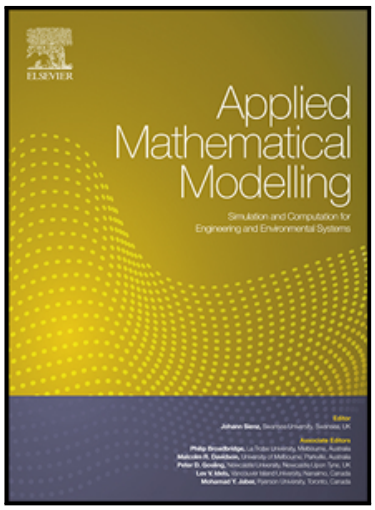

Free Edge Stress Prediction in Thick Laminated Cylindrical Shell Panel Subjected to Bending Moment

Isa Ahmadi

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Free Edge Stress Prediction in Thick Laminated Cylindrical Shell Panel Subjected to Bending Moment

Isa Ahmadi[1]

Advanced Materials and Computational Mechanics Lab., Department of Mechanical Engineering, University of Zanjan, P.O.Box: 38791-45371, Zanjan, Iran

Highlights

-A Galerkin based Layer-wise formulation is presented for thick composite panel subjected to bending moment
-An analytical solution is presented for governing equations of the panel considering free edge conditions
-Free edge stresses in bending of thick panel with general layer stacking is studied for the first time
-The predictions satisfy the free edge and free surface conditions
-The effect of geometrical parameters and layer stacking are investigated

Abstract: A thick composite cylindrical shell panel with general layer stacking is studied to investigate the free edge and 3D stresses in the panel which is subjected to pure bending moment. To this aim, a Galerkin based layerwise formulation is presented to discretize the governing equation of the panel to ordinary differential equations. Employing a reduced displacement field for the cylindrical panel, the governing equations for thick panel are developed in terms of displacements and a set of coupled ordinary differential equations is obtained. The governing equations are solved analytically for free edge boundary conditions and applied pure bending moment. The accuracy of numerical results is examined and the distribution of interlaminar and in-plane stresses is studied. The free edge stresses are studied and the effect of radius to thickness ratio, width to thickness ratio and layer stacking on the distribution of stresses is investigated. The focus of numerical results is on the prediction of boundary layer and free edge stress distribution.

[1] Corresponding author, Tel.:+98 24 3305 4058; Fax: +98 24 3228 3204, E-mail: i_ahmadi@znu.ac.ir