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A DUAL PHASE LAG MODEL ON THERMOELASTIC INTERACTION IN AN INFINITE FIBER-REINFORCED ANISOTROPIC MEDIUM WITH A CIRCULAR HOLE#

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The model of generalized thermoelasticity proposed by dual phase lag (DPL), is applied to study the thermoelastic interactions in an infinite fiber-reinforced anisotropic medium with a circular hole. A decaying with time thermal field on the boundary of the hole, which is stress free, causes the thermoelastic interactions. The solutions for displacement, temperature, and stresses are obtained with the help of the finite element procedure. The effects of the reinforcement on temperature, stress, and displacement are studied. The exact solution in the case of isotropic medium is discussed explicitly. The accuracy of the finite element method validated by comparing between the finite element and exact solutions for absence the reinforcement.

Keywords: Dual phase lag model; Exact solution; Finite element method; Fiber-reinforced; Thermoelasticity.

INTRODUCTION

Fiber-reinforced composites are used in a variety of structures due to their low weight and high strength. Materials such as resins reinforced by strong aligned fibers exhibit highly anisotropic elastic behavior in the sense that their elastic moduli for extension in the fiber direction are frequently of the order of 50 or more times greater than their elastic moduli in transverse extension or in shear. An example is that of circumferential reinforcement, for which the fibers are arranged in concentric circles, giving strength and stiffness in the tangential (or hoop) direction. The theory of strongly anisotropic materials has been extensively discussed in the literature. During the second half of twentieth century, nonisothermal problems of the theory of elasticity have become increasingly important. This is due to their

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