ANALYSIS OF MODERATELY THICK FUNCTIONALLY GRADED PLATES SUBJECTED TO TRANSVERSE LOADS

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Abstract

In the present work, flexural analysis of a thin to moderately thick FGM plate subjected to transverse loads have been studied using finite element method. The formulation is developed based on the First order Shear Deformation Theory (FSDT). The mechanical properties are assumed to vary continuously through the thickness of the plate and obey a power law distribution of the volume fraction of the constituents. FGM's are typically heterogeneous in nature and a homogenization scheme is generally adopted for the analysis. To ascertain the effect of homogenization schemes on the material properties, the variation of volume fraction through the thickness have been computed using two different material homogenization techniques; namely the Rule of Mixtures and Mori-Tanaka scheme. In calculating the effective material properties through the thickness numerical integration have been used to evaluate the integrals which is easier and faster when compared to symbolic integration. A detailed discussion comparing the results from both the homogenization schemes have been presented. In addition to that a detailed parametric study bringing out the effect of boundary conditions, loading intensities and volume fraction index have been presented. Convergence tests and comparison studies have been carried out to demonstrate the efficiency of the present formulation.