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ACCEPTED MANUSCRIPT

Generalized thermo-viscoelasticity with memory–dependent derivatives

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ABSTRACT

A new generalized thermo-viscoelasticity theory with memory–dependent derivatives is constructed. The governing coupled equations with time-delay and kernel function, which can be chosen freely according to the necessity of applications, are applied to one- dimensional problem of a half-space. The bounding surface is taken traction free and subjected to a time dependent thermal shock. Laplace transforms technique is used to obtain the general solution in a closed form. A numerical method is employed for the inversion of the Laplace transforms. According to the numerical results and its graphs, conclusions about the new theory are given. The predictions of the theory are discussed and compared with dynamic classical coupled theory.

Keywords: Fourier's Law; thermo-viscoelasticity theory; Memory-dependent derivative; Fractional calculus; Time-delay; Kernel function; Laplace transforms; Numerical results.

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Nomenclature

λ, μ Lame' constants

ρ mass density

t time

C_E specific heat at constant strains

K_o $= \lambda + (2/3)\mu$, bulk modulus

C_o^2 $= \dfrac{K}{\rho}$, longitudinal wave speed

ε_{ij} components of strain tensor

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