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Bending analysis of functionally graded sandwich plates under the effect of mechanical and thermal loads
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Abstract
The bending response of sandwich plates subjected to thermo-mechanical loads is studied. The sandwich plate faces are assumed to have isotropic, two-constituent (metal-ceramic) material distribution through the thickness, and the modulus of elasticity, Poisson's ratio, and thermal expansion coefficient of the faces are assumed to vary according to a power law distribution in terms of the volume fractions of the constituents. The core layer is still homogeneous and made of an isotropic ceramic material. Several kinds of sandwich plates are used, taking into account the symmetry of the plate and the thickness of each layer. Field equations for functionally graded sandwich plates whose deformations are governed by either the shear deformation theories or the classical theory are derived. Displacement functions that identically satisfy boundary conditions are used to reduce the governing equations to a set of coupled ordinary differential equations with variable coefficients. Exact solutions for functionally graded materials (FGMs) sandwich plates are presented. Numerical results of the sinusoidal, third-order, first-order, and classical theories are presented to show the effect of material distribution on the deflections and stresses. A wide variety of results is presented for the static response of sandwich plates under thermo-mechanical loads. The effects of thermo-mechanical loads and other parameters on the dimensionless deflections and axial and transverse shear stresses of an FGM sandwich plate are studied.

Author Keywords
bending response; deflection and stresses; functionally graded material; sandwich plates; thermomechanical effect

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