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6.3.1 MATLAB ODE codes; Problems; 7 General error analysis for multistep methods; 7.1 Truncation error; 7.2 Convergence; 7.3 A general error analysis; 7.3.1 Stability theory; 7.3.2 Convergence theory; 7.3.3 Relative stability and weak stability; Problems; 8 Stiff differential equations; 8.1 The method of lines for a parabolic equation; 8.1.1 MATLAB programs for the method of lines; 8.2 Backward differentiation formulas; 8.3 Stability regions for multistep methods; 8.4 Additional sources of difficulty; 8.4.1 A-stability and L-stability; 8.4.2 Time-varying problems and stability; 8.5 Solving the finite-difference method; 8.6 Computer codes; Problems; 9 Implicit RK methods for stiff differential equations; 9.1 Families of implicit Runge-Kutta methods; 9.2 Stability of Runge-Kutta methods; 9.3 Order reduction; 9.4 Runge-Kutta methods for stiff equations in practice; Problems; 10 Differential algebraic equations; 10.1 Initial conditions and drift; 10.2 DAEs as stiff differential equations; 10.3 Numerical issues: higher index problems; 10.4 Backward differentiation methods for DAEs; 10.4.1 Index 1 problems; 10.4.2 Index 2 problems; 10.5 Runge-Kutta methods for DAEs; 10.5.1 Index 1 problems; 10.5.2 Index 2 problems; 10.6 Index three problems from mechanics; 10.6.1 Runge-Kutta methods for mechanical index 3 systems; 10.7 Higher index DAEs; Problems; 11 Two-point boundary value problems; 11.1 A finite-difference method; 11.1.1 Convergence; 11.1.2 A numerical example; 11.1.3 Boundary conditions involving the derivative; 11.2 Nonlinear two-point boundary value problems; 11.2.1 Finite difference methods; 11.2.2 Shooting methods; 11.2.3 Collocation methods; 11.2.4 Other methods and problems; Problems; 12 Volterra integral equations; 12.1 Solvability theory; 12.1.1 Special equations

Sommario/riassunto

A concise introduction to numerical methods and the mathematical framework needed to understand their performance. Numerical Solution of Ordinary Differential Equations presents a complete and easy-to-follow introduction to classical topics in the numerical solution of ordinary differential equations. The book's approach not only explains the presented mathematics, but also helps readers understand how these numerical methods are used to solve real-world problems. Unifying perspectives are provided throughout the text, bringing together and categorizing different types of problems in o
