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ACTIVE-PASSIVE DAMPING IN FUNCTIONALLY GRADED SANDWICH PLATE/SHELL STRUCTURES

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Abstract. In this work, a simple and efficient finite element model is applied to the vibration analysis of active-passive damped multilayer sandwich plates/shells with a viscoelastic core, sandwiched between functionally graded material (FGM) layers, and including piezoelectric layers. Both the FGM and the piezoelectric layers are modelled using the classical plate theory and the core is modelled using Reddy's third-order shear deformation theory. The sandwich finite element is obtained performing the assembling of N "elements" through the thickness, by using specific assumptions on the displacement continuity at the interfaces between layers. To achieve a mechanism for the active control of the structural dynamics response, a feedback control algorithm is used, coupling the sensor and active piezoelectric layers. The dynamic analysis of the sandwich plate/shell structures is conducted in the frequency domain to obtain the natural frequencies and the loss factors of the viscoelastic core and in time domain for the steady state harmonic motion. For both analyses, a finite element code has been implemented. The model is applied in the solution of some illustrative examples and the results are presented and discussed.

Keywords: Piezoelectric actuators; Viscoelastic material; Active-passive damping; FGM; Sandwich.

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