EXPONENTIAL STABILITY AND SINGULAR LIMIT FOR A LINEAR THERMOELASTIC PLATE WITH MEMORY EFFECTS

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Abstract. We consider a linear model of a thermoelastic plate where the heat flux depends solely on the past history of the temperature gradient through a memory kernel k. The resulting system consists of a fourth-order evolution equation, governing the vertical deflection u, which is coupled with a hyperbolic integrodifferential equation for the temperature field ϑ. The former one contains the term $-\omega\Delta u_{tt}$, $\omega > 0$, that accounts for rotational inertia effects. If this term is missing, it is known that the system, endowed with Navier boundary conditions, is not exponentially stable. Here we prove that its presence restores the exponential stability. Moreover, rescaling k by a time relaxation $\varepsilon > 0$, we obtain a closeness estimate between the solution to the system characterized by ε and ω and the solution to the limiting system formally obtained by setting $\varepsilon = \omega = 0$, namely, the classical linear thermoelastic plate model.

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