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www.elsevier.com/locate/ijmecsci

PII: S0020-7403(16)30489-1
DOI: http://dx.doi.org/10.1016/j.ijmecsci.2016.10.015
Reference: MS3457

To appear in: *International Journal of Mechanical Sciences*

Received date: 13 June 2016
Revised date: 29 September 2016
Accepted date: 14 October 2016

Cite this article as: J.L. Mantari and JC Monge, Buckling, free vibration an bending analysis of functionally graded sandwich plates based on an optimize hyperbolic unified formulation, *International Journal of Mechanical Sciences* http://dx.doi.org/10.1016/j.ijmecsci.2016.10.015

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Abstract

This paper presents an analytical solution of the linear buckling, free vibration and bending behavior of simple supported functionally graded sandwich plates subjected to transverse and axial mechanical loads. The used optimization strategy allows to express the transverse and in-plane displacement fields as a function of the *n* and *m* parameter, respectively, so the used Carrera's unified formulation (CUF) is also *n* and *m* parameters dependent. Principle of virtual displacement (PVD) is utilized to obtain the highly coupled differential equations. The solution is obtained via Navier-Type solution. Good agreements with quasi-3D solutions are found. The optimized parameters are used for solving the buckling problem of functionally graded sandwich plates with different side-to-thickness ratios. Numerical results for buckling are compared to different advanced theories since there isn't 3D solution available in the literature. Overall, the presented results have a high accuracy to estimate the critical loads, modes and natural frequencies.

Keywords: Sandwich plate, functionally graded materials, Carrera's unified formulation, linear buckling, free vibration.

1. Introduction

Functionally graded materials (FGMs) are heterogeneous advanced composite materials which. The thermal and elastic mechanical properties are defined by a gradual through the plate thickness variation of the mechanical properties influenced by the volume fraction. FGMs were