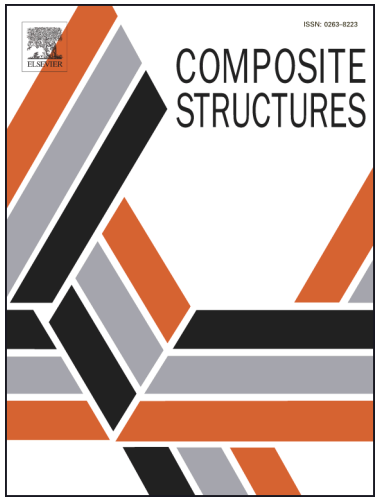

Nonlinear transient analysis of smart laminated composite plate integrated with PVDF sensor and AFC actuator

Vijay K. Singh, Trupti R. Mahapatra, Subrata K. Panda

PII: S0263-8223(16)30912-6
DOI: http://dx.doi.org/10.1016/j.compstruct.2016.08.020
Reference: COST 7701

To appear in: *Composite Structures*

Received Date: 15 June 2016
Revised Date: 6 August 2016
Accepted Date: 18 August 2016

Please cite this article as: Singh, V.K., Mahapatra, T.R., Panda, S.K., Nonlinear transient analysis of smart laminated composite plate integrated with PVDF sensor and AFC actuator, *Composite Structures* (2016), doi: http://dx.doi.org/10.1016/j.compstruct.2016.08.020

Nonlinear transient analysis of smart laminated composite plate integrated with PVDF sensor and AFC actuator

Vijay K. Singh[*a] Trupti R. Mahapatra[†b] Subrata K. Panda[‡c]

[a,c] Department of Mechanical Engineering, National Institute of Technology Rourkela, Rourkela: 769008, Sundergarh, Odisha, India

[b]School of Mechanical Engineering, KIIT University, Bhubaneswar, Odisha, India

Abstract

In this article, the geometrically nonlinear transient response of the smart laminated composite plate is investigated under the coupled electromechanical load. The plate has been modeled using the higher-order kinematic model in conjunction with Green-Lagrange nonlinear strains. The electric potential across the sensor/actuator layer is modeled as the quadratic function of the thickness coordinate. The domain is discretized with the help of a nine noded isoparametric quadrilateral element with thirteen degrees of freedom per node. The desired transient responses are obtained using the direct iterative method in association with Newmark's time integration scheme. In order to achieve distributed actuator and the sensor behaviour the active fibre composite and Polyvinylidene fluoride fibre reinforced composite are utilized along the poled fibre direction and through the thickness, respectively in this present investigation. In this analysis, two types of configurations of the sensor and actuator (collocated and non-collocated) are considered to compute the active stiffening responses. The convergence and the validity of the present numerical model have been

[a] Lead author: Research scholar; E-mail:vijaynitr12@gmail.com

[b]Co-author: *School of Mechanical Engineering*, *KIIT University, Odisha, India,*
E-mail addresses: trmahapatrafme@kiit.ac.in

[‡]Corresponding author: *Department of Mechanical Engineering*, *National Institute of Technology, Rourkela*-769008, Odisha E-mail addresses: pandask@nitrkl.ac.in, call2subrat@gmail.com