The 8th European Congress on Computational Methods in Applied Sciences and Engineering
ECCOMAS Congress 2022
5 – 9 June 2022, Oslo, Norway

BOUNDARY INTEGRAL EQUATION METHOD IN THE COUPLED THEORY OF DOUBLE-POROSITY THERMOELASTIC MATERIALS

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Key Words: *Boundary integral equation method, Thermoelasticity, Double porosity materials, problems of steady vibrations.*

The boundary integral equation method (BIEM) is an elegant mathematical way of transforming boundary value problems (BVPs) of partial differential equations into boundary integral equations. After which the numerical solutions of the BVPs can be obtained using the boundary element method.

The mathematical models of materials with double porosity represent a new possibility for the study of important problems of engineering, technology and mechanics. A double-porosity material is a solid that contains pores on a macroscale and pores on a much smaller scale. A comprehensive review of the basic results in the theories for double- and multi-porosity materials may be found in the books [1, 2].

In the present talk, the linear model of thermoelasticity for materials with double porosity is proposed in which the coupled phenomenon of the concepts of Darcy's law and the volume fraction of pore network is considered. Then, the basic BVPs of steady vibrations are investigated. Indeed, the fundamental solution of the system of steady vibration equations is constructed explicitly. Green’s identities are obtained and the uniqueness theorems for the classical solutions of the BVPs are proved. The surface and volume potentials are constructed and the basic properties of these potentials are given. The BVPs are reduced to the always solvable singular integral equations for which Fredholm’s theorems are valid. Finally, the existence theorems for classical solutions of the BVPs are proved by means of the BIEM and the theory of singular integral equations.

Acknowledgements: This work was supported by Shota Rustaveli National Science Foundation of Georgia (SRNSFG) [Grant # FR-19-4790].

REFERENCES

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