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SINGULARLY PERTURBED CAUCHY PROBLEM FOR ABSTRACT LINEAR DIFFERENTIAL EQUATIONS OF SECOND ORDER IN HILBERT SPACES*

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Abstract

We study the behavior of solutions to the problem

$$\begin{cases} \varepsilon\left(u_\varepsilon''(t)+A_1u_\varepsilon(t)\right)+u_\varepsilon'(t)+A_0u_\varepsilon(t)=f_\varepsilon(t), \quad t\in(0,T),\\ u_\varepsilon(0)=u_{0\varepsilon}, \quad u_\varepsilon'(0)=u_{1\varepsilon}, \end{cases}$$

as $\varepsilon\to 0$, where A_1 and A_0 are two linear self-adjoint operators in a Hilbert space H.

MSC: 35B25, 35K15, 35L15, 34G10

keywords: singular perturbations; Cauchy problem; boundary layer function.

1 Introduction

Let H be a real Hilbert space endowed with the inner product $(\cdot,\cdot)$ and the norm $|\cdot|$. Let $A_i : D(A_i)\to H$, $i=0,1$, be two linear self-adjoint operators.

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