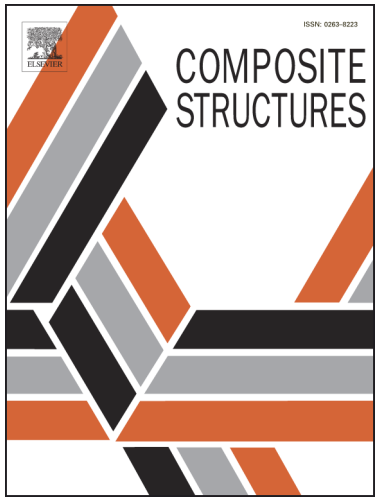

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PII: S0263-8223(16)30533-5
DOI: http://dx.doi.org/10.1016/j.compstruct.2016.07.070
Reference: COST 7670

To appear in: *Composite Structures*

Received Date: 9 May 2016
Revised Date: 18 July 2016
Accepted Date: 25 July 2016

Please cite this article as: Shao, D., Hu, S., Wang, Q., Pang, F., A unified analysis for the transient response of composite laminated curved beam with arbitrary lamination schemes and general boundary restrains, *Composite Structures* (2016), doi: http://dx.doi.org/10.1016/j.compstruct.2016.07.070

A unified analysis for the transient response of composite laminated curved beam with arbitrary lamination schemes and general boundary restrains

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Abstract

In this paper, the method of reverberation ray matrix (MRRM) is extended to develop an exact and unified solution for the transient response analysis of composite laminated curved beams with arbitrary lamination schemes and general boundary restrains. The effects of shear deformation, rotary inertia and deepness term as well as the Poisson's effect are considered in the theoretical formulations. Through the Laplace transformation, the governing differential equations are derived in frequency domain via the Hamilton's principle, and the exact closed form solutions are used to represent the elastic waves propagating in the curved beam. As the main focus of this paper, the artificial spring boundary technique is adopted to simulate general boundary restraints and the scattering matrix is redefined to make the MRRM suitable for different boundary cases. Then, the transient responses of the composite laminated curved beam under general boundary restrains are obtained directly by using the Neumann series expansion and the Fast-Fourier transform (FFT) algorithm. Several numerical cases are presented to test and verify the accuracy, reliability and efficiency of the present solution. Meanwhile, a systematic parameter investigation is performed regarding the influents of elastic restraint parameters, lamination schemes, material properties, geometry parameters and loading types.

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