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Nota di contenuto	Cover; Title page; Copyright page; Contents; Preface; 1: Problem Formulation and Model Development; Introduction; Algebraic Equations from Vapor-Liquid Equilibria (VLE); Macroscopic Balances: Lumped-Parameter Models; Force Balances: Newton's Second Law of Motion; Distributed Parameter Models: Microscopic Balances; Using the Equations of Change Directly; A Contrast: Deterministic Models and Stochastic Processes; Empiricisms and Data Interpretation; Conclusion; Problems; References; 2: Algebraic Equations; Introduction; Elementary Methods; Newton-Raphson (Newton's Method of Tangents) Regula Falsi (False Position Method) Dichotomous Search; Golden Section Search; Simultaneous Linear Algebraic Equations; Crout's (or Cholesky's) Method; Matrix Inversion; Iterative Methods of Solution; Simultaneous Nonlinear Algebraic Equations; Pattern Search for Solution of Nonlinear Algebraic Equations; Algebraic Equations with Constraints; Conclusion; Problems; References; 3: Vectors and Tensors; Introduction; Manipulation of Vectors; Force Equilibrium; Equating Moments; Projectile Motion; Dot and Cross Products; Differentiation of Vectors; Gradient, Divergence, and Curl; Green's Theorem Stokes' Theorem Conclusion; Problems; References; 4: Numerical

Quadrature; Introduction; Trapezoid Rule; Simpson's Rule; Newton-Cotes Formulae; Roundoff and Truncation Errors; Romberg Integration; Adaptive Integration Schemes; Simpson's Rule; Gaussian Quadrature and the Gauss-Kronrod Procedure; Integrating Discrete Data; Multiple Integrals (Cubature); Monte Carlo Methods; Conclusion; Problems; References; 5: Analytic Solution of Ordinary Differential Equations; An Introductory Example; First-Order Ordinary Differential Equations; Nonlinear First-Order Ordinary Differential Equations Solutions with Elliptic Integrals and Elliptic Functions Higher-Order Linear ODEs with Constant Coefficients; Use of the Laplace Transform for Solution of ODEs; Higher-Order Equations with Variable Coefficients; Bessel's Equation and Bessel Functions; Power Series Solutions of Ordinary Differential Equations; Regular Perturbation; Linearization; Conclusion; Problems; References; 6: Numerical Solution of Ordinary Differential Equations; An Illustrative Example; The Euler Method; Modified Euler Method; Runge-Kutta Methods; Simultaneous Ordinary Differential Equations Some Potential Difficulties Illustrated Limitations of Fixed Step-Size Algorithms; Richardson Extrapolation; Multistep Methods; Split Boundary Conditions; Finite-Difference Methods; Stiff Differential Equations; Backward Differentiation Formula (BDF) Methods; Bulirsch-Stoer Method; Phase Space; Summary; Problems; References; 7: Analytic Solution of Partial Differential Equations; Introduction; Classification of Partial Differential Equations and Boundary Conditions; Fourier Series; A Preview of the Utility of Fourier Series; The Product Method (Separation of Variables); Parabolic Equations Elliptic Equations

Sommario/riassunto

Prepare students for success in using applied mathematics for engineering practice and post-graduate studies moves from one mathematical method to the next sustaining reader interest and easing the application of the techniques Uses different examples from chemical, civil, mechanical and various other engineering fields Based on a decade's worth of the authors lecture notes detailing the topic of applied mathematics for scientists and engineers Concisely writing with numerous examples provided including historical perspectives as well as a solutions manual for academic adopters
