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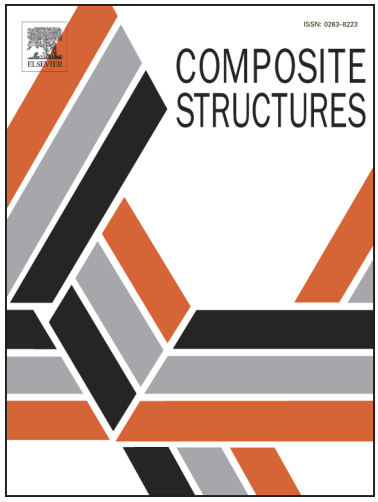

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Free and forced vibration of variable stiffness composite annular thin plates with elastically restrained edges

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Abstract: Based on the classical plate theory, free and forced vibration of variable stiffness composite annular thin plates with elastically restrained edges is studied. Material properties are assumed to be varied continuously in the radial direction, and the thickness of the plates also varies linearly. The frequencies and vibration modes of composite annular thin plates with variable stiffness with elastically restrained edges were obtained by the method of weighted residuals. Numerical results demonstrate that the method of weighted residuals has fast convergence and high accuracy. The influence of material parameters, geometrical parameters and the frequency of external forces on the dynamic performance of annular thin plates with variable stiffness is studied. It is found that the transverse mode shapes of the plates with in-plane variable stiffness are different from those with constant stiffness. The results of this paper can provide a reference for the optimization design of annular thin plates with variable stiffness.

Key words: variable stiffness; free vibration; forced vibration; annular thin plates; the method of weighted residuals.

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