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On the modelling of the vibration behaviors via discrete singular convolution method for a high-order sector annular system

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Abstract

This research presents a numerical investigation on the dynamic information of the axisymmetric sandwich annular sector plate via a higher-order continuum elasticity theory. The sandwich annular sector plate comprises multi-hybrid nanocomposite reinforced (MHCR) face sheets in the top, bottom layers, and a honeycomb core. For modeling the thermal situation and the thickness of the structure, three-kinds of thermal loading are presented. For simulating MHCR face sheets, the role of the mixture and Halpin–Tsai micromechanics model is utilized. For obtaining the governing equations and various boundary conditions, first-order shear deformation theory (FSDT), as well as Hamilton's principle, are presented. For solving the equations and obtaining eigenvalue, and eigenvector of the current structure, discrete singular convolution method (DSCM) as a numerical one is investigated. Consequently, a parametric study is carried out to examine the impacts of honeycomb network angle, thickness to length ratio of the honeycomb, honeycomb to face sheet thickness ratio, fibers angel, outer to inner radius ratio, and weight fraction of CNTs on the dynamics of the current sandwich structure. The results show that for clamped edge and each t_h/l_h, increasing θh/πθh/π is a reason for

decreasing the natural frequency of the disk. Another consequence is that the impact of temperature changes on the frequency of the disk is hardly dependent on the fiber angle. It means that the effect of temperature changes on the frequencies of the current system is more considerable at $0.2 \leq \theta_f/\pi \leq 0.4$ and $0.6 \leq \theta_f/\pi \leq 0.8$.