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A finite Element Approach to Nonlinear Free Vibration of a Spherical Shell Panel Utilising Higher Order Shear Deformation Theory

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Abstract

Examine the nonlinear free vibration response of a spherical shell made of functionally graded materials (FGMs).

Temperature independent (TID) material qualities are used to subject it to uniform and non-uniform temperature changes.

The basic formulation is based on higher order shear deformation theory (HSDT) with Von-Karman nonlinear strains using modified C0 continuity. A direct iterative based nonlinear finite element method combined with mean centered first-order perturbation technique (FOPT) proposed for the Functionally Graded Materials plate is extended for spherical shell subjected to thermo-mechanical loading. The present outlined approach will be validated with those available in literature.

Introduction

A severe discontinuity in mechanical characteristics at the interfaces of two layers in laminated composite materials causes a number of issues. FGMs have the benefit over laminated composites in that material characteristics fluctuate continuously and smoothly from one surface to the next [1-3]. This is accomplished by altering the volume proportion of constituent materials on a continual basis. These materials can withstand significant temperature gradients while preserving structural integrity. As a result, it has a wide range of applications, including plasma face for nuclear reactors, wear resistant lining in the mineral processing industry, and so on. Using higher order shear deformation theory with von Karman nonlinear strain kinematics with modified C0 continuity, a stochastic nonlinear free vibration analysis of a functionally graded material plate resting on an elastic basis in a warm environment was examined. Achchhe Lal et al. looked into it; system unpredictability affects the nonlinear bending response of a laminated composite spherical shell panel [4,5].

Conclusion

Shear distortion proposition for arbitrary values of volume bit indicator. For case of isotropic (completely ceramic/ essence) globular shell, abecedarian frequentness have been compared with being results and it has been shown that the present results are in excellent agreement with the being result. It's shown that the advanced order shear distortion proposition can give accurate results for natural frequentness of FGM globular shell.

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