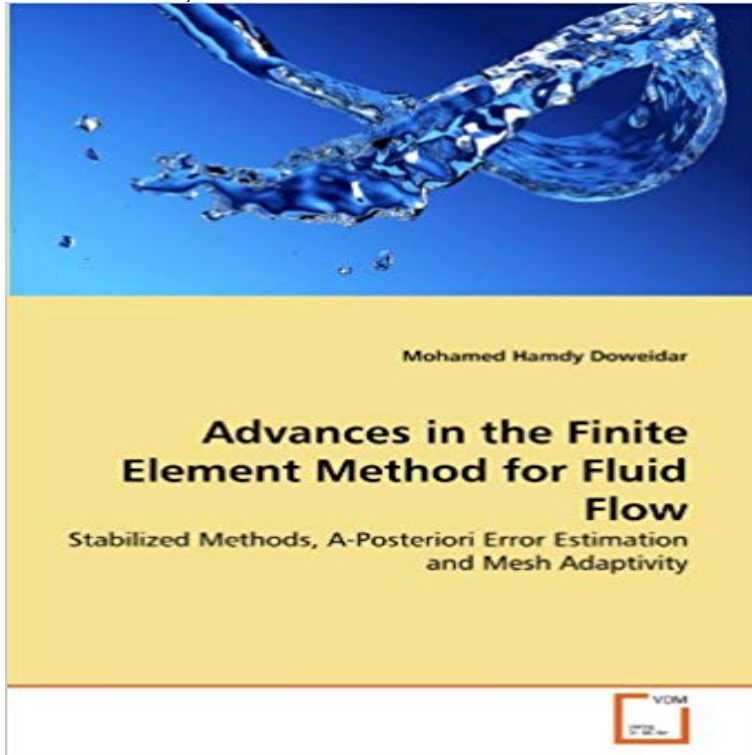


Advances in the Finite Element Method for Fluid Flow: Stabilized Methods, A-Posteriori Error Estimation and Mesh Adaptivity



Throughout this book three main topics are presented. The first one presents the new SGS/GSGS variational formulation. The local stability of this method is much better than that of the present stabilized methods. Moreover, in the advective-diffusive limit and for piecewise linear functional spaces, the method recovers the classical SUPG method. The second topic is the analysis of the most common transient methods for the transient advection-diffusion-reaction equation. This analysis includes semi-discrete, time-discontinuous space-time stabilized finite element methods and several predictor multi-corrector versions. In the last topic, a new explicit a-posteriori error estimator is presented, which is derived from the variational multiscale theory. The error estimator uses an approximation of the Greens function, which reproduces the error according to the dual problem. The technique is applied to fluid flow transport, showing that for convection-dominated flows, the efficiency index is independent of the diffusion coefficient.

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