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New analytic bending solutions of rectangular thin plates with a corner point-supported and its adjacent corner free

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Abstract: In this paper, we obtain accurate analytic bending solutions of rectangular thin plates with a corner point-supported, its adjacent corner free and their opposite edge clamped or simply supported. This type of problem, characterized by having both free and point-supported corners, is hard to solve by classical analytic approaches. The present study is based on an up-to-date rational superposition method in the symplectic space. The Hamiltonian system-based governing equation is first constructed. The eigenvalue problems of three fundamental bending problems are formed for a plate with a corner point-supported and its adjacent corner free. By symplectic eigen expansion, the analytic solutions of the subproblems are obtained. Superposition of these solutions is equal to that of the original problem. The developed method yields the solutions with satisfactory accuracy by rigorous derivation, without assuming any trial solutions; thus, it has potential for more complex boundary value problems of high-order partial differential equations describing plates' mechanical behavior.

Keywords: Thin plate; Point support; Free corner; Analytic solution.

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