

2016

A Three-Dimensional Solution for Bending Analysis of Functionally Graded Ceramic Metal Sandwich Plates with Stretching Effect

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Abstract : In this research, a simple but accurate sinusoidal plate theory for the thermomechanical bending analysis of functionally graded sandwich plates is presented. The main advantage of this approach is that, in addition to incorporating the thickness stretching effect, it deals with only 5 unknowns as the first order shear deformation theory (FSDT), instead of 6 as in the well-known conventional sinusoidal plate theory (SPT). The material properties of the sandwich plate faces are assumed to vary according to a power law distribution in terms of the volume fractions of the constituents. The core layer is made of anisotropic ceramic material. Comparison studies are performed to check the validity of the present results from which it can be concluded that the proposed theory is accurate and efficient in predicting the thermomechanical behavior of functionally graded sandwich plates. The effect of side-to-thickness ratio, aspect ratio, the volume fraction exponent, and the loading conditions on the thermomechanical response of functionally graded sandwich plates is also investigated and discussed.

Keywords : Sandwich plate, thermomechanical, analytical modelling, functionally graded material, stretching effect.