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# A computational method for laminated composite plates based on layerwise theory

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## Abstract

This paper presents a new computational method for stress-strain analysis of simply supported rectangular cross-ply laminated composite plates subjected to transverse loads which was applied in the authors FORTRAN program code. The algorithm of the program is based on the layerwise theory of Reddy. Equations obtained by applying the principle of virtual displacements were solved in a closed form using double trigonometric series. Convergence control and numerical stability of the program's outputs: displacements and stresses, with appropriate comments, are discussed. Comparison and verification of the presented computational method was carried out in relation to the results given in the available literature. Also, a comparison with the values calculated using the ANSYS program which is based on finite element method was performed. The paper presents and provides comments on edge dimensionless displacements and  $\bar{v}$  of a laminated plate. For the adopted simply supported rectangular four-layer plate with antisymmetric layer an analysis of dimensionless deflection change in the middle of the plate and displacement  $\bar{u}$  on the edge of the plate was performed, as well as the analysis of the ratio between the maximum values  $\sigma_{xy}/\sigma_{yy}$  and  $\sigma_{yz}/\sigma_{yy}$  due to the change of the aspect ratio  $a/b$ , the side-to-thickness ratio  $b/h$  and elastic modulus ratio  $E_1/E_2$ . The results of the proposed computational model based on the layerwise theory are given in a tabular and graphical form.

**Keywords:** laminated plates, layerwise theory, analytical solution, FORTRAN program, displacements, stresses

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