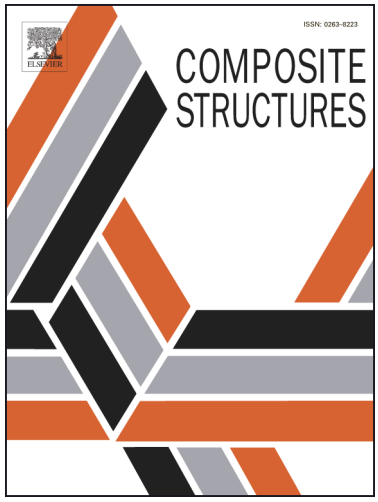

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Buckling of the composite anisogrid lattice plate with clamped edges under shear load

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Abstract

A solution of the buckling problem for a shear loaded composite anisogrid lattice plate with the clamped edges based on the Galerkin method is presented in this paper. The lattice plate is modelled as an equivalent continuous orthotropic plate with effective stiffness parameters. The deflection of buckled plate is presented in the form of a double series containing clamped-clamped beam functions. The critical in-plane shear load is found solving the generalised eigenvalue problem for a homogeneous system of algebraic equations in which the unknowns are the coefficients of the double series. Based on this solution, the effects of the plate dimensions and parameters of lattice structure on the value of critical load are investigated and analysed. Results of these analyses are successfully verified using the finite element method. An approximate analytical expression providing fast and reliable way of calculation of the critical buckling load is obtained for the lattice plate composed of the ribs made of the same composite material and with the same size of their cross-sections.

Keywords: Composite anisogrid lattice plate; Clamped edges; Shear load; Buckling analysis; Galerkin method; Finite-element analysis.

1. Introduction

Composite lattice rectangular panels are gaining popularity as efficient structural components in various aerospace designs applications. Typical loading cases in such applications are characterised by in-plane compressive and/or shear loads applied to the panel edges. These loads could cause the loss of stability of the plane form of equilibrium, i.e. the panel buckling. Hence, the buckling analysis of such panels is an important part of the design analysis. There is a substantial practical interest in the solution of buckling problem formulated for the in-plane shear-loaded lattice plate with the clamped edges. Such a problem

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