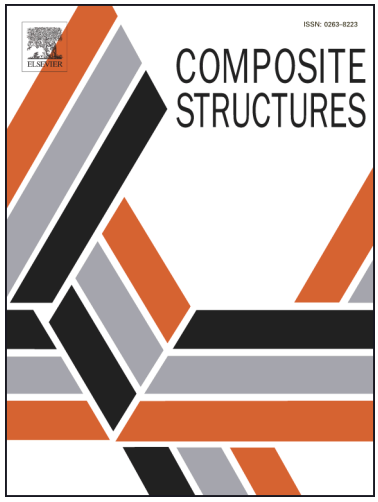

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The Walsh series method for free vibration analysis of functionally graded cylindrical shells

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Abstract

In this paper, a novel numerical method based on the Walsh series (WS) is proposed for free vibrations of functionally graded material (FGM) cylindrical shells. Based on the first order shear deformation theory, the governing equations of the FGM cylindrical shells are derived via the Hamilton's principle. After converting the governing equations into a set of ordinary differential equations (ODEs) by the separation of variables, the proposed Walsh series method (WSM) is utilized to transform the ODEs to algebraic equation sets, which results to a standard linear eigenvalue problem. The natural frequencies of the FGM cylindrical shell are calculated by solving the obtained algebraic equations. The convergence and accuracy analyses of the present method are performed by comparing the obtained results with those available in the existing literature. The results show that the solution of the proposed WSM is stably converged with the numerical convergence rate close to 2 and the good agreement of the obtained results with those in the available literature is also observed. Finally, the parametric study is conducted to investigate the effects of several geometrical and material parameters of the FGM cylindrical shells with various boundary conditions on the natural

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