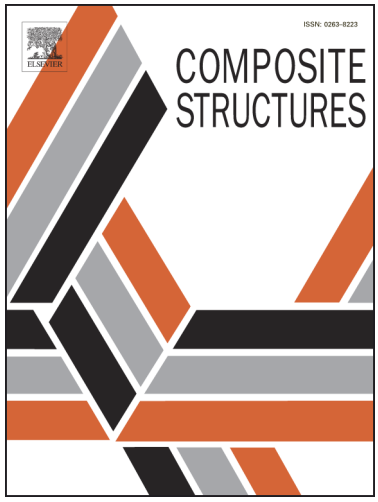

Nonlinear axisymmetric response of FGM shallow spherical shells with tangential edge constraints and resting on elastic foundations

Hoang Van Tung

PII: S0263-8223(16)30323-3
DOI: http://dx.doi.org/10.1016/j.compstruct.2016.04.032
Reference: COST 7396

To appear in: *Composite Structures*

Received Date: 2 May 2013
Revised Date: 2 April 2016
Accepted Date: 18 April 2016

Please cite this article as: Van Tung, H., Nonlinear axisymmetric response of FGM shallow spherical shells with tangential edge constraints and resting on elastic foundations, *Composite Structures* (2016), doi: http://dx.doi.org/10.1016/j.compstruct.2016.04.032

Nonlinear axisymmetric response of FGM shallow spherical shells with tangential edge constraints and resting on elastic foundations

Hoang Van Tung
Faculty of Civil Engineering, Hanoi Architectural University,
Ha Noi, Viet Nam
Tel: +84906193585
Email address: hoangtung0105@gmail.com

Abstract

This paper presents an analytical approach to investigate the nonlinear axisymmetric response of Functionally Graded (FG) Shallow Spherical Shells (SSSs) resting on elastic foundations, exposed to thermal environment and subjected to uniform external pressure. Material properties are assumed to be temperature-independent, and graded in the thickness direction according to a simple power law distribution in terms of the volume fractions of constituents. Formulations are based on the first order shear deformation shell theory taking geometrical nonlinearity, initial geometrical imperfection, Pasternak type elastic foundations and tangential edge restraints into consideration. Approximate solutions are assumed to satisfy clamped boundary conditions and Galerkin method is applied to derive explicit expressions of buckling loads and load-deflection relations. The effects of material and geometrical properties, foundation stiffness parameters, degree of tangential restraint, temperature field and imperfection on the buckling behavior and load carrying capacity of FG SSSs are analyzed and discussed.

Keywords: Functionally graded materials, Shallow spherical shells, Elastic foundation, Tangential restraint, Buckling and postbuckling, Imperfection.

1 Introduction

Structural elements in the form of spherical shells are widely used in many engineering structures. They play an important role as load carrying portions in the components of aircraft, missile and aerospace vehicle. Spherical shells also find diverse applications in industries such as shipbuilding, underground structures and