Existence, Uniqueness of Weak Solution to the Thermoelastic Plates

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Abstract: In this paper, we study a model of dynamic von Karman equation coupled to the thermoelastic equation, with rotational forces and not clamped boundary conditions. Our fundamental goal is to establish the existence as well as the uniqueness of a weak solution for the so-called global energy. In the end, we display a numerical simulation.

1 Introduction

In nonlinear oscillation of elastic plates, a dynamic von Karman equation with rotational forces, ($\alpha > 0$) [1], describes the buckling and flexible phenomenon of small nonlinear vibration of vertical displacement to the elastic plates. In nonlinear thermoelastic plate interaction, we study in this paper the case when the plate is coupled with thermal dissipation. From physical point of view, the main peculiarities of the model are the possibility of large deflections of the plate and small changes of the temperature near the reference temperature of the plate. As is well-known, the model with clamped boundary conditions, taking and not taking into account the rotational terms, for displacement u, the Airy stress function ϕ and the thermal function θ, can be formulated by the following system, see for instance [1].

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