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GENERAL DECAY OF CLASS OF BRESSE-TIMOSHENKO TYPE SYSTEMS WITH BOTH MEMORY AND DISTRIBUTED DELAY TERMS

Abdelbaki Choucha[1] and Djemal Ouchenane[2]

[1]Department of Material Sciences
Faculty of Sciences, Amar Teledji Laghouat University, Algeria

[2] Laboratory of pure and applied mathematics
Amar Teledji Laghouat University, Algeria

Abstract. In this paper, we consider a Bresse-Timoshenko type system with memory and distributed delay terms. Under suitable assumptions and by using the energy method, we show the exponential stability results for the system with both memory and distributed delay in vertical displacement.

Keywords. Bresse-Timoshenko-type systems; Exponential decay; Memory term; Distributed delay; Relaxation function.

AMS (MOS) subject classification: 35B35, 35B40, 35Q74, 93D15

1 Introduction and Preliminaries

In this work, we are concerned with the following system

$$\begin{cases} \rho_1\varphi_{tt} - \beta(\varphi_x+\psi)_x + \mu_1\varphi_t + \displaystyle\int_{\tau_1}^{\tau_2} |\mu_2(p)|\varphi_t\,(x,t-p)\,dp = 0 \\ -\rho_2\varphi_{ttx} - b\psi_{xx} + \beta(\varphi_x+\psi) + \displaystyle\int_0^t g(t-s)\psi_{xx}\,(x,s)\,ds = 0, \end{cases} \tag{1.1}$$

where

$$(x,p,t) \in (0,1)\times(\tau_1,\tau_2)\times(0,\infty),$$

with the initial conditions

$$\begin{cases} \varphi\,(x,0) = \varphi_0\,(x)\,, \varphi_t\,(x,0) = \varphi_1\,(x)\,, \varphi_{tt}\,(x,0) = \varphi_2\,(x) \\ \varphi_{ttt}(x,0) = \varphi_3(x),\ \psi\,(x,0) = \psi_0\,(x)\,, x\in(0,1) \\ \varphi_t(x,-t) = f_0(x,t), x\in(0,1)\,, t\in(0,\tau_2), \end{cases} \tag{1.2}$$

where $\varphi_0, \varphi_1, \varphi_2, \varphi_3, \psi_0, f_0$, are given functions, and the Dirichlet conditions

$$\varphi\,(0,t) = \varphi\,(1,t) = \psi\,(0,t) = \psi(1,t) = 0,\ t>0. \tag{1.3}$$

Here, φ is the transverse displacement of the beam, ψ is the angle of rotation, and $\rho_1, \rho_2, b, \beta > 0$ and the first integral represents the distributed delay term