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Experimental, numerical and analytical study of bending of rectangular composite laminates

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Abstract

The deflection of the composite laminates and their maximum tensile strain in bending conditions are investigated in this study. For this purpose, different equivalent single layer and layerwise theories based on polynomial shape functions are used. Then Rayleigh–Ritz approximation technique and principle of minimum potential energy are applied to obtain the unknown coefficients of the displacement fields. The results are compared with the three dimensional finite element analysis and the experimental investigation. Also the process of obtaining material properties in tensile condition is explained completely. Regarding to the computational costs and agreement of the analytical and numerical results with the experimental ones, for both CCFF and SSFF boundary conditions the deflection prediction by layerwise HSDT is in a good consistency with the experimental results than the other plate theories and FEM method in this study. Although for obtaining strains in SSFF boundary conditions precisely FEM is more applicable.

Keywords: Bending test; Composites; Plate theories.