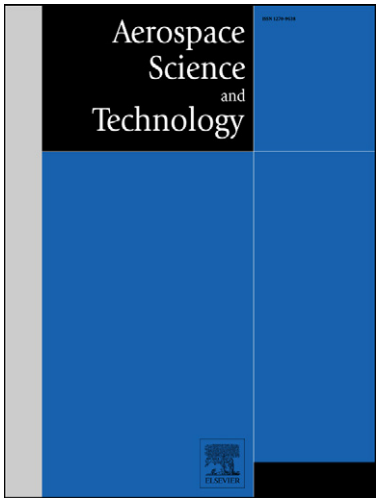

Three dimensional graded finite element elasticity shear buckling analysis of FGM annular sector plates

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Three dimensional graded finite element elasticity shear buckling analysis of FGM annular sector plates

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Abstract

In the present paper, shear buckling analysis of functionally graded annular sector plates is investigated for the first time. A three-dimensional elasticity approach is employed instead of the approximate plate theories. In-plane shear loads have been applied to radial, circumferential, or all edges of annular sector plates. Moreover, buckling of annular sector plates subjected to in-plane shear load at upper/lower surfaces is investigated for the first time. Three different boundary conditions have been examined: 1- Movable simply supported edges. 2- Immovable simply supported radial edges and free circumferential edges. 3- Immovable simply supported circumferential edges and free radial edges. The material properties are assumed to have transverse heterogeneity according to a power law distribution while the Poisson's ratio is assumed to be constant. Results are extracted based on the principle of minimum total potential energy and a graded finite element method. Buckling loads are obtained based on a generalized geometric stiffness concept. In addition to different loading and boundary conditions, the effects of material gradient exponent, sector angles, aspect ratio and thickness ratio on the shear buckling loads and mode shapes of FGM annular sector plates have been investigated in detail.

Keywords: Shear buckling; Three dimensional elasticity; Graded Finite element method; FGM annular sector plate

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