عنوان مقاله:

Effect of Temperature Dependency on Thermoelastic Behavior of Rotating Variable Thickness FGM Cantilever Beam

محل انتشار:

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خلاصه مقاله:

Thermoelastic behavior of temperature-dependent (TD) and independent (TID) functionally graded variable thickness cantilever beam subjected to mechanical and thermal loadings is studied based on shear deformation theory using a semi-analytical method. Loading is composed of a transverse distributed force, a longitudinal distributed temperature field due to steady-state heat conduction from root to the tip surface of the beam and an inertia body force due to rotation. A successive relaxation (SR) method for solving temperature-dependent steady-state heat conduction equation is employed to obtain the accurate temperature field. The beam is made of functionally graded material (FGM) in which the mechanical and thermal properties are variable in longitudinal direction based on the volume fraction of constituent. Using first-order shear deformation theory, linear strain–displacement relations and Generalized Hooke's law, a system of second order differential equation is obtained. Using division method, differential equations are solved for every division. As a result, longitudinal displacement, transverse displacement, and consequently longitudinal stress, shear stress and effective stress are investigated. The results are presented for temperature dependent and independent properties. It has been found that the temperature dependency of the material has a significant effect on temperature distribution, displacements and stresses. This model can be used for .thermoelastic analysis of simple turbine blades

کلمات کلیدی:

Cantilever beam, Temperature dependency, Functional graded materials (FGM), First-order shear deformation theory (FSDT), Division method, Thermoelastic