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# Analysis of dynamics of a non-ideal system based on decomposition of the equations of motion

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*Abstract*: The dynamical response of a nonlinear 3 degrees-of-freedom system under the action of non-ideal excitation is investigated in the paper. The excitation is said to be a non-ideal when the forces depend on the motion of the system. Such a source is described by its own differential equation and therefore, the total number of degrees of freedom of the system increases by one. In considered system the role of non-ideal source is played by a DC motor with eccentrically suspended mass which generates a torque the magnitude of which depends on the angular velocity. During operation of the system, the general coordinate assigned to the non-ideal source is growing rapidly as a result of rotation. The main idea of the paper is to carry out the decomposition of the equations of motion in such a way as to extract the solution which is directly related to the rotation of the unbalanced rotor. The remaining part of the solution describes pure oscillations which depend on the dynamical behavior of the whole system. The equations of motion, decomposed in this way, have been solved numerically. The influence of selected system parameters on its dynamic behavior has been examined. The examined system may be considered as a good example for several engineering applications.

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