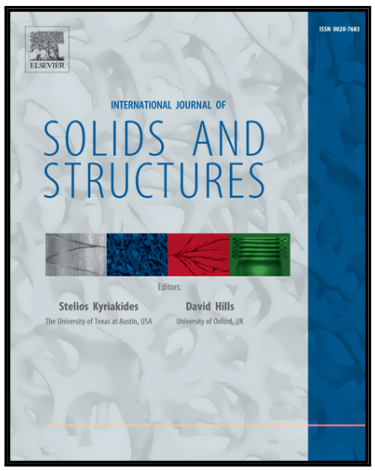

An analytical approach for global buckling of composite sandwich cylindrical shells with lattice cores

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An analytical approach for global buckling of composite sandwich cylindrical shells with lattice cores

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Abstract

In this paper, a new analytical approach is developed for global buckling of composite sandwich cylindrical shells with lattice cores under uniaxial compression by using the smeared stiffener method. The stiffness contribution of stiffeners is evaluated through the new force and moment effect analysis of the stiffener network on a general unit cell. In these analyses, outer skin-stiffener and inner skin-stiffener interactions are considered, appropriately. The equivalent stiffness of the composite sandwich cylindrical shells with lattice cores is then computed by superimposing the stiffness contribution of stiffeners, outer and inner skins. The critical buckling load is calculated by Rayleigh-Ritz method. Finally, various test examples with different scales of the structure, outer and inner skins ply stacking sequence, outer and inner skins thicknesses were analyzed and the results were compared with results obtained by finite element methods and other works. The results show that the proposed approach has high prediction accuracy and low computational cost for the global buckling analysis of composite sandwich shells with lattice cores. Also, another advantage of the developed approach is able to prediction of the global buckling load of stiffened composite cylindrical shells with better accuracy. Therefore, the proposed approach is highly attractive for the preliminary design of composite sandwich structures in the aerospace industry.

Keywords

Global buckling, Composite, Sandwich cylindrical shells, lattice cores, FEM

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