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Abstract

This paper investigates the free vibration analysis of a doubly tapered magnetorheological rotating sandwich beam based on the Euler-Bernoulli theory. The beam is made of a magnetorheological elastomer core sandwiched between two elastic layers. Through energy approach the kinetic and potential energies of the system are written and using the Lagrange equation the discretized form of the governing equation is derived based on the Ritz method. The free vibration analysis is carried out to obtain the natural frequency and the corresponding loss factor of the beam. Finally, after validating the formulation in order to provide a deep insight the effects of different parameters on the free vibration characteristics of the beam are studied through a comprehensive survey.

Key words: Free vibration, Rotating tapered beam, Sandwich beam, Magnetorheological material, Natural frequency

1. Introduction

For many years, idea of smart materials and intelligent structures was an attractive issue and challenge for researchers and engineers. A smart structure is an active or semi-active multifunction system with the capability of responding to external excitation in a controlled and prescribed manner. There are different types of smart materials including shape memory alloys, piezoelectrics, self-healing material and etc with a wide range of applications

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