عنوان مقاله:

A New Technique for Stress Analysis of Functionally Graded Pressure Vessels Based on Bernstein Polynomials

محل انتشار:

هجدهمین کنفرانس سالانه مهندسی مکانیک (سال: 1389)

تعداد صفحات اصل مقاله: 6

نویسندگان:

A. Fallah - *Graduate student, Sharif University of Technology*

M.M Aghdam - *Accosiate Professor, Amirkabir University of Technology*

خلاصه مقاله:

In this paper, a new technique is developed to determine axisymmetric displacements and stresses in functionally graded (FG) cylindrical and spherical pressure vessels subjected to uniform internal pressure based on Bernstein polynomials. Material properties such as Young's modulus and Poisson's ratio of FG vessels vary with arbitrary functions of the radial coordinate. Based on the 2D elasticity theory and axisymmetricassumption, the governing equations of the problem reduce to a variable coefficients second order boundary value problem. Galerkin method together with Bernstein polynomials is used to obtain solution for the governing equation. The presented method is simple, efficient and accurate. Comparison of the predictions for both stress and displacement components with analytical results available in the literature for some special cases shows excellent agreement. For example, using only the first 10 terms of the Bernstein polynomials provides accurate predictions up to five digits in comparison with exact solution. Furthermore, predictions for radial displacement and stresses in various cylindrical and spherical pressure vessels with different material models are presented for future references.

کلمات کلیدی:

Functionally graded materials, Stressanalysis, Pressure vessels, Bernstein polynomials,Galerkin method