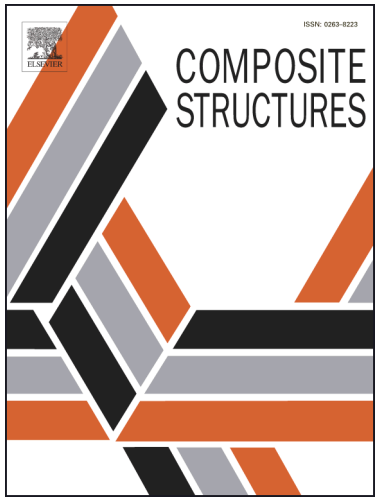

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Vibration analysis of the functionally graded carbon nanotube reinforced composite shallow shells with arbitrary boundary conditions

Qingshan Wang[1,2*], Xiaohui Cui[1,2], Bin Qin[3], Qian Liang[4]

[1]College of Mechanical and Electrical Engineering, Central South University, Changsha, 410083, PR China

[2]State Key Laboratory of High Performance Complex Manufacturing, Central South University, Changsha 410083, PR China

[3]Institute for turbulence-noise-vibration interaction and control, Shenzhen graduate school, Harbin Institute of Technology, Shenzhen, 51800, PR China

[4]The 54th Research Institute of CETC, Shijiazhuang, 050081, PR China

ABSTRACT

The aim of this paper is to firstly present the free vibration analysis of functionally graded carbon nanotube reinforced composite (FG-CNTRC) shallow shells with arbitrary boundary conditions. The first-order shear deformation theory and the artificial spring boundary technique are introduced to achieve the general theoretical modeling and arbitrary boundary conditions, respectively. Then according to the energy variational principle, the energy expression of the FG-CNTRC shallow shells is obtained. Furthermore, the admissible displacement functions of the FG-CNTRC shallow shells are chosen as an improved Fourier series which combines the standard double cosine Fourier series and several auxiliary functions which are introduced to remove any potential discontinuity of the displacement function and its derivatives at the edges. In the current framework, the vibration analysis of the FG-CNTRC shallow shells with arbitrary boundary conditions can be conducted by a unified model, and the calculation core code derived from the

* **Corresponding Author: Telephone: +86-451-82519797; Email: wangqingshanxlz@hotmail.com**