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TO THE MANIFESTATION OF THE EFFECT OF OSCILLATOR ASYMMETRY WITH CUBIC NONLINEARITY IN EXPRESSION OF ELASTICITY FORCE

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At instantaneous loading of linear elastic systems with constant force the coefficient of dynamism is equal to two. This pattern is absent in nonlinear systems, where the coefficient of dynamism depends on the type of elastic characteristics of the system, as well as the value of the load [1-4].

This effect is characteristic, for example, of an oscillator with cubic nonlinearity in terms of elastic force:

$$\ddot{x}+\omega^2 x+\frac{\beta}{m}x^3=\frac{P}{m}\mathrm{H}(t). \qquad (1)$$

where: $\omega^2=\alpha/m$; m – mass; α,β – elasticity characteristics; $x=x(t)$ – oscillator movement; t – time; $\mathrm{H}(t)$ – single Heaviside function.

The solutions of the differential equation of motion of a cubic-nonlinear oscillator loaded with instantaneously applied force are expressed in terms of periodic elliptic functions [3].

The coefficient of dynamics of the oscillator depends not only on its mass and stiffness parameters, but also on the value of the applied force.

It is less than two for hard elasticity and larger than two for soft elasticity. In the case of a soft elasticity characteristic, there are critical values of dynamic and static loads, of which dynamic is less than static. Under the action of critical dynamic load, the oscillator loses its oscillating properties.

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