INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

This dissertation deals with the active and active-passive vibration control of annular plates through the design of two new piezoelectric fiber composite (PFC) actuators and shear actuated hybrid damping treatment. The first PFC actuator is an extension-mode PFC actuator with the cylindrically periodic microstructure. It is designed mainly for active control of plane structures of revolution, where the extension-mode actuation force primarily arises in the radial coordinate of the reference cylindrical coordinate system.

The second PFC actuator is a new shear-mode PFC actuator by the name of Balanced Laminate of PFC (BL-PFC). The shear-mode actuation characteristics of this BL-PFC actuator are first investigated through a theoretical study on the shear actuated bending deformation of a sandwich beam with the BL-PFC actuator patches at the core. Subsequently, the performance of this BL-PFC actuator in shear-mode active vibration control of annular plates is estimated theoretically along with a comparative study on the shear-mode actuation capabilities of Shear Actuated Fiber Composite (SAFC) actuator, monolithic shear piezoelectric actuator (PZT5H) and present BL-PFC actuator. Finally, the effectiveness of the BL-PFC actuator for shear actuated hybrid active-passive damping treatment of annular plates is presented where the passive counterpart of the total active-passive damping is achieved either using a conventional monolithic viscoelastic material layer or using a 0-3 viscoelastic composite (VEC) layer.