Integral Formulation 5.1.1. Finite Volume Grid 5.1.2. Global Conservation Property; 5.2. Approximation of Integrals; 5.2.1. Volume Integrals; 5.2.2. Surface Integrals; 5.3. Methods of Interpolation; 5.3.1. Upwind Interpolation; 5.3.2. Linear Interpolation; 5.3.3. Upwind Interpolation of Higher Order; 5.3.4. Interpolation on Nonorthogonal Grids; 5.4. Boundary Conditions; References and Suggested Reading; Problems; 6 Stability of Transient Solutions; 6.1. Introduction and Definition of Stability; 6.1.1. Discretization and Round-off Error; 6.1.2. Definition; 6.2. Stability Analysis; 6.2.1. Neumann Method 6.2.2. Matrix Method

Sommario/riassunto

"This book serves as a complete and self-contained introduction to the principles of Computational Fluid Dynamic (CFD) analysis. It is deliberately short (at approximately 300 pages) and can be used as a text for the first part of the course of applied CFD followed by a software tutorial. The main objectives of this non-traditional format are: 1) To introduce and explain, using simple examples where possible, the principles and methods of CFD analysis and to demystify the 'black box' of a CFD software tool, and 2) To provide a basic understanding of how CFD problems are set and which factors affect the success and failure of the analysis. Included in the text are the mathematical and physical foundations of CFD, formulation of CFD problems, basic principles of numerical approximation (grids, consistency, convergence, stability, and order of approximation, etc), methods of discretization with focus on finite difference and finite volume techniques, methods of solution of transient and steady state problems, commonly used numerical methods for heat transfer and fluid flows, plus a brief introduction into turbulence modeling. A solutions manual will be provided for instructor's use."--BOOK JACKET.

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