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Free vibration analysis of thin isotropic and anisotropic rectangular plates by the discrete singular convolution algorithm. (English) Zbl 1235.74330

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Summary: This paper presents the free vibration analysis of thin isotropic and anisotropic rectangular plates with various boundary conditions by using the discrete singular convolution (DSC) algorithm. Based on Taylor's series expansion, a unique scheme is proposed to handle various boundary conditions, including the simply supported (S), clamped (C) and free (F) edge. To validate the proposed method, the non-dimensional frequency parameters of isotropic, orthotropic and angle-ply symmetric laminated rectangular plates with various combinations of boundary conditions are obtained by using the DSC algorithm and compared with the analytical and/or numerical solutions. Comparisons reveal that the proposed method can handle the zero bending moment and zero shear force conditions for the isotropic as well as anisotropic plates. The proposed method provides an alternative way for applying the simply supported boundary conditions in applications of the DSC algorithm to plate structures. This investigation extends the application range of the DSC algorithm to vibration analysis of anisotropic plates with various combinations of boundary conditions.

MSC:

74S05 Finite element methods applied to problems in solid mechanics
74H45 Vibrations in dynamical problems in solid mechanics
74K20 Plates
74H15 Numerical approximation of solutions of dynamical problems in solid mechanics

Keywords:

discrete singular convolution; free vibration analysis; anisotropic rectangular plates; free boundary condition; Taylor series expansion

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