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Motions; 1.4 Fourth-Order Runge-Kutta Method for Computing Two-Dimensional Motions of a Body through a Fluid; 1.5 Ballistics of a Spherical Projectile; 1.6 Flight Path of a Glider-A Graphical Presentation; 1.7 Rolling Up of the Trailing Vortex Sheet behind a Finite Wing
Appendix2 Inviscid Fluid Flows; 2.1 Incompressible Potential Flows; 2.2 Numerical Solution of Second-Order Ordinary Differential Equations: Boundary-Value Problems; 2.3 Radial Flow Caused by Distributed Sources and Sinks; 2.4 Inverse Method I: Superposition of Elementary Flows; 2.5 von Karman's Method for Approximating Flow Past Bodies of Revolution; 2.6 Inverse Method II: Conformal Mapping; 2.7 Classification of Second-Order Partial Differential Equations; 2.8 Numerical Methods for Solving Elliptic Partial Differential Equations
2.9 Potential Flows in Ducts or around Bodies-Irregular and Derivative Boundary Conditions2.10 Numerical Solution of Hyperbolic Partial Differential Equations; 2.11 Propagation and Reflection of a Small-Amplitude Wave; 2.12 Propagation of a Finite-Amplitude Wave: Formation of a Shock; 2.13 An Application to Biological Fluid Dynamics: Flow in an Elastic Tube; Appendix; 3 Viscous Fluid Flows; 3.1 Governing Equations for Viscous Flows; 3.2 Self-Similar Laminar Boundary-Layer Flows; 3.3 Flat-Plate Thermometer Problem-Ordinary Boundary-Value Problems Involving Derivative Boundary Conditions
3.4 Pipe and Open-Channel Flows3.5 Explicit Methods for Solving Parabolic Partial Differential Equations-Generalized Rayleigh Problem; 3.6 Implicit Methods for Solving Parabolic Partial Differential Equations-Starting Flow in a Channel; 3.7 Numerical Solution of Biharmonic Equations-Stokes Flows; 3.8 Flow Stability and Pseudo-Spectral Methods; Appendix; 4 Numerical Solution of the Incompressible Navier-Stokes Equation; 4.1 Flow around a Sphere at Finite Reynolds Numbers-Galerkin Method; 4.2 Upwind Differencing and Artificial Viscosity; 4.3 Benard and Taylor Instabilities
4.4 Primitive Variable Formulation: Algorithmic Considerations4.5 Primitive Variable Formulation: Numerical Integration of the Navier-Stokes Equation; 4.6 Flow Past a Circular Cylinder: An Example for the Vorticity-Stream Function Formulation; Appendix; Bibliography; Index

Sommario/riassunto

This new book builds on the original classic textbook entitled: An Introduction to Computational Fluid Mechanics by C. Y. Chow which was originally published in 1979. In the decades that have passed since this book was published the field of computational fluid dynamics has seen a number of changes in both the sophistication of the algorithms used but also advances in the computer hardware and software available. This new book incorporates the latest algorithms in the solution techniques and supports this by using numerous examples of applications to a broad range of industries from mec