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Dedicated to Professor LAZĂR DRAGOȘ on his 75th birthday

The mathematical modelling and the stability study of some speed regulators for nonlinear oscillating systems

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Abstract - The paper analyses two speed regulators for a uniform response in the case of some mechanisms with periodic motion. For the first mechanism with one degree of freedom, the conditions for uniform motion are computed in three cases: I. the vibrating mass is a rigid coupling with the elastic force and the damping force, II. the vibrating mass is a rigid coupling with the hardened elastic force and the damping force, III. the vibrating mass is a rigid coupling with the elastic force, the hardened elastic force and the damping force. For the second mechanism with two degrees of freedom, the vibrating mass is serially linked with the elastic and damping forces. This analysis leads to the study of some Duffing equations. The obtained equations being nonlinear, we apply the averaging method and the Van der Pol method. The stability of solutions in the phases space, the limit cycles for a uniform response of the system and the conditions of resonance are also studied.

Key words and phrases : speed regulator, nonlinear dynamical system, averaging method, Van der Pol method, limit cycle, stable point

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