SM22S_11653

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Bifurcation Buckling of Sandwich Plates and Shells in Plastic Range

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Exact bifurcation buckling analyses of sandwich plates and shells are presented. The particular caes considered are the complete circular plates and complete spherical shells subjected to uniform equi-biaxial compression. The high-modulus faces are allowed to undergo plastic straining; the low-modulus core remains elastic. Constitutive relations of the competing incremental and deformation theories of plasticity are employed. Transverse shear strains, important for sandwich structures, are accounted for by suitable kinematic hypothesis. Governing equations in kinematic variables are obtained by virtual work method and using Shanley's concept of plastic bifurcation under increasing loading. Analytical solutions are obtained for general non-axisymmetric buckling. The derived formulas generalize the classical results for homogeneous plates and shells by supplying transverse shear correction terms. Numerical results show that the deformation theory furnishes, as usual, a lower critical buckling pressure. However, interestingly, the results from the incremental theory are only slightly higher.

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