applied to a general set of equations, and a whole range of resonance is classified. In Chapter 3, Dynamic Resonances \( v = (p/q)a \), the author discusses forced resonances of linear and nonlinear single-degree-of-freedom systems including effects of frequency passage through resonance, interactions of response with a forcing excitation of limited power, and hysteretic damping. In Chapter 4, Parametric Main Resonance, the author examines the Euler column with a pulsating end load including effects of nonlinearities, viscoelasticity, and passage through resonance. In Chapter 5, Combination Additive Resonances, a thin beam acted upon by pulsating end moments, a shallow arch, and a nonlinear three-degree-of-freedom spring mass system are studied. Many resonances are found at forcing frequencies equal to the sums of various natural frequencies. In Chapter 6, Combination Differential Resonances, a cantilever beam under a pulsating follower end load, and a rotating gyroscope are examined. Here, resonances occur mainly at differences of the natural frequencies. In Chapter 7, Internal (Autoparametric) Resonances, the author discusses first the behavior of a spring pendulum involving nonlinear coupling of extensional motion with the angular motion, and then the nonlinear coupling of breathing and flexural modes of vibration in a cylindrical shell. Finally, in Chapter 8, Parametric Main and Combination Resonance Oscillations in Structures, the author discusses some of his experimental work with plates and cylindrical shells. The section dealing with shells shows some interesting examples of combination additive resonances.

The present book contains much original work by the author and his associates, some of which has not appeared generally before. The reviewer believes this book gives a good insight into analytical aspects of resonances in mechanical systems, as well as presenting many new aspects for further investigation.


REVIEWED BY A. L. FLORENCE

This monograph on dynamic thermoelasticity is a translation of the Polish edition published in 1966 augmented by a subject index, an Appendix with recent research trends, and a list of publications that have appeared since the mid 1960's.

Thermoelasticity couples elasticity and heat conduction through the thermodynamic interaction of strain and temperature, as formulated by M. A. Biot in 1956. Thermoelastic solutions are quantitatively similar to uncoupled solutions in elasticity and heat conduction so the value of the theory does not lie primarily in engineering applications. The significance lies in the qualitative differences. For example, undamped waves in classical elasticity become damped in thermoelasticity because heat energy dissipation is taken into account. The value of thermoelasticity lies primarily in the basic unification of separate theories.

Three quarters of the text, consisting of the first four of the six chapters, is devoted to a thorough treatment of thermoelasticity. Chapter 1 is a clear and formal development of the subject along the lines of classical elasticity and includes the uniqueness, variational (Biot), and reciprocity theorems. Chapter 2 commences with a treatment of plane, cylindrical, and spherical harmonic waves. It then leads into topics that include oscillating forces and heat sources, the axisymmetric and plane Lamb problems of a thermoelastic half space, Rayleigh waves, and a thermoelastic layer. The chapter ends with an account of wave scattering from cylindrical and spherical cavities. Chapter 3 is a treatment of wave propagation generated by nonperiodic sources. Integral transform techniques and approximation methods are employed. Chapter 4 contains applications in plane stress and plane strain and to thermal stresses in plates.

Chapter 5 is a development of thermoelasticity for anisotropic and piezoelectric bodies that parallels the development in Chapter 1. Chapter 6 presents the theory of magnetothermoelasticity as developed by S. Kaliski; the theory embodies Maxwell's equations and the associated Lorentz forces. Several wave propagation problems are treated.


REVIEWED BY D. S. GRIFFIN

This text is the result of 25 years of development of a program of instruction in structural dynamics at the University of California, Berkeley. In a single volume, it covers the broad range of practical dynamics analysis required in structural design. The treatment provides a simple route for the "statistics" trained structural engineer to the study of time-varying response of structures due to time-varying loadings. It progresses logically from structures with a single degree of freedom, to generalized single-degree systems, to the multi-degree-of-freedom analysis of multidegree discrete-coordinate structures. It also considers the analysis of vibration mode shapes and frequencies, the response of structures to arbitrary periodic and nonperiodic loadings, as well as both linear and nonlinear systems. Emphasis is on transient dynamic response analysis rather than the traditional vibration analysis. Solution methods are oriented toward effective use of the high-speed digital computer although hand-solution methods are utilized for instructional purposes and to provide basic understanding. Although the frame of reference for this book is clearly civil engineering applications, the same basic techniques are readily applicable in aerospace engineering, naval architecture, automotive engineering, and other structural systems subjected to time-varying loadings.

The first three parts of the book deal with deterministic analysis to obtain the response history where the time variation of loading is fully known. The basis of dynamic analysis is introduced in Part 1 by the treatment of single-degree-of-freedom systems. Responses to harmonic, periodic, impulsive, and general dynamic loadings are considered, including nonlinear response. Part 2 deals with discrete-parameter multidegree-of-freedom systems, including both mode-superposition for linear systems and step-by-step integration for nonlinear systems. Part 3 considers dynamic systems having continuously distributed properties; distributed-parameter systems. Practical solutions are obtained using the mode-superposition procedure by considering only a limited number of vibration modes.

Part 4 provides an introduction to nondeterministic methods of dynamic analysis. It provides a concise treatment of probability theory and the probabilistic approach to the analysis of response to random loadings. Stochastic response of linear single and multiple-degree-of-freedom systems are both treated. Finally, Part 5 deals with applications of structural dynamics theory to problems of earthquake engineering. Both deterministic and nondeterministic analysis of earthquake response are considered.

This clearly written text is well organized for teaching structural dynamics at the graduate and advanced undergraduate levels. The required prerequisites are a solid background in statics and a working knowledge of matrix methods. A large number of examples are incorporated in the text to demonstrate application of the methods, and there is ample supply of homework problems for instructional use. The reviewer feels that the study of dynamics would have been a lot less mystifying had this text been available to him during his academic preparation.

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