

A Modified Refined Higher Order Zigzag Theory for Stress Analysis of Hybrid Composite Laminates

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Abstract : A modified refined higher order zigzag theory has been developed in this paper in order to compute the accurate interlaminar stresses within hybrid laminates. Warping has significant effect on the mechanical behaviour of the laminates. To the best of author(s)' knowledge the stress analysis of hybrid laminates is not reported in the published literature. The present paper aims to develop a new C0 continuous element based on the refined higher order zigzag theories considering warping effect in the formulation of hybrid laminates. The eight noded isoparametric plate bending element is used for the flexural analysis of laminated composite plates to study the performance of the proposed model. The transverse shear stresses are computed by using the differential equations of stress equilibrium in a simplified manner. A computer code has been developed using MATLAB software package. Several numerical examples are solved to assess the performance of the present finite element model based on the proposed higher order zigzag theory by comparing the present results with three-dimensional elasticity solutions. The present formulation is validated by comparing the results obtained from the relevant literature. An extensive parametric study has been carried out on the hybrid laminates with varying percentage of materials and angle of orientation of fibre content.

Keywords : hybrid laminate, Interlaminar stress, refined higher order zigzag theory, warping effect

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