

FINITE DIFFERENCE SCHEMES ON SHISHKIN MESHE FOR
SINGULARLY PERTURBED INITIAL-BOUNDARY VALUE SOBOLEV
TYPE PROBLEMS

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MSC 2000: 65M06, 65M12, 34K28

Abstract

In this paper, we present a finite difference schemes on piece-wise uniform Shishkin mesh for solving singular perturbation Sobolev problem. We show that the constructed difference scheme is stable and first order uniform convergence. We give a numerical example which illustrate the theoretical results on the uniform accuracy of the discrete problem, as well as the robustness of the method.

Keywords: Singular Perturbation, Difference schemes, Shishkin Mesh, Sobolev problem.

References

- [1] G.M. Amiraliev, Investigation of the difference schemes for the quasi-linear Sobolev equations, *Differ. Equ.* 23 (8) (1987) 1453–1455 (Russian).
- [2] V.I. Lebedev, The method of diffence for the equations of Sobolev type, *Dokl. Acad. Sci.USSR* 114 (6) (1957) 1166–1169.
- [3] Bellman, R.& Cooke, K.L., *Differential–Difference Equations*, Mathematics in Science and Engineering, vol. vol. 6, 1963.
- [4] Ford, W.H., Ting, T.W., Uniform error estimates for difference approximations to nonlinear pseudo-parabolic partial differential equations. *SIAM. J. Numer. Anal.* 15, 155–169 (1974).
- [5] S.L. Sobolev, About new problems in mathematical physics, *Izv. Acad. Sci. USSR, Math.* 18 (1) (1954) 3–50.

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