Special issue on recent advances in nonlinear rotordynamics

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This issue of Nonlinear Dynamics is devoted to actual problems in rotordynamics. Rotating machinery plays an important role in many disciplines of engineering. The dynamics of such machines are rich in nonlinearity so that a survey on topics concerning nonlinear phenomena in rotor dynamics is interesting for theory and practice.

In organizing this issue, we did not intend to target one special topic within this field. We simply wanted to reflect its breadth of interests. The results of this informal survey are published in this issue indicating that many different problems occur. Nine contributions are collected from all over the world. Okabe and Cavalca investigate the dynamics of systems with a nonlinear model of tilting pad bearings including turbulence effects. Boyaci et al. perform an analytical bifurcation analysis of a rotor supported by floating ring bearings while Schweizer studies oil whirl, oil whip and whirl/whip synchronization occurring in such systems. Szolc et al. examine the nonlinear and parametric vibrations of rotor-shaft systems as fault identification

symptom using stochastic methods. Xia et al. present two efficient calculation methods for solving the Reynolds equation within the nonlinear modeling and dynamic analysis for rotor-bearing systems while Zhang et al. carry out an analytical study of nonlinear synchronous full annular rub motion of flexible rotor-stator system and its stability. Ishida et al. deal with nonlinear resonances and self-excited oscillations of a rotor caused by radial clearance and collision and Pennacchi considers nonlinear effects due to electromechanical interaction in generators with smooth poles. Finally, Quinn analyzes the resonant dynamics in a rotor system with nonlinear inertial coupling and shaft anisotropy.

The presented special issue is far from being a complete or a systematic survey of nonlinear rotordynamics. The area contains many different problems and also the approaches and methods show a rich variety. We hope to encourage the active community to do further research helping to assess the actual state-of-the-art in this important field.

The guest editors would like to thank all the authors for their contributions to this special issue. They also would like to express gratitude to all the reviewers for their efforts. Last, but not least, a special thanks to Prof. Ali H. Nayfeh for encouraging the guest editors to compose a special issue on recent advances in nonlinear rotordynamics. The guest editors hope that the information collected in this special issue will be interesting and useful, and will motivate readers to this research area.

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