Viscoelasticity

Theory of Viscoelasticity. By R. M. Christensen, Academic Press, Inc., January, 1971.

REVIEWED BY. L. B. FREUND[1]

In view of the small number of available books which present a thorough description of the behavior of viscoelastic materials, this book, written by an active contributor to the field, should be welcomed by those engineers and researchers interested in the subject. The book presents a development of the phenomenological theory of viscoelastic materials, with the physical processes giving rise to the time-dependent behavior receiving only brief mention at isolated points. The mathematical aspects of the theory are emphasized but, for the most part, only insofar as these aspects have bearing on practical applications. A discussion of some experimental results is included. The book contains seven chapters discussing the following topics: viscoelastic stress-strain constitutive relations, isothermal boundary-value problems, thermoviscoelasticity, wave propagation, general theorems and formulations, nonlinear viscoelasticity, and determination of mechanical properties, plus an Appendix on generalized functions, Laplace transforms, and approximate inversion of Laplace transforms. Each chapter is followed by a fairly extensive list of references to the relevant literature, which helps to develop historical perspective, and each of the first five chapters contains several exercises. Aside from being a good reference source, this book could serve as a text for a graduate course in viscoelasticity. In view of the succinct manner of development of the subject matter, it would be essential that such a course be preceded by a course in linear elasticity, and preferably by a course in general continuum mechanics.

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