عنوان مقاله:

Effect of Material Gradient on Stresses of FGM Rotating Thick-Walled Cylindrical Pressure Vessel with Longitudinal Variation of Properties under Non-uniform Internal and External Pressure

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خلاصه مقاله:

The present paper provides a semi-analytical solution to obtain the displacements and stresses in a functionally graded material (FGM) rotating thick cylindrical shell with clamped ends under non-uniform pressure. Material properties of cylinder are assumed to change along the axial direction according to a power law form. It is also assumed that the Poisson's ratio is constant. Given the existence of shear stress in the thick cylindrical shell due to material and pressure changes along the axial direction, the governing equations are obtained based on first-order shear deformation theory (FSDT). These equations are in the form of a set of general differential equations with variable coefficients. Given that the FG cylinder is divided into n homogenous disks, n sets of differential equations with constant coefficients are obtained. The solution of this set of equations, applying the boundary conditions and continuity conditions between the layers, yields displacements and stresses. The problem was also solved, using the finite element method (FEM), the results of which were compared with those of the multi-layered method (MLM). Finally, some numerical results are presented to study the effects of applied pressure, non-homogeneity index, and power law index of FGM on the mechanical behavior of the cylindrical shell.

کلمات کلیدی:

Thick cylindrical shell, Functionally graded material (FGM), Multi-layered method (MLM), Longitudinal variation of properties, Non-uniform pressure

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