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CONSTRUCTION OF SMALL SOLUTIONS OF THE BOUNDARY VALUE PROBLEM FOR A SECOND ORDER NONLINEAR DIFFERENTIAL EQUATION CONNECTED WITH TRANSVERSE-LONGITUDINAL ROD BENDING

We consider the problem on bifurcation of equilibrium forms of the axis of a rod whose one end is clamped and the other end is free, loaded with constant compressing force P and constant distributed force of intensity γ.

In the given case the bent rod axis is described by the nonlinear differential equation with two real parameters P and γ and zero boundary conditions (see [1], [2]).

The case, in which an auxiliary boundary value problem is Fredholmian one with a number of zeros $n = 1$, is considered. The Liapunov–Schmidt branching equation, taking in this case the form of equation with one unknown and two real parameters, is investigated. Solutions of equation of branching allowing one to construct approximate solutions of the initial boundary value problem are given in the first approximation.

The problems on the existence of points of bifurcation and continuous branches-solutions of that boundary value problem, when the force of axial compression is proportional to the transverse load ($P = m\gamma$, $m = const > 0$), are studied. For finding quantities of critical forces the functionals are constructed. Asymptotical representations of small solutions, expressing an approximate type of supercritical deformation of the rod, are given.

References

1. V. V. Eliseev, D. P. Zeragia, // *Proc. Georgian Polytech. Inst.*, 1989, No. 6(348), 148–150.

2. V. V. Eliseev, Mechanics of elastic rods. *St.-Petersburg State Techn. Univ., St.-Petersburg*, 1994.