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Nonlinear Dynamics : Mathematical Models for Rigid Bodies with a Liquid

By Ivan A. Lukovsky

Walter De Gmbh Gruyter Jun 2017, 2017. Taschenbuch. Condition: Neu. Neuware - This book is devoted to analytically approximate methods in the nonlinear dynamics of a rigid body with cavities (containers) partly filled by a liquid. The methods are normally based on the Bateman-Luke variational formalism combined with perturbation theory. The derived approximate equations of spatial motions of the body-liquid mechanical system (these equations are called mathematical models in the title) take the form of a finite-dimensional system of nonlinear ordinary differential equations coupling quasi-velocities of the rigid body motions and generalized coordinates responsible for displacements of the natural sloshing modes. Algorithms for computing the hydrodynamic coefficients in the approximate mathematical models are proposed. Numerical values of these coefficients are listed for some tank shapes and liquid fillings. The mathematical models are also derived for the contained liquid characterized by the Newton-type dissipation. Formulas for hydrodynamic force and moment are derived in terms of the solid body quasi-velocities and the sloshing-related generalized coordinates. For prescribed harmonic excitations of upright circular (annular) cylindrical and/or conical tanks, the steady-state sloshing regimes are theoretically classified; the results are compared with known experimental data. The book can be useful for both experienced and early-stage...



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