Difference Methods for Singular Perturbation Problems (Monographs and Surveys in Pure and Applied Mathematics)

Grigory I. Shishkin, Lidia P. Shishkina

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Difference Methods for Singular Perturbation Problems focuses on the development of robust difference schemes for wide classes of boundary value problems. It justifies the ε-uniform convergence of these schemes and surveys the latest approaches important for further progress in numerical methods.

The first part of the book explores boundary value problems for elliptic and parabolic reaction-diffusion and convection-diffusion equations in *n*-dimensional domains with smooth and piecewise-smooth boundaries. The authors develop a technique for constructing and justifying ε uniformly convergent difference schemes for boundary value problems with fewer restrictions on the problem data.

Containing information published mainly in the last four years, the second section focuses on problems with boundary layers and additional singularities generated by nonsmooth data, unboundedness of the domain, and the perturbation vector parameter. This part also studies both the solution and its derivatives with errors that are independent of the perturbation parameters.

Co-authored by the creator of the Shishkin mesh, this book presents a systematic, detailed development of approaches to construct ε uniformly convergent finite difference schemes for broad classes of singularly perturbed boundary value problems.

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