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Biaxial buckling analysis of soft-core composite sandwich plates using improved high-order theory. (English) Zbl 1278.74065

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Summary: In the present paper, a new improved high-order theory is presented for biaxial buckling analysis of sandwich plates with soft orthotropic core. Third-order plate theory is used for face sheets and quadratic and cubic functions are assumed for transverse and in-plane displacements of the core, respectively. Continuity conditions for transverse shear stresses at the interfaces as well as the conditions of zero transverse shear stresses on the upper and lower surfaces of plate are satisfied. The nonlinear Von-Karman type relations are used to obtain strains. Also, transverse flexibility and transverse normal strain and stress of the orthotropic core are considered. The equations of motion and boundary conditions are derived by principle of minimum potential energy. Analytical solution for static analysis of simply supported sandwich plates under biaxial in-plane compressive loads is presented using Navier's solution. Effect of geometrical parameters of face sheets and core and biaxial loads ratio are studied on the overall buckling of sandwich plates. Comparison of the present results with those of the three-dimensional theory of elasticity and some plate theories confirms the accuracy of the proposed theory.

MSC:

74G60 Bifurcation and buckling
74K20 Plates
74E30 Composite and mixture properties

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biaxial buckling; sandwich plate; analytical solution

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