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Vibration Control of a Functionally Graded Carbon Nanotube-Reinforced Composites Beam Resting on Elastic Foundation

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Abstract : In this paper, vibration of a nonlinear composite beam is analyzed and then an active controller is used to control the vibrations of the system. The beam is resting on a Winkler-Pasternak elastic foundation. The composite beam is reinforced by single walled carbon nanotubes. Using the rule of mixture, the material properties of functionally graded carbon nanotube-reinforced composites (FG-CNTRCs) are determined. The beam is cantilever and the free end of the beam is under follower force. Piezoelectric layers are attached to the both sides of the beam to control vibrations as sensors and actuators. The governing equations of the FG-CNTRC beam are derived based on Euler-Bernoulli beam theory Lagrange- Rayleigh-Ritz method. The simulation results are presented and the effects of some parameters on stability of the beam are analyzed.

Keywords : carbon nanotubes, vibration control, piezoelectric layers, elastic foundation
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