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Stability and free vibration of functionally graded sandwich beams resting on two-parameter elastic foundation

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Abstract

In this present study, Chebyshev collocation method is utilized to solve buckling and vibration problems of functionally graded (FG) sandwich beams resting on two-parameter elastic foundation including Winkler and shear layer springs. The faces of FG sandwich beam are assumed to be made by functionally graded materials (FGMs) composing of ceramic and metal phases and the core of the beam is made from homogenous material. Timoshenko beam theory is employed to construct the governing equations of motion in order to cover the significant effects of shear deformation and rotary inertia. The beams with various boundary conditions are considered to find out their critical loadings and natural frequencies. An accuracy of the present solutions is confirmed by comparing with some available results in the literature. Moreover, many important parametric studies of layer and beam thickness ratios, material volume fraction index, spring constants, etc. are taken into investigation. According to numerical exercises, it is revealed that the spring constants of elastic foundation have significant impact on buckling and vibration results of such beams.

Keywords: Vibration, Buckling, Functionally graded sandwich beam, Chebyshev collocation method

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