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A NUMERICAL MODEL FOR MODAL ANALYSIS OF FUNCTIONALLY GRADED PIEZOELECTRIC BEAM

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ABSTRACT

This investigation is concerned with a numerical model of modal analysis of functionally graded piezoelectric material beam actuated under d31 effect. A refined Trigonometric shear deformation theory is being used in this study. The electric potential is assumed to follow the sinusoidal distribution along the length direction. The material properties are assumed to vary continuously across the thickness according to the volume fraction of constituents described by power law distribution. Hamilton's principle is employed to obtain the governing equations of motion along with associated boundary conditions for FGPM beam. A numerical model is derived for vibration analysis of FGPM beam using differential quadrature method. Results for fixed-fixed end condition are presented. Effects of power exponents and geometric parameter on natural frequency are also reported.

Keywords: Numerical model, Vibration analysis, Refned Trigonometric shear deformation theory, Functionally graded piezoelectric beam, Generalized differential Quadrature