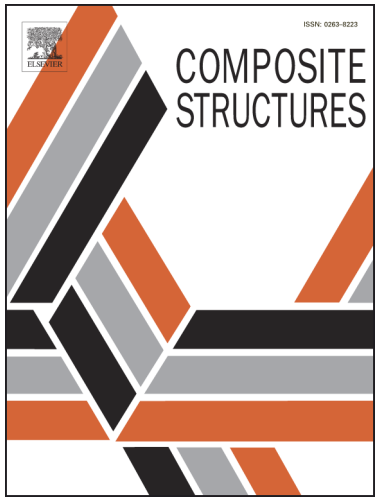

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DYNAMIC ANALYSIS OF THICK AND THIN ELLIPTIC SHELL STRUCTURES MADE OF LAMINATED COMPOSITE MATERIALS

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ABSTRACT. Elliptic geometries appear to be important components in engineering practices. The purpose of the present study is to examine the free vibration nature of laminated composite thick and moderately thick elliptic cones, cylinders and plates. A strong form approach, such as the Generalized Differential Quadrature (GDQ) method is employed to carry out the numerical analyses. The geometric description of the structures under consideration is performed through the differential geometry which is a convenient and general mathematical tool to have parametric description of curved structures. Reference solutions are presented for laminated composite thick elliptic shells. 3D finite element models are used for proving the validity and the advantages of the present methodology. Since laminated composite structures are investigated, higher-order theories are considered to capture the nonlinear behavior of the material fibers through the shell thickness. In particular, a hierarchical expansion order of the kinematic displacements is adopted. The expansion order is a function of a free parameter. The numerical solution is found discretizing the dynamic equilibrium equations, written as functions of the displacement parameters, with GDQ method. This technique proved to have several advantages such as stability, accuracy and easy implementation as also demonstrated by the authors in the provided literature.

KEYWORDS: Elliptic cones and cylinders, Doubly-Curved Shells and Panels, Laminated Composites, Higher-Order Shear Deformation Theory, Generalized Differential Quadrature Method, Free Vibrations.

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