

Accepted Manuscript

A semi-analytical solution for in-plane free vibration analysis of functionally graded carbon nanotube reinforced composite circular arches with elastic restraints

Zeyu Shi, Xiongliang Yao, Fuzhen Pang, Qingshan Wang

PII: S0263-8223(17)32227-4

DOI: <http://dx.doi.org/10.1016/j.compstruct.2017.09.045>

Reference: COST 8908

To appear in: *Composite Structures*

Received Date: 17 July 2017

Revised Date: 21 August 2017

Accepted Date: 17 September 2017



Please cite this article as: Shi, Z., Yao, X., Pang, F., Wang, Q., A semi-analytical solution for in-plane free vibration analysis of functionally graded carbon nanotube reinforced composite circular arches with elastic restraints, *Composite Structures* (2017), doi: <http://dx.doi.org/10.1016/j.compstruct.2017.09.045>

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.

A semi-analytical solution for in-plane free vibration analysis of functionally graded carbon nanotube reinforced composite circular arches with elastic restraints

Zeyu Shi¹, Xiongliang Yao¹, Fuzhen Pang^{*1}, Qingshan Wang^{*2,3}

¹ College of Shipbuilding Engineering, Harbin Engineering University, Harbin, 150001, PR China

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

³ College of Mechanical and Electrical Engineering, Central South University, Changsha, 410083, PR China

This paper focuses on the issue of in-plane free vibration behaviors of functionally graded carbon nanotube reinforced composite (FG-CNTRC) circular arches (curved beams) under elastic boundary restraints. An improved Fourier series method and the first-order beam theory are adopted for this analysis. Carbon nanotubes (CNTs) are assumed to be varied continuously, as a matter of fact, uniformly distributed or functionally graded along the thickness of the arch, and the effective material parameters of the arch are decided by the rule of mixture. The displacements functions are unified expanded in the form of the a standard cosine Fourier series with two auxiliary terms which are appended to ensure continuity of displacement functions and their derivatives on the edges of circular arch and to achieve better convergence. The theoretical formulation is derived by the improved Fourier series representations and subsequently solved by two procedures which are strong form solution and weak form solution. With comparing to existing results reported in the publications, both proposed solutions are shown fast convergence, delightful accuracy and satisfactory dependability. A thoroughly parametric study is accomplished, in which the influences

* Corresponding Author: Telephone: +86-13945077820; Email: pangfuzhen@hrbeu.edu.cn

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

Download English Version:

<https://daneshyari.com/en/article/4917743>

Download Persian Version:

<https://daneshyari.com/article/4917743>

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