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A generalized thermoelasticity problem of an annular cylinder with temperature-dependent density and material properties

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Highlights

- The problem of generalized thermoelasticity with one relaxation time is discussed.
- A finite element model is developed to solve the present problem.
- The solution of the coupled non-linear partial differential equations is given.
- The transient solution can be evaluated directly from the model at any time.
- The effect of temperature-dependent parameter and relaxation time is investigated.

Abstract

In this paper, the problem of generalized thermoelasticity with one relaxation time for an infinite annular cylinder of temperature dependent physical properties is discussed. Both the inner and outer curved surfaces of the cylinder are considered stress free. The inner

surface is subjected to decaying with time and temperature whereas the outer surface is maintained at a reference temperature. A finite element model is developed to derive the solution of the coupled non-linear partial differential governing equations. The transient solution can be evaluated directly from the model at any time. The numerical solution of displacement, temperature, and stresses is obtained inside the annulus for different forms of the temperature-dependent and temperature-independent material properties of the medium. The effect of temperature-dependent parameter and the relaxation time is investigated by different graphical plots.

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Keywords

Generalized thermoelasticity; Relaxation time; Annular cylinder; Temperature-dependent; Finite element method

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