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Discretisation -- 3.2 Approximation to Derivatives -- 3.3 Accuracy of the Discretisation Process -- 3.4 Wave Representation -- 3.5 Finite Difference Method -- 3.6 Closure -- 3.7 Problems -- 4. Theoretical Background -- 4.1 Convergence -- 4.2 Consistency -- 4.3 Stability -- 4.4 Solution Accuracy -- 4.5 Computational Efficiency -- 4.6 Closure -- 4.7 Problems -- 5. Weighted Residual Methods -- 5.1 General Formulation -- 5.2 Finite Volume Method -- 5.3 Finite Element Method and Interpolation -- 5.4 Finite Element Method and the Sturm-Liouville Equation -- 5.5 Further Applications of the Finite Element Method -- 5.6 Spectral Method -- 5.7 Closure -- 5.8 Problems -- 6. Steady Problems -- 6.1 Nonlinear Steady Problems -- 6.2 Direct Methods for Linear Systems -- 6.3 Iterative Methods -- 6.4 Pseudotransient Method -- 6.5 Strategies for Steady Problems -- 6.6 Closure -- 6.7 Problems -- 7. One-Dimensional Diffusion Equation -- 7.1 Explicit Methods -- 7.2 Implicit Methods -- 7.3 Boundary and Initial Conditions -- 7.4 Method of Lines -- 7.5 Closure -- 7.6 Problems -- 8. Multidimensional Diffusion Equation -- 8.1 Two-Dimensional Diffusion Equation -- 8.2 Multidimensional Splitting Methods -- 8.3 Splitting Schemes and the Finite Element Method -- 8.4 Neumann Boundary Conditions -- 8.5 Method of Fractional Steps -- 8.6 Closure -- 8.7 Problems -- 9. Linear Convection-Dominated Problems -- 9.1 One-Dimensional Linear Convection Equation -- 9.2 Numerical Dissipation and Dispersion -- 9.3 Steady Convection-Diffusion Equation -- 9.4 One-Dimensional Transport Equation -- 9.5 Two-Dimensional Transport Equation -- 9.6 Closure -- 9.7 Problems -- 10. Nonlinear Convection-Dominated Problems -- 10.1 One-Dimensional Burgers' Equation -- 10.2 Systems of Equations -- 10.3 Group Finite Element Method -- 10.4 Two-Dimensional Burgers' Equation -- 10.5 Closure -- 10.6 Problems -- Appendix A.1 Empirical Determination of the Execution Time of Basic Operations -- A.2 Mass and Difference Operators -- References.

Sommario/riassunto

This well-known 2-volume textbook provides senior undergraduate and postgraduate engineers, scientists and applied mathematicians with the specific techniques, and the framework to develop skills in using the techniques in the various branches of computational fluid dynamics. A solutions manual to the exercises is in preparation.
