

IMPACT OF THE SHEAR AND THICKNESS STRETCHING EFFECTS ON THE FREE VIBRATIONS OF ADVANCED COMPOSITE PLATES

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Quasi-3D high-order shear deformation theories (HSDT) are often more effective for investigating advanced composite thick plates than two-dimensional (2D) theories. The present study examines the specific dimensionality effect of quasi-3D HSDT theories through-thickness stretching on the free vibration behavior of thin-thick rectangular plates. For this purpose, a 3D displacement field defined by only five unknowns is proposed. Besides, it contains a stretching component that contributes to the whole behavior of the plate. The results of the 2D model are compared to the results of the quasi-3D model. In addition, several factors, such as the aspect ratio, geometrical ratio, and material index, illustrate the influence of dimensionality. Young's modulus and densities should be graded in the direction of thickness. The motion equations are deduced based on Hamilton's principle. According to the boundary condition type, Navier's solution method is used for solving the obtained equations. The results show that the inclusion of the stretching component would increase the dynamic response of the thick advanced composite plates. Moreover, the influence of dimensionality is less significant for pure ceramic plates.

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