

Book Notes

Differential-Difference Equations, Richard Bellman, *The Rand Corporation*, and Kenneth L. Cooke, *Pomona College* (Academic Press, New York, 1963), 462 pp. \$13.75.

Chapters: 1) The Laplace Transform; 2) Linear Differential Equations; 3) First-Order Linear Differential-Difference Equations of Retarded Type with Constant Coefficients; 4) Series Expansions of Solutions of First-Order Equations of Retarded Type; 5) First-Order Linear Equations of Neutral and Advanced Type with Constant Coefficients; 6) Linear Systems of Differential-Difference Equations with Constant Coefficients; 7) The Renewal Equation; 8) Systems of Renewal Equations; 9) Asymptotic Behavior of Linear Differential-Difference Equations; 10) Stability of Solutions of Linear Differential-Difference Equations; 11) Stability Theory and Asymptotic Behavior for Non-linear Differential-Difference Equations; 12) Asymptotic Location of the Zeros of Exponential Polynomials; 13) Stability Properties of the Zeros of Exponential Polynomials.

This book requires only slight prior acquaintance with the theory of Laplace transform and differential equations; it can serve as an introduction to these areas. It is designed to be of interest to mathematicians, physicists, and mathematically trained engineers and to provide graduate students with training in a broad variety of analytic techniques.

Fluid Mechanics, Walther Kaufmann, *Professor Emeritus of Mechanics, Technical University, Munich*, translated by Ernest G. Chilton, *Stanford Research Institute* (McGraw-Hill Book Company Inc., New York, 1963), 432 pp. \$12.75.

Contents: 3 major parts. Part 1) Properties of Liquids and Gases; Part 2) Equilibrium (Hydro- or Aerostatics); Part 3) Fluids in Motion (Hydro- and Aerodynamics).

This volume is written for senior-graduate survey courses in fluid mechanics and as a reference book for graduate engineers and physicists who are not primarily in the field of fluid mechanics. The translator has tried to supplement the original references by including a list of textbooks in the field, all readily available in most technical libraries in the United States.

Control of Aircraft and Missile Powerplants: An Introduction to the Analysis and Design of Engine Control Systems, Albert J. Sobey, *Section Chief, Rocket Pro-*

pulsion Research, Allison Division, General Motors Corporation, and Alfred M. Suggs, *Department Head, Control Systems Analysis, Allison Division, General Motors Corporation* (John Wiley and Sons Inc., New York, 1963), 432 pp. \$12.50.

Chapters: 1) Introduction; 2) Controllability of Engines; 3) Control-System Design Requirements; 4) Application Requirements; 5) Physical Limiting Control Modes; 6) Thrust Control Modes; 7) Transient Control Modes; 8) Propellant Supply Considerations; 9) Actuation Systems; 10) Parameter-Measurement Systems; 11) Computing Elements; 12) Stability; 13) Computational Methods.

This book presents a basic introduction to propellant system mechanical design and component performance. It is intended primarily for the use of mechanical design engineering personnel working on control systems for propulsion, but it also should be of value to other technical personnel working on aircraft powerplants. The book is organized for self-instruction by the reader; however, classroom use also has been considered.

Recent Soviet Contributions to Mathematics, edited by J. P. LaSalle and S. Lefschetz (Macmillan Company, New York, 1962), 324 pp. \$8.75.

Contents: 10 chapters contributed by different authors. 1) General Appraisal of Mathematics in the USSR; 2) Algebra; 3) Control and Stability; 4) Functional Analysis; 5) Numerical Analysis; 6) Ordinary Differential Equations; 7) Partial Differential Equations (1947-1960); 8) Probability Statistics and Information Theory; 9) Topology; 10) Russian Journals of Mathematics.

The editors of this volume feel that, although it is a modest report, it will contribute to spreading knowledge of Soviet activities in the general domain of mathematics. It is intended to be of interest to mathematicians, engineers, physicists, and all scientists who are interested in mathematics and its applications.

U. S. Standard Atmosphere, 1962, prepared under the sponsorship of NASA, U. S. Air Force, and U. S. Weather Bureau (U. S. Government Printing Office, Washington, D. C., 1962), 278 pp. \$3.50.

Contents: 3 major parts. Part 1) Basis of the Tables; Part 2) Additional Information Relating to the Atmosphere; Part 3) The Tables.

This volume, with tables and data to 700 km, takes into account all available rocket and satellite data from extreme altitudes and recent accurate determinations of basic quantities, such as redefinition of the absolute thermodynamic temperature scale. A discussion of variability and extremes of data is included in order to give those using this standard an appreciation of such excursions from the standard as may be met in practice.

Gas Dynamics and Physics of Combustion, edited by A. S. Predvoditelev, *Corresponding Member of the Academy of Sciences, USSR*, translated by A. Barouch, translation edited by R. Hardin (Israel Program for Scientific Translations, Jerusalem, 1962), 168 pp. \$6.00.

Contents: 13 chapters contributed by different authors. 1) Hydrodynamic Inhomogeneities in the Theory of Combustion and Explosion; 2) Propagation of Shock Waves in the Combustion Products of Hydrogen Oxygen Mixtures; 3) Propagation of Waves of Finite Amplitude Generated during the Explosion of a Gas in a Cylindrical Vessel of Variable Volume; 4) Influence of External Friction and Heat Exchange on the Motion of an Ignition Surface and a Shock-Discontinuity in a Chemically Reactive Medium; 5) Some Properties of Supersonic Flow; 6) Supersonic Flow in the Region of an Angular Ledge; 7) Supersonic Flow at Different Reynolds Numbers in Contoured Nozzles under Conditions of Overexpansion; 8) Measuring the Density Distribution in a Three-Dimensional Object Using the Schlieren Method; 9) Experimental Investigation of the Density Distribution in a Three-Dimensional Supersonic Jet; 10) Thermocouple Measurement of the Temperature in a High-Velocity Gas Flow; 11) Laws Describing Formation of a Flame Front in a Free Jet; 12) Investigation of the Combustion behind a Flame Front in a Turbulent Stream; 13) Propagation of a Turbulent Flame Front in the Presence of High Flow Velocities.

This collection considers supersonic flow in connection with the needs of industry. It is designed to be of aid to scientists and engineers who are doing research on combustion and the hydrodynamics of reactive media.

The Solar Corona, edited by John W. Evans, *Sacramento Peak Observatory, Sunspot, N. Mex.* (Academic Press, New York, 1963), 344 pp. \$14.00.

Contents: 44 papers contributed by different authors and divided into 3 sessions. Session 1) Local Physics of the Corona; Session 2) Coronal Phenomena; Session 3) Larger Aspects of the Corona.

This volume contains the Proceedings of International Astronomical Union Symposium No. 16, held at Cloudercroft, N. Mex., August 28-30, 1961. The Symposium was sponsored by the Air Force Cambridge Research Laboratories through the offices of the Commander, Brigadier General Benjamin Holzman.

Modern Developments in Heat Transfer, edited by Warren Ibele, *Heat Transfer Laboratory, Department of Mechanical Engineering, University of Minnesota* (Academic Press, New York, 1963), 493 pp. \$18.00.

Contents: 14 chapters contributed by different authors. 1) Noncircular Duct

The books listed here are those recently received by the AIAA from various publishers who wish to announce their current offerings in the field of astronautics. The order of listings does not necessarily indicate the editors' opinion of their relative importance or competence.

Convective Heat Transfer; 2) Heat Transfer from Chemically Reacting Gases; 3) Ablation Cooling; 4) Heat Transfer with Boiling; 5) Similarities between Energy Transport in Rarefied Gases and by Thermal Radiation; 6) Calculation of Radiant Interchange between Surfaces; 7) Thermal Radiation Properties of Solids; 8) Heat Transfer Research in Japan; 9) Measurements of the Thermal Contact Resistance from Stainless Steel to Liquid Sodium; 10) Viscosity of Water and Steam at High Pressures Up to 800 Atmospheres and 700°C; 11) High-Temperature Thermodynamic Properties; 12) Gas-Surface Interaction in an Enthalpy-Composition Chart; 13) Investigation of the Anode Energy Balance of High-Intensity Arcs in Argon; 14) Recent Developments in Plasma Heat Transfer.

This volume contains lectures delivered by authorities in the various fields of heat transfer before a group of 65 scientists and engineers. It should be of interest to heat transfer workers in the fields of chemical engineering, mechanical engineering, and aeronautical engineering and in the areas of propulsion, power, combustion, high-speed flow, plasma physics, mass transfer, thermodynamics, and transport processes.

An Introduction to the Calculus of Variations, L. A. Pars, *President of Jesus College, Cambridge* (John Wiley and Sons Inc., New York, 1963), 350 pp. \$8.50.

Chapters: 1) Introduction; 2) Fundamental Theory; 3) Illustrative Examples; 4) Variable End-Points; 5) The Fundamental Sufficiency Theorem; 6) The Isoperimetrical Problem; 7) Curves in Space; 8) The Problem of Lagrange; 9) The Parametric Problem; 10) Multiple Integrals.

This introductory book makes no attempt to cover the entire subject. Instead, it is designed to give the nonspecialist a good insight into the fundamental ideas of the subject, a good working knowledge of the relevant techniques, and an adequate starting-point for further study and research into those regions of the subject not dealt with by the author.

Computer Basics, Technical Education and Management Inc. (Howard W. Sams & Company Inc., Indianapolis, Ind., 1962), 5 vols., 1210 pp. total. \$4.95 per volume.

Contents: Vol. 1) Introduction to Analog Computers; Vol. 2) Analog Computers: Mathematics and Circuitry; Vol. 3) Digital Computers: Mathematics and Circuitry; Vol. 4) Digital Computers: Storage and Logic Circuitry; Vol. 5) Computers: Organization, Programming, and Maintenance.

This set of volumes assumes no prior knowledge of computer systems, although it does require some background in basic electronics theory and a working knowledge of algebra and trigonometry. The set is tailored to serve as a comprehensive course suitable for any training program on computer systems.

Essentials of Scientific Russian, O. Star-chuck, *Head of Slavonic Division, Department of Modern Languages, University of*

Alberta, and H. Chanal, *Former Assistant Professor of Russian, University of Alberta* (Addison-Wesley Publishing Company Inc., Reading, Mass., 1963), 300 pp. \$5.95.

Contents: 4 major parts. Part 1) Introduction; Part 2) Grammar; Part 3) Readings; Part 4) Appendixes.

This introductory Russian grammar is designed to provide a sound reading knowledge of Russian scientific literature. It also could serve as a classroom text or as an aid to self-study for the practicing scientist and engineer. Included in the book are a large glossary and an extensive selection of readings chosen from original Russian scientific books and articles.

Plasma Physics and Magnetofluidmechanics, Ali Bulent Cambel, *Gas Dynamics Laboratory and Department of Mechanical Engineering, Northwestern University* (McGraw-Hill Book Company Inc., New York, 1963), 304 pp. \$11.50.

Chapters: 1) Concepts of Magnetofluidmechanics; 2) Units and Dimensions; 3) Electricity and Magnetism; 4) Plasma Wave Phenomena; 5) Ionization and Deionization; 6) Thermodynamics of Real Gases; 7) Transport Phenomena; 8) Flow Equations of Magnetofluidmechanics; 9) Applications of Magnetofluidmechanics. *Appendixes:* 1) Fundamental Constants and Conversion Factors; 2) Study Problems.

The material in this book is not aimed at any specific narrow specialty within plasma physics and magnetofluidmechanics but should be useful in many different types of research and applications. It is designed to serve as a text for advanced or graduate courses in magnetogasdynamics, and it also is suited for reference work and self-study by the practicing engineer.

Proceedings of the First Symposium on Engineering Applications of Random Function Theory and Probability, edited by John L. Bogdanoff, *Professor of Aeronautical and Engineering Sciences, Purdue University*, and Frank Kozin, *Associate Professor of Aeronautical and Engineering Sciences, Purdue University* (John Wiley and Sons Inc., New York, 1963), 421 pp. \$8.75.

Contents: 10 papers contributed by different authors. 1) Introduction to Symposium; 2) Probability Theory as a Mathematical Discipline and as a Tool in Engineering and Science; 3) Theory of Random Functions with Application to Noise in Radio Receivers; 4) Reliability; 5) Safety, Safety Factors, and Reliability of Mechanical Systems; 6) New Engineering Applications of Information Theory; 7) Aerodynamic Noise; 8) Theory and Observations of the Dynamics and Statistics of Traffic on an Open Road; 9) New Methods in Wiener Filtering Theory; 10) Random Processes in Communication Engineering.

This volume contains the Proceedings of a Symposium sponsored by the National Science Foundation and Purdue University. The purpose of this meeting was to bring to the engineering public the latest efforts in stochastic analysis and the construction of stochastic models that have

application in technological areas of importance.

An Introduction to Plasma Physics, W. B. Thompson, *Head of the Theoretical Physics Division, Culham Plasma Physics Laboratory, United Kingdom Atomic Energy Authority* (Pergamon Press, Oxford, and Addison-Wesley Publishing Company Inc., Reading, Mass., 1962), 256 pp. \$10.00.

Chapters: 1) Introduction to Plasma Physics; 2) Basic Properties of the Equilibrium Plasma; 3) The Arc Plasma; 4,5) Magnetohydrodynamics; 6) Magnetohydrodynamic Stability; 7) Plasma Dynamics and Particle Motions; 8) Kinetic Theory of the Plasma. *Appendixes:* 1) Some Formulas; 2) Some Numbers; 3) Some Functions.

This book is designed to give the physicist and mathematician a comprehensive introduction to the modern theory of the dynamics of a fully ionized gas. It is directed toward graduate students in physics, and it is supposed that the reader will have had some training in theoretical physics.

Introduction to Celestial Mechanics, S. W. McCuskey, *Department of Astronomy, Case Institute of Technology* (Addison-Wesley Publishing Company Inc., Reading, Mass., 1963), 184 pp. \$7.50.

Chapters: 1) Fundamental Dynamics; 2) Central Force Motion; 3) The Two-Body Problem; 4) Computation of Orbits; 5) The Three- and n -Body Problems; 6) Theory of Perturbations.

This book is designed as an introduction to those physical problems that have dominated the study of astronomy for the past several years. The reader is assumed to have a background in differential equations and some familiarity with vector notation and operations. The book should be of use to the advanced undergraduate or graduate student of astronomy, physics, or mathematics and as a reference work for industry and research.

Numerical Solution of Ordinary and Partial Differential Equations, edited by L. Fox, *Director, Oxford University Computing Laboratory* (Pergamon Press, Oxford, and Addison-Wesley Publishing Company Inc., Reading, Mass., 1962), 509 pp. \$10.00.

Contents: 36 chapters contributed by different authors and divided into 4 major parts. Part 1) Ordinary Differential Equations; Part 2) Integral Equations; Part 3) Introduction to Partial Differential Equations; Part 4) Practical Problems in Partial Differential Equations.

This advanced-level text or reference work is essentially a presentation of the material, both theoretical and practical, needed for the numerical solution of all types of problems involving ordinary differential equations, partial differential equations, and integral equations. The book is based on material presented at a summer school for representatives of industry, government, universities, and technical schools, held at the University Computing Laboratory, Oxford, England, in September 1961.

Design of Vibration Isolation Systems, edited by SAE Committee G-5, Aerospace Shock and Vibration (Macmillan Company, New York, and Pergamon Press Ltd., Oxford, 1962), 106 pp. \$13.50.

Contents: 3 chapters and 12 appendices contributed by different authors. 1) Introduction; 2) Determination of Basic Dynamical Parameters of Vibration Isolation System; 3) Determination of Mechanical, Installational, and Environmental Requirements for Isolators. *Appendices:* 1) Symbols and Definitions; 2) Theoretical Background of the Procedure; 3) Numerical Examples; 4) Determination of Fragility; 5) Existing Data on Fragility; 6) Measurement of Isolator Properties; 7) Measurement of Mechanical Admittance or Impedance; 8) Determination of Center of Gravity and Moments of Inertia; 9) Methods of Estimation; 10) Application of Digital Computers; 11) Methods of Checking; 12) References.

This document represents a first installment toward an attempt to describe all the steps required in the design of vibration isolation systems for aircraft, missiles, and spacecraft. The procedure itself is written in the format of a set of directions.

Magnetohydrodynamic Shock Waves, J. Edward Anderson, *Member of the Technical Staff, Military Products Research Department, Minneapolis-Honeywell, and Lecturer in Magnetohydrodynamics, University of Minnesota* (MIT Press, Cambridge, Mass., 1963), 226 pp. \$6.50.

Chapters: 1) Introduction; 2) Shock Discontinuities in a Perfect Fluid; 3) Stability of Shocks with Respect to Small Disturbances; 4) Equations of the Steady-State Shock Layer; 5) General Qualitative Study of the Shock Layer in Special Cases; 7) Results and Conclusions. *Appendices:* 1) Nomenclature Used in the Appendix; 2) Introduction; 3) Description of the Experiments; 4) Theory; 5) Experimental Results; 6) Conclusions.

In this monograph, steady-state shock relations are discussed in sufficient detail to provide a basis for the analysis of existence and stability. The analysis of the effects of small disturbances is based on

work of several Russian authors but is expanded to help the reader understand the conclusions reached.

Shock and Vibration Engineering, Charles T. Morrow, *Manager of Technical Relations, Aerospace Corporation* (John Wiley and Sons Inc., New York, 1963), Vol. 1, 384 pp. \$12.00.

Chapters: 1) General Introductory Considerations; 2) Resonance and Its Significance; 3) Response of a Simple Resonator; 4) Vibration Testing; 5) Shock Testing and Shock Spectra; 6) Additional Topics Related to Design and Test; 7) Selection of Vibration Isolators and Shipping Container Cushions; 8) Response of Coupled Resonators without Loading; 9) Spectra and Probability Distributions; 10) Data Reduction; 11) Some Topics in Statistics of Reliability; 12) Additional Topics in Random Noise Theory; 13) Recapitulation, Considerations for the Future.

This book is concerned not only with the information most fundamental to shock and vibration engineering, but also with the constraints imposed on the application of this information by program schedule, program cost, and complexity of equipment design. Volume 1 concentrates on those considerations that are related most closely to the central problem of developing equipment to withstand extreme shock and vibration.

Reaction Heats and Bond Strengths, C. T. Mortimer, *University of Keele* (Pergamon Press, Oxford, and Addison-Wesley Publishing Company Inc., Reading, Mass., 1962), 230 pp. \$5.00.

Chapters: 1) The Thermochemical Approach; 2) Strain Energies in Saturated and Unsaturated Organic Compounds; 3) Stabilization Energies in Nonaromatic Compounds; 4) Strain and Resonance Energies in Aromatic Compounds; 5) Polymerization Energies; 6) Molecular Addition Compounds; 7) Bond Dissociation Energies and Heats of Formation of Free Radicals; 8) Metal-Carbon and Metal-Halogen Bonds; 9) Ionization Energies in Aqueous Solution; 10) Bond

Strengths in Silicon, Phosphorus, and Sulphur Compounds.

This book presents a survey of the experimental methods available for thermochemical measurements. It is designed for students seeking a brief outline of thermochemistry and for research chemists seeking an easy-to-use reference for bond energies and bond dissociation energies.

Aeronautical and Space Serial Publications: A World List, prepared under the direction of Marvin W. McFarland, *Chief, Science and Technology Division, Library of Congress* (U. S. Government Printing Office, Washington, D. C., 1962), 255 pp. \$1.00.

Contents: Serial publications listed alphabetically by 76 countries plus an international list.

This bibliography lists 4551 titles of serial publications related to aeronautics and astronautics. It attempts to survey the whole range of aeronautical and astronautical serial literature on a worldwide basis and includes several categories of publications—such as yearbooks and annual reports—which were not part of the Library's 1948 publication.

Operator Techniques in Atomic Spectroscopy, Brian R. Judd, *Associate Professor, Faculty of Sciences, University of Paris* (McGraw-Hill Book Company Inc., New York, 1963), 242 pp. \$9.95.

Chapters: 1) Classical Methods; 2) Crystal Fields; 3) The $n-j$ Symbols; 4) Configurations of Two Electrons; 5) Continuous Groups; 6) Seniority; 7) Fractional Parentage Coefficients; 8) Configurations of More Than Two Equivalent Electrons. *Appendices:* 1) Radial Integrals for Hydrogenic Eigenfunctions; 2) The Coefficients $\langle UL|U'L' + f \rangle$ and $\langle WU|W'U' + f \rangle$.

This book seeks to provide a theoretical background for physicists engaged, or about to engage, in spectroscopic work with atoms or ions, particularly those of the rare earth or actinide series. The author has stressed the applications of the theory, in order to give physicists a working knowledge of electron structure.