عنوان مقاله:

A refined inverse hyperbolic shear deformation theory for bending analysis of functionally graded porous plates

محل انتشار:

مجله مکانیک کاربردی محاسباتی, دوره 51, شماره 2 (سال: 1399)

تعداد صفحات اصل مقاله: 15

نویسندگان:

Sidda Bathini - *Department of Mechanical Engineering, Rajeev Gandhi Memorial College of Engineering and Technology, Nandyal*

Vijaya Kumar Reddy K - *Department of Mechanical Engineering, Jawaharlal Nehru Technological University, Hyderabad*

خلاصه مقاله:

The modern engineering structures require the advanced engineering materials to resist the high temperatures and to provide high stiffness. In particular the functionally graded porous materials (FGPMs) introduced are expected to have these desired properties, consequently eliminating local stress concentration and de-lamination. In the present paper, a new shear strains shape function is chosen to research the bending analysis of functionally graded plates (FGPs) with uneven symmetrical, uneven asymmetrical and even distributions of porosity. The material properties of uneven porosity distributions along the thickness of the FGPs vary with cosine function. The present theory includes the influence of thickness stretching. This theory also fulfills the nullity of the shear stresses in the transverse direction on the top and bottom of the plate, thus avoids the use of a shear correction factor. The virtual displacement principle is employed to develop the equilibrium equations for porous FGPs. The Navier's method is used to obtain the solutions of porous FGPs for simply supported (SS) conditions. The accuracy of the developed theory is established with numerical results of perfect and porous FGPs available in the open source. The transverse displacements and stress results have been reported and studied for evenly, unevenly symmetrical and unevenly asymmetrical distributions with different porosity volume fraction (PVF), thickness ratios and aspect ratios. From the numerical results it is concluded .that the type of porosity distribution needs to be considered as a key factor in the optimal design of the porous FGPs

کلمات کلیدی:

Functionally graded porous plates, Bending analysis, Rule of Mixtures, Porosity distribution, Porosity volume fraction