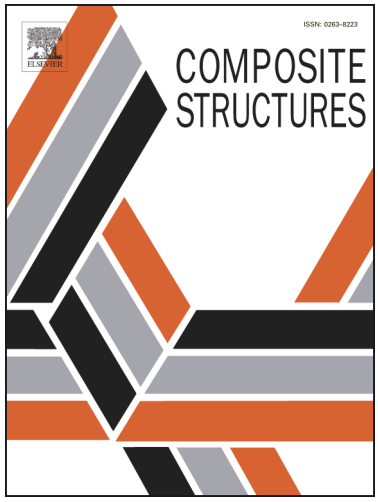

Free vibration of thin functionally graded viscoelastic open-cell foam plates on orthotropic visco-Pasternak medium

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Free vibration of thin functionally graded viscoelastic open-cell foam plates on orthotropic visco-Pasternak medium

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Abstract

The present study deals with vibration of functionally graded viscoelastic open-cell foam plates resting on three parameters orthotropic visco-Pasternak foundation. The kinematic and constitutive relations are described by classical plate theory and separable kernels framework, respectively. Viscoelastic treatment of bulk and shear moduli of plates are modeled by standard solid and Kelvin-Voigt models. Also, nonlinear non-symmetric porosity distribution through thickness is obtained using power law and neutral surface decoupling. The integro-PDE of motion with frequency-dependent coefficients is figured out by weighted residual method and iterative numerical algorithm to obtain natural frequencies and modal loss factors. In elastic domain, frequencies are compared with those reported for thin functionally graded plates resting on isotropic Pasternak foundation while in the viscoelastic domain, complex frequencies are compared for standard solid and Kelvin-Voigt viscoelastic plates where acceptable correlation is observed. Influences of various boundary conditions including fully clamped and fully free edge conditions, aspect ratio, coefficients and orthotropy angle of medium on dynamic characteristics are scrutinized via a comprehensive parametric study which could be used as benchmark results in future studies.

Keywords:

Functionally graded materials; *neutral surface*; *viscoelastic foam*; *visco-Pasternak medium*; *open-cell foam; orthotropic foundation;*

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