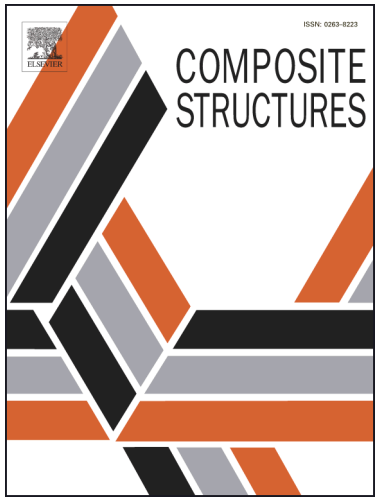

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3D-wave propagation in generalized thermoelastic functionally graded disks

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Abstract

This paper explores the capabilities of refined finite elements for 3D analysing of thermoelastic waves propagation in disks made of functionally graded materials. Based on the Lord-Shulman generalized theory of thermoelasticity, the field equations are written according to the three-dimensional formalism of the Carrera Unified Formulation (CUF). The system of the coupled equations is solved in the Laplace domain and, then, converted in the time domain by using numerical inverse Laplace transform. For a functionally graded disk exposed to thermal shock load, the time histories of displacement, temperature and stress fields are reported for different gradation laws. Propagation and reflection of the thermoelastic waves are illustrated as well. Comparisons with analytical solutions demonstrated the significant rate of convergence and the accuracy of the presented finite elements.

Keywords: Functionally graded materials; Disk; Thermoelastic waves, Finite Elements; Carrera Unified Formulation.

1. Introduction

Over the last decades, the functionally graded materials (FGMs) have been the subject of many investigations aiming at predicting their mechanical behavior in different operational conditions. The microscopic heterogeneity of FGMs, obtained by usually mixing ceramic and metal particles, enables the global structural properties to be tailored appropriately. For this unique property, FG structures are

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