CHAOTIC AND REGULAR VIBRATIONS IN DISCRETE-CONTINUOUS SYSTEMS TORSIONALLY DEFORMED WITH LOCAL NONLINEARITIES

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The paper deals with regular and irregular nonlinear vibrations in discrete-continuous mechanical systems. Such systems consist of rigid bodies connected by elastic elements torsionally deformed. Damping in the systems is taken into account by an equivalent damping located in selected cross-sections. To the first rigid body a discrete element is attached. The spring in this element has nonlinear characteristics described by the polynomial of the third degree. The behavior of the systems in the case of the both types of characteristics, hard and soft, is discussed. The systems are loaded by an external moment represented by the function harmonically changing in time. In the considerations the wave approach is used leading to solving equations with a retarded argument.

Exemplary numerical results are presented for three-mass systems. It will be shown that in the case of a hard characteristic amplitude jumps are observed while in the case of a soft characteristic an escape phenomenon is observed. These effects concern regular vibrations with large damping. Irregular vibrations, including chaotic vibrations, can occur for selected parameters with small damping. The possibilities of occurring of such vibrations are discussed on the basis of the Poincare maps, bifurcations diagrams and the exponents of Lyapunov. Several diagrams of these types with detailed descriptions are presented [1,2].

REFERENCES