journal of applied mechanics

book reviews

Theory of Elasticity

Theory of Elasticity. By S. P. Timoshenko and J. N. Goodier. 3rd ed., McGraw-Hill, New York, 1970. 567 pages. $15.50.

REVIEWED BY H. NORMAN ABRAMSON[1]

ALMOST two generations have passed since the original publication of Timoshenko's *Theory of Elasticity*, and countless thousands of students and engineers have found great pleasure and stimulation from the rewarding insight into the elastic behavior of solid materials provided by the clarity and succinctness of its presentation. The only previous revision of the book, done in collaboration with Professor Goodier, was published just about 20 years ago and emphasized developments in thermal stress problems and elastic wave propagation.

This third edition, prepared by Norman Goodier just before his passing last Fall, is a much more extensive revision of the basic work and yet retains all of the flavor and enduring qualities of the original. The present volume is almost a third larger than the first edition and has been completely reset and a number of figures have been redrawn. Timoshenko and Goodier's *Theory of Elasticity* has a new suit of clothes and is well prepared to meet and serve future generations.

Specific revisions incorporated in this third edition are described briefly as follows. End effects and eigensolutions associated with Saint-Venant's principle are given in Chapters 3 and 4. Discontinuous displacements have been given more explicit treatment as edge and screw dislocations in several chapters. Chapter 5 on photoelastic methods has been expanded to include the moiré's method. The old chapter on strain-energy methods has been rewritten and incorporated into Chapter 8 (General Theorems) as a basis for the analysis of Thermal Stress (Chapter 13). The presentation of complex potentials for two-dimensional problems has been considerably expanded to include the methods attributed to Muskhelishvili. The chapters on Thermal Stress (Chapter 13) and Wave Propagation (Chapter 14) have again been almost completely rewritten in order to emphasize more recent developments. Many other sections have been revised to a greater or lesser extent to provide for more simplified and/or more coherent treatments.

Control Theory and Computing

Modern Control Theory and Computing. By D. Bell and A. W. J. Griffin, McGraw-Hill, New York and London. 211 pages.

REVIEWED BY K. J. ASTROM[2]

THE gap between theory and practice in control is currently subject to much discussion. This book is devoted to bridging this gap. It is directed to the practicing engineer and aims at giving him a flavor of some of the mathematical advances in control theory which have occurred in the last decade.

The book starts with a survey of classical linear control theory. Use of Lyapunov techniques for analysis and synthesis are covered in one chapter. Analog, digital, and hybrid computers are discussed. The discussion is illustrated by programming examples for computation of Bode plots, root loci, and simulation of linear constant parameter systems.

A brief introduction to the theory of stochastic processes is given. The theory is later applied to identification problems and to design of adaptive systems. Optimization techniques based on Bellman's Dynamic Programming and the Pontryagin Maximum Principle are also covered.

The book is written by several different authors contributing one chapter each. The treatment is expository with an attempt to minimize the mathematics. Examples are often substituted for generalities. It would have been desirable to include a chapter of Kalman filtering theory and another on linear stochastic control theory since these are very important for the applications. It would also have been desirable if the examples had been more directed toward demonstrating what problems the "modern theory" can solve which are outside the scope of classical theory rather than to illustrate new methods of solving old problems.

The reviewer believes that the book can serve its purpose well and make the practicing engineer aware of some of the potentials of modern control theory.

Thermodynamic Properties of Perfect Gases

Thermodynamische Funktionen idealer Gase für Temperaturen bis 6000 deg K (Thermodynamic Properties of Perfect Gases for Temperatures up to 6000 deg K). By H. D. Baehr, H. Hartmann, H. C. Pohl, and H. Schömaker, Springer-Verlag, Berlin, Heidelberg, and New York, 1968. IV and 73 pages. $8^1/_2$ in. by $11^1/_8$ in. $4.60.

REVIEWED BY J. KESTIN[3]

ALONG with the increase in our ability to set up realistic thermodynamic models for the operation of a wide variety of thermal engines and devices, we require progressively more reliable data on the thermodynamic properties of an ever-growing variety of working fluids. In the case of gases at low pressure (i.e., in the standard state), the task, of providing such data can be expeditiously solved by a triangular marriage between spectroscopy, statistical thermodynamics and computer techniques. Thus a large number of tabulations have been, and are still being, undertaken. Much of this work is being duplicated in this country and abroad. This is a pity. It seems that this is one of the tasks of engineering science that should be centralized and performed through national institutions cooperating internationally. In this country such a central organization exists in the form of the National Standard Reference Data System. International cooperation is also practiced, mainly through the International Council of Scientific Unions (ICSU); in particular, the International Unions of Pure and Applied Physics and Chemistry (IUPAP and IUPAC). However, the slow pace of these efforts is probably responsible for the fact that the immediate demand is being filled, largely by spontaneous, individual efforts. Or, is it a case of *Le mieux est l'ennemi du bien* in the work of the responsible bodies?

The little volume under review appears to be carefully prepared, with tables which are very pleasantly and legibly reproduced from computer-output sheets on good-quality paper. The explanations are kept to a minimum, but the authors' reputation is a guarantee of accuracy. The tabulation covers the usual equilibrium properties for a total of 30 gases.

Given the graphical excellence of the booklet, the relatively low price should prove attractive to readers who need the data.

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