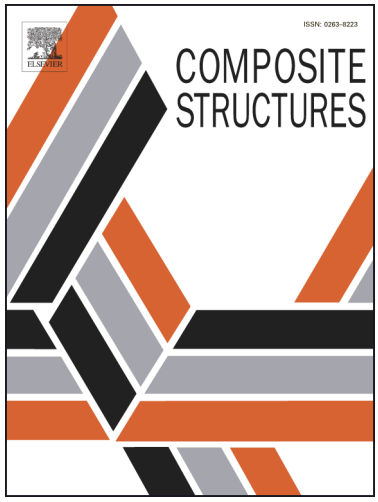

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A semi-analytical solution for in-plane free vibration analysis of functionally graded carbon nanotube reinforced composite circular arches with elastic restraints

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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

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