SM25S_10871

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Interaction of Primary and Internal 1:1 Resonances in Nonlinear Symmetric 2DOF Systems with Cubic Nonlinearities

Arkadiy I. Manevich

Dniepropetrovsk National University, Ukraine

The primary resonance at forced oscillations in symmetric cubic two-degree-of-freedom systems with close eigenfrequencies under harmonic excitation is studied. Equations of motion(which are written for the case when generalized displacements are the principal coordinates) are solved by the multiple scales method. The interaction of the internal resonance and the primary external resonance gives rise to one or two additional resonances due to appearance of coupled stationary (steady-state) modes (CSM). A complete analysis of the number of CSM's, their stability and configuration of the CSM's paths in phase spaces is carried out. It is shown, in particular, that in damped systems the CSM's are not exact normal or elliptic modes but they asymptotically approach NM or EM when the energy of oscillations increases (if they exist at large amplitudes).

View the extended summary