Advanced thermoelastic fractional heat conduction model with two-parameters and phase-lags

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May 5, 2020

Abstract

The present paper treats with constructing a generalized two-fractional-parameter heat conduction model of thermoelasticity with multi-phase-lags. In this the new model, the Fourier heat conduction is replaced by a formula that is more general. In the limited cases, the proposed model reduces to several models of generalized thermoelasticity in the presence and absence of fractional derivatives. The model is then adopted to investigate the problem of a semi-infinite medium subjected a body force and exposed to decaying varying heat. Using the Laplace transform procedure, we obtain the analytical solution for various physical fields. Numerical calculations are depicted in tables and graphs to clarify the effects of the two fractional parameters, external force, and decaying parameter. Finally, the results obtained are discussed in detail and also confirmed with those in the previous literature.

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