INTRODUCTION

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Vibrations are encountered in nearly all domains explored by scientific thought : mechanics, acoustics, electricity, optics, biology, geology, sociology, etc., . They may be useful and agreeable such as those produced by the clock, the musician, an electric power station, or radio broadcasting; or they may be disagreeable, useless, or even dangerous, such as the heaving of ships, sounds produced by the beginning violin student, the vibrations of an airplane using, excessive cardiac activity, or the instability of automatic controls.

The mathematical theory underlying oscillation may be very simple like that of simple harmonic motion, or very difficult like that of non-linear oscillations. The vibrating systems may have but one degree of freedom or many or an infinity.

One of the most attractive features of the subject of non-linear oscillations is the existence of a surprisingly wide variety of such distinctive phenomena. For example the occurrence of resonance (harmonic, sub-harmonic, super-harmonic, sub-superharmonic, combination of type additive, or difference) and other. Certainly it will not be possible in this work to include all of it. I have therefore limited my self to those topics, which consider essential. I have been concerned only with systems having two-degree of freedom, with the object to,

-Finding an approximate solutions in the presence of resonance conditions by using one of the perturbation methods [10,12,15,16,33].

Stephenson [3] and Timoshenko [10] showed that beams and rods with dynamic axial loads exhibit interesting parametric phenomena. Skomedal [41] studied the parametric excitation of roll motion and its effect on stability. Nayfeh and Zavondy [69] and Nayfeh [42] investigated the response of one-and two-degree-of freedom systems to parametric excitation. Several books are devoted to the problem of parametric excitations. That of Evan-Iwanowski [30], Nayfeh and Mook [33] and Ibrahim [55].

A considerable number of investigators have given much attention in systems subjected to combined parametric and external excitation, Haquang, Mook and Plaut [65], Kazuyuki and others [81], Yagasaki [85], Sanchez and Nayfeh [86], Anna [88], Sethna [18], Plaut and others [80] and Pezeshki and others [87]. There exist some undesirable vibrations in most physical system. Quenching of such vibrations are led to design single degree of freedom systems, this systems are called vibration absorbers. Their exist several types of absorbers, such as Lanchester absorber [36,73], autoparametric vibration absorber (AVA) [22,29], and dynamic vibration absorber [48,68]. A general study of the (AVA) has been given by Sethna [18]. Haxton and Barr [22], and Hatwal, Mallik and Gosh [39,44,45], Ibrahim and Roberts [29] and Roberts [35].

The dynamic vibration absorbers are investigated by Mansour [25], Tondl [27,28], Yamakawa, Takeda and Kojima [24], Kojima and Saito [48], Hunt and Nissen [40], Nissen and Popp and others [46], Natasiavas [89,91], and Huang and Lian [94].

The main aim of this thesis which contains five chapters is to study forced, parametric , interaction of the parametric and forced response of some physical systems. Also the response of autoparametric vibration absorbers " AVA " and the dynamic vibration absorber.

In chapter one, we focus our attention on the study of the forced oscillations of two degree of freedom system. Sub-harmonic resonance of the first mode and super-harmonic resonance of the second mode in in the presence of internal resonance two-to-one and one-to-two are investigated.

Chapter two is concerned with the response of two internal resonant, oscillators with quadratic non-linearities subjected to quadratic parametric excitation. Principal parametric resonances of the first and second mode in the presence of internal resonance of type two-to-one and one-to-two are discussed.

In chapter three we studied, the response of two internal resonant oscillators subjected to combined quadratic parametric excitation and external excitation of the same frequency. Principal parametric resonance of the second mode and combination parametric resonance of the additive type in the presence of internal resonance two-to-one and one-to-two are examined.

In the first three chapters the method of multiple scales [33]. is used to determine four first order non-linear ordinary differential equations that governing the time variations of the amplitudes and phases of the interacting modes. The fixed (equilibrium) points of the modulation equations are obtained by using a numerical technique, and their stability is determined using Routh-Hurwitz Criterion . Numerical results are given and represented by group of Figures.

Chapter four is devoted to study the response of a non-linear system provided with non-linear vibration absorber, (autoparametric vibration absorber, (AVA)), the method of multiple dimension [75], which is a generalization of Lindsted-Poincare method [33] or an alternative perturbation technique of multiple scales method, is applied to determine, harmonic sub-harmonic, and super-harmonic resonances. Steady-state equations are obtained. Stability analysis of each type of resonance are determined. Numerical calculations are carried out. Results are plotted in group of Figures.

Chapter five is concerned with the study, of steady state behavior of systems provided with non-linear dynamic vibration absorber, in which both the machine and the absorber are supported by non-linear dampers and non-linear springs. Using the method of averaging [10,12,33], the steady state solutions are determined. Stability analysis are investigated. Numerical calculations are presented for several representative combinations of the system parameters, in an effort to gain a better understanding of their effect on the system response. The results are plotted in group of Figures.