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This eminently readable **reference/text** serves as an excellent training manual for **generalized difference methods (GDM)**—presenting a comprehensive mathematical theory for elliptic, parabolic, and hyperbolic differential equations. Comparing finite element and finite difference methods, the volume builds an impressive case for the superiority of GDM and demonstrates its myriad uses in numerical analysis.

Generalized Difference Methods for Differential Equations discusses advantages of GDM, such as grid flexibility, higher accuracy, and maintenance of the mass conservation law...covers convection-dominated diffusion equations and alternative schemes, including the characteristic difference methods proposed by Douglas and Russel...showcases applications of GDM to the computation of compressible and incompressible fluid equations...highlights GDM's united theory to regular and irregular networks...surveys one- and two-dimensional second-order linear equations, biharmonic equations, and GDM based on mixed variational principles...elucidates a discontinuous finite method to obtain highly accurate generalized upwind schemes...reviews Sobolev spaces and the generalized solutions on variational problems and their approximations...explains comprehensive H^1- and L^2-error estimates, as well as superconvergence estimates...and more.

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