عنوان مقاله:

Dynamic Response of Bi-Directional Functionally Graded Materials (BDFGMs) Beams Rested on Visco-Pasternak Foundation Under Periodic Axial Force

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خلاصه مقاله:

Since the temperature or stress distribution in some advanced machines such as modern aerospace shuttles and craft develops in two or three directions, the need for a new type of FGMs is felt whose properties vary in two or three directions. On the other hand, dynamic buckling behavior of structures is a complicated phenomenon which should be investigated through the response of equations of motion. In this paper, dynamic response of beams composed of bi-directional functionally graded materials (BDFGMs) rested on visco-Pasternak foundation under periodic axial force is investigated. Material properties of BDFGMs beam vary continuously in both the thickness and longitudinal directions based on the two types of analytical functions (e.g. exponential and power law distributions). Hamilton's principle is employed to derive the equations of motion of BDFGMs beam according to the Euler-Bernoulli and Timoshenko beam theories. Then, the generalized differential quadrature (GDQ) method in conjunction with the Bolotin method is used to solve the differential equations of motion under different boundary conditions. It is observed that a good agreement between the present work and the literature result. Various parametric investigations are performed for the effects of the gradient index, length-to-thickness ratio and viscoelastic foundation coefficients on the dynamic stability region of BDFGMs beam. The results show that the influence of gradient index of material properties along the thickness direction is greater than gradient index along the longitudinal direction on the dynamic stability of BDFGMs beam for both exponential and power law distributions.

کلمات کلیدی:

Dynamic stability, BDFGM, Visco-Pasternak foundation, Periodic axial force