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An exact analytical approach for in-plane and out-of-plane free vibration analysis of thick laminated transversely isotropic plates. (English) Zbl 1293.74180

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Summary: In this article, the governing equations of motion of thick laminated transversely isotropic plates are derived based on Reddy's third-order shear deformation theory. These equations are exactly converted to four uncoupled equations to study the in-plane and out-of-plane free vibrations of thick laminated plates without any usage of approximate methods. Based on the present analytical approach, exact Levy-type solutions are obtained for thick laminated transversely isotropic plates and, for some boundary conditions, the exact characteristic equations hitherto not reported in the literature are given. Also, the in-plane and out-of-plane deformed mode shapes are plotted for different boundary conditions. The present solutions can accurately predict both the in-plane and out-of-plane natural frequencies and mode shapes of thick laminated transversely isotropic plates.

MSC:

74H45 Vibrations in dynamical problems in solid mechanics

74K20 Plates

74E30 Composite and mixture properties

Cited in **2** Documents

Keywords:

thick laminated plates; exact analytical procedure; free vibration; in-plane and out-of-plane modes; third-order shear deformation theory

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