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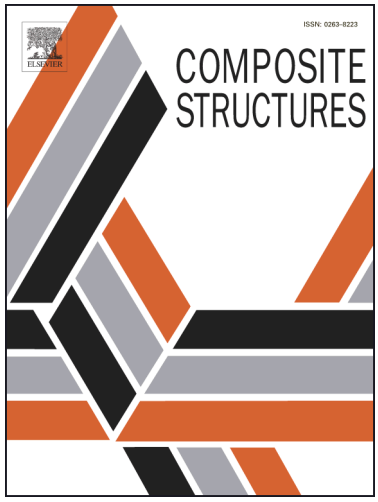

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Stability analysis of multi-layered plates subjected to partial edge compression with and without initial imperfection

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Abstract

This paper studies buckling and post-buckling behaviours of multi-layered plates under in-plane compression based on Reissner-Mindlin plate theory. The governing equations are derived from a kinematic nonlinearity based on the von-Kármán assumptions and are thereafter discretized by isogeometric analysis (IGA), which utilizes the NURBS basis functions. For the symmetrically laminated plates, stability analysis consists of three steps: pre-buckling, buckling and post-buckling analyses. In fact, the pre-buckling stresses must be first determined in the pre-buckling analysis and become an important factor in accurate estimation of the critical buckling and post-buckling loads. Otherwise, in the imperfect or unsymmetrically stacked plates, there is no buckling bifurcation phenomenon. The Newton-Rapshon method is hence adopted to solve the geometrically nonlinear problem. Numerical examples are supplied to investigate the effect of an initially geometrical imperfection, which is possible imperfection type such as sine-type, global-type or local-type imperfection, on the post-buckling response of the plates.

Keywords Geometrical imperfection, post-buckling, laminated composite plate, partial edge loading, isogeometric analysis.

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