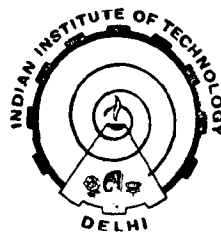


# VIBRATION AND DAMPING ANALYSIS OF CURVED SANDWICH STRUCTURES WITH VISCO-ELASTIC CORES

by

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A Thesis submitted to the  
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for the award of the degree of  
**DOCTOR OF PHILOSOPHY**



Department of Mechanical Engineering  
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CERTIFICATE

This is to certify that the thesis entitled 'Vibration and Damping Analysis of Curved Sandwich Structures with Visco-elastic Cores' being submitted by Mr. Jagdish Vaswani to the Indian Institute of Technology, New Delhi, for the award of the Degree of Doctor of Philosophy in Mechanical Engineering, is record of bonafide research work carried out by him. He has worked under our guidance and supervision and has fulfilled the requirements for submission of this thesis, which has reached the requisite standard.

The results contained in this thesis have not been submitted in part or in full, to any other university or institute for the award of any degree or diploma.

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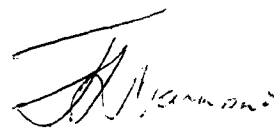
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Jagdish Vaswani

ABSTRACT

Energy principles have been used to derive the equations of motion and expressions for boundary conditions for four configurations of unsymmetrical curved sandwich structures with constrained viscoelastic layers subjected to harmonic excitation. The structures analysed are a 3 layer curved sandwich beam; a multilayered curved sandwich beam with alternate viscoelastic layers; a three layered singly curved sandwich panel; and a three layered doubly curved sandwich panel. Equations of motion have been derived in terms of the displacements of midsurfaces of elastic layers and the transverse displacement, by considering extension and bending of elastic layers and shear deformation in visco-elastic layers. Variation of radius of curvature across thickness of a layer has been accounted for except in the case of doubly curved sandwich panels. Simplified equations of motion for the three layered curved sandwich beam and singly curved sandwich panel have also been derived by neglecting this effect of variation of radius of curvature across thickness of a layer.

The equations of motion have been solved for the case of simply supported boundaries by assuming a series solution for the displacements and expressing the forcing function in terms of a series, to study the effect of

various geometrical and physical parameters on the vibration and damping response of these structures.

Vibration and damping response tests have been carried out on curved sandwich beams with simulated simply supported end conditions, and the experimental and theoretical results compared to verify the theoretical analysis.

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