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four chapters, there is a vast range of topics covered in depth in its 436 pages.

The first chapter on kinematics contains an excellent analysis and discussion of rigid body orientation and angular velocity – subjects that are often poorly treated in standard texts and are thus confusing to students. The chapter includes discussions of Euler parameters, Rodrigues parameters, and screw motion – topics of increasing interest in modern dynamical analyses. In the reviewer's opinion, purchase of the text could be justified solely on the basis of this first chapter.

The second chapter is more specialized; it deals with gravitational forces as they affect spacecraft. However, it is perhaps the most extensive and exhaustive treatment of this subject at one place in the literature.

The third chapter discusses simple spacecraft dynamics. A "simple spacecraft" is a single rigid body or simple gyrostat. Dynamical equations are formulated using the angular momentum principle. Knowledge of inertia principles is assumed.

The final chapter extends the discussion to complex spacecraft with multiple degrees of freedom and with elastic parts. Particular emphasis is given to formulaton of the dynamical equations. A system of equations called "Kane's dynamical equations" are shown to be especially convenient for this formulation – particularly as the complexity of the spacecraft increases. The chapter concludes with a discussion on the use of the finite element method for constructing modal functions.

Four sets of problems are provided at the end of the text covering the subject matter of the respective chapters. (The reviewer believes it would be pedagogically more efficient to have these at the end of the chapters themselves.) The problems are good, but *all* need to be solved to cover the subject material. That is, there is little overlap in the problems – a possible disadvantage for classroom instructors.

The book is eloquently set in a lucid style. It should be of interest and use to students, engineers, and researchers, and it is highly recommended by this reviewer.

Theory of Thin Elastic Shells. By M. Dikman. Pitman, Marshfield, Mass., 1982, pp. xii–364. Price $59.95.

REVIEWED BY J. L. SANDERS, JR.[9]

This monograph is the eighth in a series of surveys and reference works in mathematics offered by the publisher. Both as a reference work and as a survey the volume is superb. An early chapter on the differential geometry of surfaces and nearby space (i.e., the shell space) developed by means of tensor calculus introduces the notation and takes care of most of the purely mathematical aspects of the subject.

The book is devoted wholly to the theory of elastic thin shells. There is essentially no material on applications, methods of solution, or inelastic behavior. There is a strong emphasis on the nature of the problem: to arrive at a satisfactory and usable approximate two-dimensional theory for real shells that are three-dimensional objects. The author recognizes two principal approaches to the problem which lead to two classes of theories termed "derived" and "direct." Derived theories involve a descent from three dimensions and, at least in an intermediate stage, involve an infinite system of equations or rather a hierarchy of systems of equations. In this case the problem is how to decide where to leave off. The direct approach is two-dimensional from the outset, and involves defining the objects of shell theory (displacement measures, stress measures, etc.) over the surface, and postulating constitutive relations. In this case the problem is to justify the relation of the defined objects and postulated equations to the real world. The direct approach occupies much less space in the book, perhaps because it is the more efficient, or as the author maintains the two approaches complement each other. The ideas of the many researchers who have contributed to the subject are smoothly woven into the text. Copious references are supplied.

In addition to the material on the foundations of shell theory there are chapters on stability, dynamics, and stochastic problems. A chapter each is devoted to the state of knowledge on error estimation and existence. Missing is a chapter dealing specifically with the significant advances made in recent years on the geometrically nonlinear theory.

Perhaps some readers, like the reviewer, might wish to see a more definite choice among alternatives at a number of places in the book. Some questions are, I believe, rather more definitely settled than the author indicates. However, no axes are ground, and on the whole the author has produced an excellent book, unique in its field.

Classical Mechanics, Vol. I an Vol. II. By E. A. Desloge. Wiley, New York, 1982. 991 Pages. Price: Vol. I, $40.00; Vol. II, $49.50.

REVIEWED BY R. H. RAND[10]

This lengthy two-volume work consists of some 93 chapters and 32 appendices spread over 991 pages. Volume I treats Newtonian particle and rigid body dynamics, and offers a brief introduction to Lagrange's and Hamilton's equations. Volume II treats Lagrangian and Hamiltonian dynamics in detail and includes a discussion of special relativity. The appendices contain brief summaries of mathematical topics.

The author's style is clear and readable, and there are many solved examples and homework problems (with solutions at the back of the book). In terms of current engineering education, volume I would be suitable for text in a senior level or beginning graduate course in intermediate dynamics, while volume II could serve as a text for a graduate course in advanced dynamics.

Volume II offers an unusually good treatment of the following topics: Noether's theorem for obtaining first integrals; the use of group representations for solving linear vibrations problems with symmetry; the Gibbs-Appell equations; and special relativity. On the other hand, the following topics are regrettably missing: differential forms and exterior calculus, which provide an elegant and concise condition for a transformation to be canonical; KAM theory and related results on the breakup of invariant tori in nonintegrable systems; and canonical perturbation theory, e.g., Lie series or von Zeipel's method.

These books, especially volume II, would be a useful reference for a researcher in applied mechanics, particularly a specialist in dynamics. However, the importance of Desloge's Classical Mechanics as a reference work is eclipsed by the existence of many other excellent and established works covering the same material (e.g., those by Goldstein, Lanczos, and Pars).

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