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Book Reviews

Mechanical Vibration Analysis and Computation, by D. E. Newland. John Wiley and Sons, New York, 1989. 583 pages. Price: $59.95.

REVIEWED BY ANDRES SOOM[1]

This book is a fine addition to currently available vibration texts. It covers linear vibrations in considerable detail and makes appropriate use of matrix methods and computational techniques.

The first chapter is devoted to describing the relation between the impulse and frequency response of a single-degree-of-freedom oscillator. The next two chapters emphasize frequency response characteristics of multi-degree-of-freedom systems and include a section on damping measures.

Matrix methods are introduced in the fourth chapter and are related to natural frequencies and mode shapes in Chapter 5, which includes a good discussion of complex modes. Singular and defective matrices are covered in Chapter 6. The next four chapters combine numerical methods and general response functions for response calculations. Chapter 11, which deals with systems with symmetric matrices, also introduces Lagrange's equations.

Two chapters are devoted to continuous systems. The first chapter emphasizes longitudinal vibrations of elastic rods and the second transverse vibrations of beams and plates. The book concludes with a chapter on parametric and nonlinear vibrations which includes solutions of the Mathieu equations and the Duffing equations, along with discussion of stability, jump phenomena internal resonances, a brief mention of chaotic vibration, and approximate methods for finding periodic responses.

The book is very well written and is rich with examples that illustrate fundamental concepts, computational issues, and applications of the material to both simple and sophisticated practical vibration problems.

Although the material presented is self-contained, the book would be most suitable for advanced undergraduate or beginning graduate students with some previous background in mechanical vibrations, linear algebra, and dynamic systems analysis.

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Theory of Wire Rope, by G. A. Costello. Springer-Verlag, New York, 1990. 106 pages. Price: $59.00.

REVIEWED BY C. W. BERT[2]

For a very long time, there has been a great need for a monograph such as this. This is especially true since wire rope has been used since the days of Babylon (700 BC). Although there have been some users manuals and numerous technical papers on the subject, to the best of the reviewer's knowledge, this is the first monograph devoted solely to wire rope.

In a brief introductory chapter, the reader is introduced to the components and construction of wire rope. This is followed by a chapter on the equilibrium of a single curved wire, as presented in A. E. H. Love's treatise on elasticity. Chapter 3 discusses the static response of a strand consisting of a straight center wire and multiple helical wires. This includes the geometry involved and the response to axial and bending loads, multilayered strands, and detailed calculation of bending and contact stresses.

In Chapter 4 ropes of complicated cross-sections are analyzed for static response. Chapter 5 covers frictional effects and the effective length of broken wires. Chapter 6 is devoted to testing, including axial testing, size effects, and fatigue life. Chapter 7 discusses and analyzes the failure phenomenon known as "birdcaging," which is peculiar to wire rope. Rope rotation is treated in Chapter 8. The monograph is concluded with an extensive list of references and bibliography as well as an ample subject index.

In summary, the book fills very ably a need for a concise treatment of the mechanics of wire rope under static and fatigue loading. This monograph should be in the libraries of every mechanical engineering and manufacturing concern having any use for wire rope. It also should be of great interest to applied mechanicians in general.

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