

A NUMERIAL TECHNIQUE FOR SINGULAR PERTURBATION PROBLEMS USING A FITTED FINITE DIFFERENCE SCHEME

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Abstract

In this paper, a numerical method is presented to solve singularly perturbed mixed boundary value problems. First, we find a fitted difference operator and we introduced it in the given differential equation. Then, we replaced the original differential equation by an approximate differential equation with a small deviating argument. The resulting differential equation is discretized using finite differences to obtain a tri-diagonal scheme. The stability and convergence of the method are investigated. An optimal value for the deviating argument is obtained. Several linear and non-linear problems are solved to demonstrate the applicability of the method.

Key Words and Phrases : *Two-point boundary value problems, Singular perturbation problems, Finite differences, Numerical algorithm, Upwind scheme, Exponentially fitting factor.*