

عنوان مقاله:

Two-Dimensional Elasticity Solution for Arbitrarily Supported Axially Functionally Graded Beams

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خلاصه مقاله:

First time, an analytical two-dimensional (2D) elasticity solution for arbitrarily supported axially functionally graded (FG) beam is developed. Linear gradation of the material property along the axis of the beam is considered. Using the strain displacement and constitutive relations, governing partial differential equations (PDEs) is obtained by employing Rissiner mixed variational principle. Then PDEs are reduced to two set of ordinary differential equations (ODEs) by using recently developed extended Kantorovich method. The set of $4n$ ODEs along the z -direction has constant coefficients. But, the set of $4n$ nonhomogeneous ODEs along x -direction has variable coefficients which is solved using modified power series method. Efficacy and accuracy of the present methodology are verified thoroughly with existing literature and 2D finite element solution. Effect of axial gradation, boundary conditions and configuration lay-ups are investigated. It is found that axial gradation influence vary with boundary conditions. These benchmark results can be used for assessing 1D beam theories and further present formulation can be extended to develop solutions for 2D micro or Nanobeams.

کلمات کلیدی:

Axially functionally graded, Two-Dimensional elasticity, Arbitrary supported, Extended Kantorovich method

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