OSCILLATION OF CUSPED EULER-BERNOULLI BEAMS AND KIRCHHOFF-LOVE PLATES

George V. Jaiani* and Alois Kufner†

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Abstract
In this paper, mathematical problems of cusped Euler-Bernoulli beams and Kirchhoff-Love plates are considered. Changes in the beam cross-section area and the plate thickness are, in general, of non-power type. The criteria of admissibility of the classical bending boundary conditions (clamped end (edge), sliding clamped end (edge), and supported end (edge)) at the cusped end of the beam and on the cusped edge of the plate have been established. The cusped end of the beam and the cusped edge of the plate can always be free independent of the character of the sharpening. A sufficient conditions for the solvability of the vibration frequency have been established. The appropriate weighted Sobolev spaces have been constructed. The well-posedness of the admissible problems has been proved by means of the Lax-Milgram theorem.

Keywords: Cusped elastic plates, Cusped elastic beams, Vibration, Degenerate elliptic equations, Weighted spaces, Hardy’s inequality.

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1. Introduction

In the early fifties of the last century I. Vekua (see [23] and also [24, 25]) raised the problem of investigation of cusped elastic plates which mathematically leads to degenerate partial differential equations and systems. At that time the study of such equations and systems was in full swing and it was interesting to find a mechanical interpretation of the so-called E (i.e., Keldysh, see [8]) problem and of weighted boundary value problems (shortly: BVPs, see [1]). The first results concerning classical bending (Kirchhoff-Love...