UDC 539.3

POTENTIAL METHOD IN THE COUPLED LINEAR THEORY OF THERMOELASTICITY OF MATERIALS WITH DOUBLE POROSITY

Merab Svanadze

Ilia State University, Tbilisi, Georgia

The mathematical models of materals 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 book [1].

Many of the engineering problems have coupled physical nature. Therefore, it is required to consider several coupled mechanical concepts simultaneously in the models of such materials. Recently, Svanadze [2] introduced the linear model of thermoelasticity for single porosity materials in which the coupled phenomenon of the concepts of Darcy's law and the volume fraction of pore network is considered.

In the present talk, the linear coupled model of thermoelasticity for materials with double porosity is proposed in which the above-mentioned coupled phenomenon is considered. Then, the basic internal and external boundary value problems (BVPs) of steady vibrations are investigated. Indeed, the fundamental solution of the system of steady vibration equations is constructed explicitly by means of elementary functions. The radiation conditions are established and Green's identities are obtained. 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 potential method.

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

1. *Svanadze M.* Potentia Method in Mathematical Theories of Multi-Porosity Media, Switzerland: Springer Inter Publ AG, 2019.
2. *Svanadze M.* Boundary integral equations method in the coupled theory of thermoelasticity for porous materials. In: Proceedings of ASME, IMECE2019, Volume 9: Mechanics of Solids, Structures, and Fluids, V009T11A033, November 11-14, (2019). https://doi.org/10.1115/IMECE2019-10367