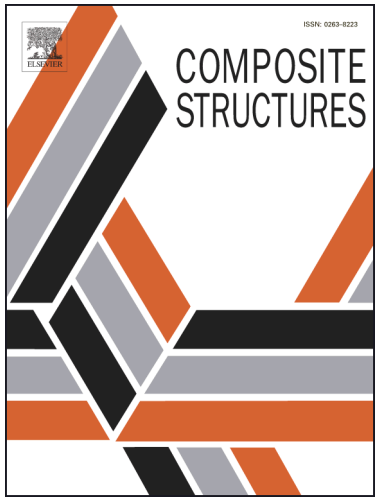

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A refined quasi-3D zigzag beam theory for free vibration and stability analysis of multilayered composite beams subjected to thermomechanical loading

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Abstract A refined four-unknown quasi-3D zigzag beam theory is developed to model the free vibration and buckling behaviors of multilayered composite beams subjected to axial mechanical loading (*e.g.*, distributed load and terminal force) and uniform temperature variation. Types of the composite beams considered include laminated composite beams, sandwich beams with composite face sheets, and fiber metal laminates. The proposed theory accounts for not only thickness stretching but also interlaminar continuity of transverse shear stresses and displacements. Associated eigenvalue problems for various boundary conditions are derived using the Ritz method. Accuracy and effectiveness of the theoretical predictions are verified by comparison with existing results and present finite element simulations. The theory is employed to quantify the effects of axial distributed load/terminal force and temperature variation on free vibration and buckling for different boundary conditions, geometric parameters and material properties. The present theory could produce sufficiently accurate predictions of natural frequencies and buckling capacities of multilayered beams at a very low computational cost.

Keywords: Quasi-3D zigzag beam theory; Layered structure; Vibration; Buckling; Thermomechanical loading

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