

عنوان مقاله:

Buckling Analysis of Functionally Graded Shallow Spherical Shells Under External Hydrostatic Pressure

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خلاصه مقاله:

The aim of this paper is to determine the critical buckling load for simply supported thin shallow spherical shells made of functionally graded material (FGM) subjected to uniform external pressure. A metal-ceramic functionally graded (FG) shell with a power law distribution for volume fraction is considered, where its properties vary gradually through the shell thickness direction from pure metal on the inner surface to pure ceramic on the outer surface. First, the total potential energy functional is obtained using the first-order shell theory of Love and Kirchhoff, Donnell-Mushtari-Vlasov kinematic equations and Hooke's Law. Then, equilibrium equations are derived through the minimization of the total potential energy functional by employing the Euler equations. The stability equations are derived by application of the adjacent - equilibrium criterion. As the nonlinear strain-displacement relations are employed, so the presented analysis is nonlinear with high accuracy. The Galerkin method is used to determine the critical buckling load. The present problem is also analyzed numerically by simulating it in Abaqus software. For validation, the present analytical results are compared with the present numerical results and with the known data in the literature. Also, the effects of some important geometrical and mechanical parameters on the hydrostatic buckling pressure are investigated.

کلمات کلیدی:

Buckling, Spherical shell, FGM, External hydrostatic pressure

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