"THE EFFECT OF COULOMB DAMPING ON SINGLE AND MULTIDEGREE OF FREEDOM STRUCTURES"

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ABSTRACT

This study compares the effects of viscous and coulomb damping on the dynamic response of single and multidegree of freedom structures.

It was found that coulomb damping was less effective than viscous damping in reducing the steady-state resonant amplitude of all non-linear structures when the steady-state amplitude was greater than two. Also, there is no single, simple relationship relating the amount of viscous damping to coulomb damping for equal resonant steady-state response of non-linear structures.

For the earthquake excitation of the single-degree-of-freedom structure it was found that coulomb damping was less effective than viscous damping in reducing the velocity and displacement spectral response values for short period structures whereas for longer period structures coulomb damping was much more effective than viscous damping. Both forms of damping had a paradoxical effect on the acceleration response of non-linear structures in that an increase in damping generally causes an increase in the acceleration response.

The closed solution of a multidegree of freedom structure with viscous and coulomb damping subjected to a sinusoidal forcing function is derived and used to obtain approximate values of viscous and coulomb damping from small amplitude vibration tests. It is clear from the results obtained that if coulomb damping is present in small amplitude vibrations of a structure then the concept of equivalent viscous damping will result in the structure being overdamped when subjected to an earthquake ground motion.

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