

Accepted Manuscript

Static and free vibration analysis of cross-ply laminated plates using the Reissner-mixed variational theorem and the cell based smoothed finite element method

A.L.N. Pramod, S. Natarajan, A.J.M. Ferreira, E. Carrera, M. Cinefra



PII: S0997-7538(16)30348-5

DOI: [10.1016/j.euromechsol.2016.10.006](https://doi.org/10.1016/j.euromechsol.2016.10.006)

Reference: EJMSOL 3366

To appear in: *European Journal of Mechanics / A Solids*

Received Date: 17 January 2016

Revised Date: 2 August 2016

Accepted Date: 17 October 2016

Please cite this article as: Pramod, A.L.N., Natarajan, S., Ferreira, A.J.M., Carrera, E., Cinefra, M., Static and free vibration analysis of cross-ply laminated plates using the Reissner-mixed variational theorem and the cell based smoothed finite element method, *European Journal of Mechanics / A Solids* (2016), doi: 10.1016/j.euromechsol.2016.10.006.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Static and free vibration analysis of cross-ply laminated plates using the Reissner-mixed variational theorem and the cell based smoothed finite element method

A. L. N. Pramod^a, S. Natarajan^{a,1}, A. J. M. Ferreira^b, E. Carrera^c, M. Cinefra^c

^a*Department of Mechanical Engineering, Indian Institute of Technology-Madras, Chennai, India.*

^b*Faculdade de Engenharia da Universidade do Porto, Porto, Portugal.*

^c*Department of Aeronautics and Aerospace Engineering, Politecnico di Torino, Torino, Italy.*

Abstract

Static bending and free vibration of cross-ply laminated plates with simply supported boundary conditions are studied using layerwise description for field variables. The layerwise approach accounts for the through-the-thickness deformations. The equations of motion and the boundary conditions are obtained by the Carrera's unified formulation. The stiffness matrix is computed by using the Reissner mixed variational theorem (RMVT), in which the transverse stresses are also treated as independent variables apart from the displacements. To this end, a mixed form of Hooke's law is defined. A cell-based smoothed finite element method is employed to compute the terms in the stiffness matrix. The influence of various parameters on the static bending and free vibration are numerically studied.

Keywords: Reissner-mixed variational theorem, laminated plates, vibration, cell based smoothed finite element method, static bending, layerwise theory

1. Introduction

The increased use of engineered materials, commonly referred to as 'composites' in various fields of engineering [1–3], demands clear understanding of their behaviour and

¹Department of Mechanical Engineering, Indian Institute of Technology-Madras, Chennai - 600036, India. Tel:+91 44 2257 4566, Email: snatarajan@cardiffalumni.org.uk; snatarajan@iitm.ac.in

Download English Version:

<https://daneshyari.com/en/article/5014407>

Download Persian Version:

<https://daneshyari.com/article/5014407>

[Daneshyari.com](https://daneshyari.com)