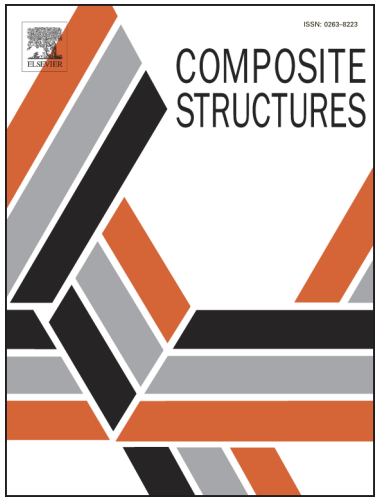

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Nonlocal third-order shear deformation theory for analysis of laminated plates considering surface stress effects

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Abstract

In this work, analytical solutions are presented for laminated composite plates using a nonlocal third-order shear deformation theory considering the surface stress effects. The theory is based on Eringen's theory of nonlocal continuum mechanics [1] and the third-order plate theory of Reddy [2, 3]. The mathematical formulation for surface stress is based on Gurtin and Murdoch's work [4],[5]. Analytical solutions of bending and vibration of simply supported laminated and isotropic plates are presented using new formulation to illustrate the effects of nonlocality and surface stress on deflection and vibration frequencies for various span-to-thickness ratios (a/h).

1 Background

In modeling micro and nano structures, where material size effects are prominent (e.g., study of elastic waves when dispersion effect is taken into account and the determination of stress at the crack tip when the singularity of the solution is of concern), conventional theories cannot model the material behavior accurately. There has been considerable focus in recent yeas towards the development of generalized continuum theories that account for the inherent micro-structure in natural and engineering materials (see [6], [7], [8], and [9]). The notion of

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