ABSTRACT

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Title: Study of Non-Linear Response of Some Parametric Oscillators With Vibrational Resonance.

This Ph.D. thesis consists of the analysis of nonlinear response of certain oscillators under the influence of bi-harmonic forces of widely different frequencies (slow and fast frequency). In literature, study of resonance response by controlling this fast frequency drive strength is extensively known as ***Vibrational Resonance***.

We consider various types of parametric oscillators for this purpose. In our study of Mathieu-Duffing oscillator and Van der Pol-Mathieu-Duffing oscillator, we examine the effects of fast frequency and fast drive strength on the system's response to the external slow excitation. We also inspect the behavior of system's stability through bifurcation analysis by tuning the fast drive frequency. To derive the analytical results we use perturbation methods like direct partition of motion, multiple time scale analysis, Lindstedt-Poincaré method of perturbation. Finally, all the analytical results are supported by the detailed numerical simulations and physical interpretations are given.

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