عنوان مقاله:

Nonlinear Vibration of Rotating Laminated Composite Cross-ply Cylindrical Shell on Nonlinear Rotating Elastic Foundation

نویسندگان:

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خلاصه مقاله:

This paper is focused on the study of nonlinear vibration of rotating laminated composite cross-ply cylindrical shells on a nonlinear rotating elastic foundation. In this study, FSDT is employed while the geometrical nonlinearity of the cylindrical shell is modeled considering the von Karman approach. It should be mentioned that this study is accomplished considering the influences of initial hoop tension as well as Coriolis and Centrifugal accelerations. The nonlinear equation of the rotating laminated composite cross-ply cylindrical shell is extracted via the Ritz method and then is written in the state space form. Then, modal analysis and the multiple scales method are applied to the nonlinear vibration equation in the state space form to obtain relations for nonlinear forward and backward frequency ratios. Validation of the results of this study is investigated considering some results published in the literature and good agreement is observed. Finally, the effects of the nonlinear and linear constants of the rotating foundation, radius, total thickness, length, and rotation speed on the linear frequencies, nonlinear parameters, and the curves of nonlinear frequency ratios versus amplitude parameters are acquired. The results show that the increase of the nonlinear constant of the rotating foundation doesn't influence the linear frequencies. Besides, linear frequencies increase with increase of the linear constants of the rotating elastic foundation and decrease with increase of the radius or total thickness. Furthermore, the increase of the nonlinear constant of the rotating elastic foundation or total thickness leads to an increase in nonlinear parameters and nonlinear frequency ratios. Conversely, the increase of the linear constants of the rotating foundation or the radius leads to a decrease in nonlinear parameters and frequency ratios. Moreover, the increase in amplitude parameters leads to an increase in the nonlinear frequency ratios.

کلمات کلیدی:

Nonlinear vibration, Rotating laminated composite cross-ply cylindrical shell, Nonlinear rotating elastic foundation, Modal Analysis, multiple scales method

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