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Several Disks; 2.7.1 Rayleigh's Method; 2.7.2 Dunkerley's Formula; References; 3 Vibrations of a Continuous Rotor; 3.1 General Considerations; 3.2 Equations of Motion; 3.3 Free Whirling Motions and Critical Speeds; 3.3.1 Analysis Considering Only Transverse Motion; 3.3.2 Analysis Considering the Gyroscopic Moment and Rotary Inertia; 3.3.3 Major Critical Speeds; 3.4 Synchronous Whirl References; 4 Balancing; 4.1 Introduction; 4.2 Classification of Rotors; 4.3 Balancing of a Rigid Rotor; 4.3.1 Principle of Balancing; 4.3.1.1 Two-Plane Balancing; 4.3.1.2 Single-Plane Balancing; 4.3.2 Balancing Machine; 4.3.2.1 Static Balancing Machine; 4.3.2.2 Dynamic Balancing Machine; 4.3.3 Field Balancing; 4.3.4 Various Expressions of Unbalance; 4.3.4.1 Resultant Unbalance U and Resultant Unbalance Moment V ; 4.3.4.2 Dynamic Unbalance (U_1, U_2); 4.3.4.3 Static Unbalance U and Couple Unbalance [$U_c, -U_c$]; 4.3.5.1 Balance Quality Grade; 4.3.5 Balance Quality Grade of a Rigid Rotor 4.4 Balancing of a Flexible Rotor; 4.4.1 Effect of the Elastic Deformation of a Rotor; 4.4.2 Modal Balancing Method; 4.4.2.1 N -Plane Modal Balancing; 4.4.2.2 $(N + 2)$ -Plane Modal Balancing; 4.4.3 Influence Coefficient Method; References; 5 Vibrations of an Asymmetrical Shaft and an Asymmetrical Rotor; 5.1 General Considerations; 5.2 Asymmetrical Shaft with a Disk at Midspan; 5.2.1 Equations of Motion; 5.2.2 Free Vibrations and Natural Frequency Diagrams; 5.2.2.1 Solutions in the Ranges $\omega > \omega_{c1}$ and $\omega > \omega_{c2}$ 5.2.3 Synchronous Whirl in the Vicinity of the Major Critical Speed

Sommario/riassunto

A wide-ranging treatment of fundamental rotordynamics in order to serve engineers with the necessary knowledge to eliminate various vibration problems. New to this edition are three chapters on highly significant topics: Vibration Suppression - The chapter presents various methods and is a helpful guidance for professional engineers. Magnetic Bearings - The chapter provides fundamental knowledge and enables the reader to realize simple magnetic bearings in the laboratory. Some Practical Rotor Systems - The chapter explains various vibration characteristics of steam turbines and wi