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Analysis of the Dynamics of a Two-Degree-of-Freedom Nonlinear Mechanical System under Harmonic Excitation

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Abstract: In this paper the 2-degree-of-freedom mechanical system under the action of external harmonic excitation is considered. The system consists of the rotating elastically mounted frame and attached mass (absorber) with viscous friction and nonlinear stiffness. The stability problem of periodic regimes is investigated based on the averaging method. The influence of nonlinear component is analyzed with respect to responses of the main mass in the vicinity of resonance frequencies.

Keywords: *harmonic excitation; averaging technique; resonance frequency; stability; nonlinear stiffness.*

Mathematics Subject Classification (2010): 34C46, 34D20, 70E50, 70E55, 70K20.

1 Introduction

The problems associated with unwanted vibrations are encountered in many applied tasks in machine-building, construction, aerospace engineering, biomechanics, etc. For a number of reasons, a structure may encounter excitation sources that are not provided for in the design. To improve the reliability of the design, the engineers aim at a simple, low cost and efficient solution. In many cases, dynamic vibration absorbers (DVA) meet these requirements. Dynamic vibration absorbers or tuned mass dampers are small mass-spring-damper elements locally attached to the structure designed to dissipate excessive vibration energy.

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