Journal of Applied Mechanics

Book Reviews

Mechanics of Solids With Applications to Thin Bodies. By G. Wempner. Martinus Nijhoff, 1982. 633 Pages. Price $79.00.

REVIEWED BY T. J. LARDNER[1]

This book was originally published by McGraw-Hill in 1973 and it has, I believe, stood the test of time well; I have had many occasions to refer to different sections in the book during the past nine years. A review of the book appeared in *Applied Mechanics Reviews* (AMR, Review No. 10535, 1976) and this reviewer agrees with the conclusions of the AMR review.

The principal goal of the book, according to the author ". . . is to build a bridge between the most fundamental concepts of continuous media and the practical theories of structures. Foundations are laid with a view toward their eventual role in the analysis of flexible bodies." This bridge at times appears strange when fundamental relations are derived and then applied to a simple structure; the reader new to solid mechanics may wonder if the formulation might be easier by direct approaches to the simple structure. Of course, easier methods do exist but the author stresses the importance of the general approach in his discussion. Further he does emphasize that the book ". . . is intended for *engineers* interested in the *applied* mechanics of solids." Chapter titles and a brief outline of some of them follows:

1. *Introduction.* A review of notation to be used in the book.
2. *Deformation.* The basic kinematic results for the deformation of a continuous solid are derived.
3. *Stress.* The basic concepts of internal forces are presented.
4. *Behavior of Materials.* The general theory of elasticity, the incremental theory of plasticity, and the linear theory of viscoelasticity are developed.
5. *Linear Theories of Isotropic Elasticity and Viscoelasticity.*
6. *Extension, Flexure, and Torsion of Rods.*
7. *Elastic Plates.*
8. *Mechanics of Curved Rods.* A useful chapter containing a number of results.
9. *Energy Principles.*
10. *Curvilinear Coordinates.*
10. *Differential Geometry of a Surface.*
12. *Theory of Shells.*

As can be seen from the chapter titles, the book covers a wide range of topics in the mechanics of solids. The derivations are carefully presented and clear. References up to the time of the original publication provide sources to the original works on a number of topics. This is a useful reference book and can be used effectively for an introductory graduate course in solid mechanics.

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Wave Propagation in Viscoelastic Media. Edited by F. Mainardi. Pitman Publishing, Marshfield, Mass. 272 Pages. Price $25.00.

REVIEWED BY T. C. T. TING[2]

This book is Volume 52 of *Research Notes in Mathematics* which contains 11 articles by lecturers who took part at the Euromech Colloquium 127 on "Wave Propagation in Viscoelastic Media," held at Taormina (Sicily, Italy) in April, 1980.

The authors and the titles of the articles are as follows: D. Graffi, "Mathematical models and waves in linear viscoelasticity," M. Hayes, "Viscoelastic plane waves," S. Zahorski, "Properties of transverse and longitudinal harmonic waves," L. Brun and A. Molinari, "Transient linear and weakly nonlinear viscoelastic waves," A. Jeffrey and J. Engelbrecht, "Waves in nonlinear relaxing media," T. B. Moodie, R. J. Tait, and J. B. Haddow, "Waves in compliant tubes," E. Strick, "Applications of linear viscoelasticity to seismic wave propagation," E. A. Trautenberg, K. Gebauer, and A. Sachs, "Numerical simulation of wave propagation in viscoelastic media with nonreflecting boundary," J. L. Sackman, "Prediction and identification in viscoelastic wave propagation," G. C. Gaunaurd, W. Madigosky, H. Überall, and L. R. Dragonette, "Inverse scattering and the response of viscoelastic and electromagnetic waves," and J. Brilla, "generalized variational principles and methods in dynamic viscoelasticity."

The problems of wave propagation in viscoelastic media are much more difficult to analyze than the associated problems in elastic media because of the history dependence nature of the stress-strain laws. The governing equations are in general in the form of integro-differential equations if the stress-strain laws are written in an integral form. If they are written in a differential form, one can obtain the governing equations in the form of differential equations but they are usually of higher order than the equations for elastic waves. Therefore, with few exceptions, only linear or one-dimensional problems can be treated analytically. This is reflected in this book in which most articles are concerned with linear and/or one-dimensional problems. With the exception of the article by Zahorsky, which deals with viscoelastic fluids and the article by Jeffrey and Engelbrecht, which discusses both fluids and solids, the articles deal with waves in viscoelastic solids. Moodie, Tait, and Haddow consider the wave propagation in

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