

4.1.6. STATIC ANALYSIS OF ANTISYMMETRIC CROSS-PLY THICK LAMINATED PLATES USING A LAYERWISE THEORY: THE LÉVY-TYPE SOLUTION

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The full LWT of Reddy is used to analyze the bending problem of Antisymmetric cross-ply thick laminates with finite dimensions. The solution procedure is based on a generalized Lévy-type solution where two opposite edges of the plates are simply supported and the remains are arbitrary. Combinations of simply supported, clamped and free boundary conditions are considered. The governing equations of equilibrium, which are derived by using the principle of minimum total potential energy, are transformed into a set of coupled first-order linear ordinary differential equations with constant coefficients. The exact solutions of these equations are obtained using the state-space concept. Then application of the boundary conditions yields equations for the deflections and stresses. The numerical results are converged, with desired level of accuracy, by using ten numerical layers in each physical lamina. For all the results, the static interlaminar stresses are computed with the help of local equations of equilibrium. The plate geometry, which characterizes a very thick plate, is considered to be an adequate test of reliability of the method at least as far as simply supported plates is concerned. The results obtained from this theory are compared with the Lévy-type solution of various equivalent single-layer theories that are available. These include the classical laminated plate theory (CLPT), the first-order shear deformation plate theory (FSDPT), and the third-order shear deformation plate theory (TSDPT). Finally, the results are given and compared in graphical and tabular form.