Vladikavkaz Scientific Center of the Russian Academy of Sciences

North Caucasus Center for Mathematical Research
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Southern Mathematical Institute
of the Vladikavkaz Scientific Center of the RAS

International Seminar
"Operator Theory, Differential Equations and their Applications"

Seminar Chairmen: Prof. Anatoly G. Kusraev, Prof. Marat A. Pliev
Seminar Secretary: PhD Batradz B. Tasoev

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Direct and inverse problems of thermomechanics for functionally graded bodies and bodies with coatings

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Numerical and numerical-analytical methods have been developed for studying non-stationary coupled problems of thermoelasticity and thermoelectroelasticity for elements of rod and cylindrical structures made of functionally graded materials. Analytical solutions of static problems of gradient thermoelasticity for composite bodies and bodies with coatings (rod, cylinder, strip, rectangle) are constructed within the framework of a one-parameter model. A comparative analysis of the stress-strain state of bodies, calculated in the framework of the classical and gradient formulations, has been carried out, and scale effects have been identified. Two formulations of the coefficient inverse problem of thermoelasticity for finite bodies are proposed. In the first setting, additional information is known on a semi-infinite time interval; in the second statement additional information is known in a set of points on the final most informative time interval. Statements of inverse problems of thermoelasticity for a rod, layer, pipe, final cylinder are given, both under mechanical and thermal loading. Two approaches are proposed for solving nonlinear inverse problems of thermoelasticity: 1) iterative, at each step of which linearized operator equations of the 1st kind are solved; 2) algebraization method. An iterative solution scheme is constructed for two cases: 1) when one characteristic is unknown, while the rest are known; 2) when two characteristics are unknown. Computational experiments were carried out to identify both smooth and discontinuous characteristics of inhomogeneous bodies. The influence of input information noise has been studied. A comparative analysis of the iterative approach and the algebraization method is given.

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