Dynamics of Cyclic Machines
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This book is for advanced practicing engineers and academics who are focused on the development of machinery and mechanisms. The text bridges the gap between mechanical vibration and mechanism synthesis and analysis. These topics are commonly considered separately but the combination provides for a more comprehensive approach to the design of cyclic machinery. This approach is increasingly important as production rates are increased at end-user process facilities and optimal use of material becomes key to the developers of process machinery. The techniques described also have potential for application in such fields as locomotive and automotive technologies, engines and power generation technologies, electrical power distribution systems and robotics.

The 12 chapters are titled:

1. Cyclic Mechanisms
2. Dynamic Models of Cyclic Mechanical Systems
3. Mathematical Model
4. Dynamic Models with Constant Parameters
5. Dynamic Models with Variable Parameters
6. Nonlinear Dissipative Forces
7. Clearances
8. Vibration Analysis of Cyclic Machines Using Modified Transition Matrices
9. Regular Torsional Cyclic Systems with Branched Structure
10. Regular Cyclic Systems with Ring and Branched-Ring Structure
11. Regular Cyclic Systems with Translational Motion of the Actuator
12. Energy Exchange in the Regular Cyclic Oscillatory Systems. Spatial Localization of Vibrations

The book opens with introductory chapters on rigid mechanisms, mechanism synthesis and laws of motion, and basic dynamical and oscillatory models as well as introduction to the analytical mechanics used to model the systems of interest. This includes practical considerations of basic methodologies to drive mechanisms, such as cam vs. lever drive, along with detailed theoretical discussion. The book then quickly grows more advanced and combines the introductory concepts to discuss such topics as systems with constant and variable parameters, the evaluation of system nonlinearities, consideration of the effect of mechanical clearances, regular systems with branched, ring, and branched-ring structures, and spatial localization of vibrations.

Dynamics of Cyclic Machines is written in an approachable and articulate prose, which is a relief in comparison to the general nature of today's technical literature. This, however, is not in lieu of technical completeness of the book. To the contrary, the author provides ample references and command of knowledge. A significant portion of the references are Vulfson's own publications which date back to the late 1960's. Many of the references are published in Russian or German which may impair the reader's capability to use them directly. All discussions are supplemented theoretical mathematical relationships and equations. The author consistently defines the previously unknown variables of each equation, further improving the capability with which the reader can understand topics discussed. There are no “back-of-the-chapter” example problems, but the author frequently employs examples within the text of each chapter accompanied by ample descriptive diagrams and plots. Analytical and simulated numerical results are employed throughout.

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