ANALITICITY AND EXPONENTIAL DECAY FOR PIEZO-ELECTROMECHANICAL AND KIRCHHOFF LOVE PLATES WITH FRACTIONAL PARTIAL DAMPING

Abstract. In this paper we study the couple system of a Kirchhoff-Love Plate Equation with the Equation Piezo-ElectroMechanical (PEM), where the coupling is of higher order given by the Laplacian of the displacement velocity $\gamma\Delta u_t$ and the Laplacian of the electric potential field $\gamma\Delta v_t$, here only one of the equations is conservative and the other has dissipative properties. The dissipative mechanism is given by an intermediate damping $(-\Delta)^\theta v_t$ between the electrical damping potential for $\theta = 0$ and the Laplacian of the electric potential for $\theta = 2$ and the case $\theta = 1$ we have structural damping. We show that $S(t) = e^{\mathbb{B}t}$ decays exponentially for $0 \leq \theta \leq 2$, we also show that $S(t)$ is analytic for $\theta = 1$ and that $S(t)$ is not analytic for $\theta \in [0, 1) \cup (1, 2]$. These results complement previous results obtained by Han and Liu[1]-(2018). For more details on the mathematical modeling consult the reference Alessandronidell'Isola-Porfiri-d(2002)[3], the mathematical model of our interest is the following:

$$u_{tt} + \Delta^2 u + \beta^2 \Delta v_t = 0, \qquad x \in \Omega, \quad t > 0, \tag{1}$$

$$v_{tt} + \Delta^2 v - \beta^2 \Delta u_t + \gamma(-\Delta)^\theta v_t = 0, \qquad x \in \Omega, \quad t > 0, \tag{2}$$

satisfying the boundary conditions

$$u = \Delta u = 0, \quad v = \Delta v = 0, \quad x \in \partial\Omega, \ t > 0, \tag{3}$$

Authors.

(1) Fredy M. Sobrado Suárez. *Federal University of Technological of Paraná, Brazil.*
E-mail: *fredy@utfpr.edu.br*

(2) Higidio Portillo Oquendo. *Federal University of Paraná, Brazil.*
E-mail: *higidio@ufpr.br*

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