PARAMETER-UNIFORM FITTED OPERATOR B-SPLINE COLLOCATION METHOD FOR SELF-ADJOINT SINGULARLY PERTURBED TWO-POINT BOUNDARY VALUE PROBLEMS[*]

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Abstract. In this paper, we develop a B-spline collocation method for the numerical solution of a self-adjoint singularly perturbed boundary value problem of the form

$$-\varepsilon(a(x)y')' + b(x)y(x) = f(x), \quad a(x) \geq a^* > 0, \ b(x) \geq b^* > 0, \ a'(x) \geq 0, \quad y(0) = \alpha, \quad y(1) = \beta.$$

We construct a fitting factor and use the B-spline collocation method, which leads to a tridiagonal linear system. The method is analyzed for parameter-uniform convergence. Several numerical examples are reported which demonstrate the efficiency of the proposed method.

Key words. B-spline collocation method, self-adjoint singularly perturbed boundary value problem, parameter-uniform convergence, boundary layer, fitted operator method

AMS subject classifications. 34D15, 30E25, 20B40