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Coupled thermoelasticity analysis of carbon nano tube reinforced composite rectangular plate subjected to thermal shock

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Abstract

In the frame work of Lord-Shulman theory, transient response of a simply supported carbon nanotube reinforced composite (CNTRC) rectangular plate with different pattern of CNT distribution and under thermal shock is studied using generalized coupled thermoelasticity. Applying Fourier series expansion along the in-plane direction and state space technique along the thickness to the constitutive equations and governing differential equations of motion result in first state space differential equations which can be solved analytically in Laplace transform. Then response is obtained in time domain using Laplace transform . Moreover, parametric study is conducted to assess the effect of pattern of CNT distribution , CNT volume fraction, relaxation temperature constant and pick of thermal shock on transient thermoelastic behavior of FG-CNTRC rectangular plate are examined.

Key words: Thermal shock; CNT; Reinforced composite; Plate; Thermoelasticity; State space

Nomenclature

E_{11}^{CNT} , E_{22}^{CNT} , G_{12}^{CNT} , E_m , G_m Young's modulus, shear modulus of carbon nanotube and matrix, respectively

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