



Robust Numerical Methods for Singularly Perturbed Differential Equations: Convection-Diffusion-Reaction and Flow Problems (Springer Series in Computational Mathematics)

By Hans-Görg Roos, Martin Stynes, Lutz Tobiska

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This new edition incorporates new developments in numerical methods for singularly perturbed differential equations, focusing on linear convection-diffusion equations and on nonlinear flow problems that appear in computational fluid dynamics.

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Editorial Review

Review

From the reviews of the second edition:

"It is based on the classical technique of constructing asymptotic solutions to singular perturbation problems ... Singular perturbations occur in many important applications and developing asymptotic methods to study such problems continues to present challenges to the applied mathematician. ... The authors are to be commended for ... this important book, which describes a very fruitful and extensive interconnected international activity." (Robert E. O'Malley, SIAM Reviews, Vol. 51 (2), June, 2009)

"This book gives a survey of recent work on the numerical solution of singular-perturbation problems, mostly for convection-diffusion equations but also for reaction-diffusion equations. ... One valuable feature of the book is the large number of remarks, which clarify details of the various methods. ... The book is an essential reference for the researcher on computation of singular perturbation problems." (Gerald W. Hedstrom, Zentralblatt MATH, Vol. 1155, 2009)

"This book collects together some recent results in the area of numerical methods for singularly perturbed differential equations. ... This well-written and lucid book will act as a useful state-of-the-art reference guide for researchers and students interested in understanding what has been published on robust numerical methods for singularly perturbed differential equations. In addition, it is clear from this book that many avenues of research remain open within the broad field of singularly perturbed problems." (Eugene O'Riordan, Mathematical Reviews, Issue 2009 f)

From the Back Cover

This considerably extended and completely revised second edition incorporates many new developments in the thriving field of numerical methods for singularly perturbed differential equations. It provides a thorough foundation for the numerical analysis and solution of these problems, which model many physical phenomena whose solutions exhibit layers. The book focuses on linear convection-diffusion equations and on nonlinear flow problems that appear in computational fluid dynamics. It offers a comprehensive overview of suitable numerical methods while emphasizing those with realistic error estimates. The book should be useful for scientists requiring effective numerical methods for singularly perturbed differential equations.

Users Review

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