

Thin Plate Bending, Vibration, and Nonlinear Dynamics

Exact Analytical Solutions

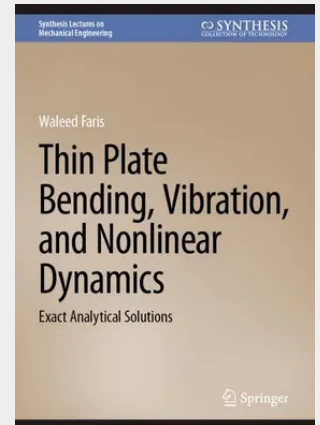
While modern engineering practice relies heavily on numerical methods such as the finite element method (FEM), these approaches require reliable benchmarks for validation. Exact solutions remain indispensable for this purpose.

This book presents a unified treatment of exact analytical solutions for the bending, vibration, and nonlinear dynamics of thin plates, including rectangular, circular, and annular geometries. It integrates classical plate theory with modern developments such as symplectic elasticity, thermoelastic vibration analysis, and electrostatic MEMS modeling, providing a rigorous framework derived from first principles.

The book systematically develops governing equations, derives exact solutions for all boundary-condition combinations, and extends the analysis to thermal loading, buckling, and nonlinear dynamic behavior. More than 80 exact solutions are presented alongside numerical benchmarks, worked examples, and engineering interpretations, making the results directly applicable to real-world problems.

Designed as both a reference and a research tool, the book serves multiple audiences: graduate students seeking a comprehensive foundation, engineers requiring validation benchmarks, and researchers developing new analytical or computational methods. It bridges the gap between classical theory and modern engineering applications, emphasizing both mathematical rigor and practical utility.

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