AN ANALYTICAL SOLUTION FOR VIBRATION AND BUCKLING ANALYSIS OF FUNCTIONALLY GRADED SANDWICH BEAMS WITH VARIOUS BOUNDARY CONDITIONS

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Abstract

The authors present an analytical solution for vibration and buckling analysis of functionally graded sandwich beams with various boundary conditions. It is based on hyperbolic shear deformation theories in which transverse shear stresses are refined through beam depth and no shear correction factors are required. The material properties in the faces are assumed to smoothly vary according to power-law form while the core is still homogeneous. Lagrangian functional is used to derive governing equations of motion and analytical solutions are derived for various boundary conditions. Numerical results obtained for sandwich beams with homogeneous hardcore are used to investigate effects of the power-law index, span-to-height ratio and ratio of layer thickness on the natural frequencies and critical buckling loads.

Keywords: Functionally graded sandwich beams; Vibration; Buckling; Beam theory.