World Academy of Science, Engineering and Technology
International Journal of Aerospace and Mechanical Engineering
Vol:9, No:01, 2015

Non-Linear Free Vibration Analysis of Laminated Composite Beams Resting on Non-Linear Pasternak Elastic Foundation: A Homogenization Procedure

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Abstract : In the present paper, the problem of geometrically non-linear free vibration of symmetrically and asymmetrically laminated composite beams (LCB) resting on nonlinear Pasternak elastic Foundation with immovable ends is studied. A homogenization procedure has been performed to reduce the problem under consideration to that of the isotropic homogeneous beams with effective bending stiffness and axial stiffness parameters. This simple formulation is developed using the governing axial equation of the beam in which the axial inertia and damping are ignored. The theoretical model is based on Hamilton's principle and spectral analysis. Iterative form solutions are presented to calculate the fundamental nonlinear frequency parameters which are found to be in a good agreement with the published results. On the other hand, the influence of the foundation parameters on the nonlinear frequency to the linear frequency ratio of the LCB has been studied. The non-dimensional curvatures associated to the fundamental mode are also given in the case of clamped-clamped symmetrically and asymmetrically laminated composite beams.

Keywords : large vibration amplitudes, laminated composite beam, Pasternak foundation, composite beams
Conference Title : ICAMAME 2015 : International Conference on Aerospace, Mechanical, Automotive and Materials Engineering
Conference Location : Jeddah, Saudi Arabia
Conference Dates : January 26-27, 2015