BOOK REVIEWS

Advanced mathematics for engineers. By H. W. Reddick and F. H. Miller. John Wiley & Sons, Inc., New York, and Chapman & Hall, Ltd., London, 1955. xiv + 548 pp. $6.50.

This is the third edition of a very adequate text, first published in 1938 and which presents to undergraduate engineering students a wide variety of advanced mathematical topics and techniques. This edition, prepared by F. H. Miller, is essentially the same as the second edition. Several new sections and topics have been added, but the great bulk of material is unchanged. The problem lists have been extensively revised; some new problems have been added and, for some reason, almost all of the formal drill problems have been trivially altered so that the answers (all of which are given) are different from those of the corresponding problems in the second edition.

PETER CHIARULLI

Lectures on partial differential equations. By I. G. Petrovsky. Interscience Publishers, Inc., New York and London, 1954. x + 245 pp. $5.75.

This book is a translation, by A. Shenitzer, of Petrovsky's concise introduction to the subject of partial differential equations. Chapter I deals with Cauchy's problem, S. Kowalewsky's existence theorem, characteristics, E. Holmgren's uniqueness proof for Cauchy's problem, canonical forms for second order linear partial differential equations in one unknown function of two independent variables, and canonical forms for systems of linear first order partial differential equations in two independent variables. Chapter II is divided into two parts: (a) Cauchy's problem in the domain of non-analytic functions and (b) vibrations. Part (a) deals with the "correct posing" of Cauchy's problem, Cauchy's problem for the wave equation in one, two, and three space dimensions and for hyperbolic systems in two independent variables, Lorentz transformations, mathematical foundations of special relativity. Part (b) is concerned with vibration problems, the so-called "mixed" problems for the wave equation, and specially Fourier's method (expansion in terms of particular solutions obtained by the method of separation of variables) for the vibrating string equation. Chapter III is devoted to elliptic equations, and covers Laplace's equation, potential theory, solution of Dirichlet's problem for a circle by Poisson's integral. The uniqueness of the solution of Dirichlet's problem is proved by an elementary method (not involving Green's theorem) due to I. I. Privalov (Mat. Sbornik (1) 32, 464-469 (1925)) and the existence of the solution by the Poincare-Perron method of sub- and super-harmonic functions. The difference equation method for the approximate solution of the Dirichlet problem is also considered. Parabolic equations are discussed briefly in Chapter IV. At the end of each of the last three chapters there is a brief but informative survey of related known results. To quote from Professor Courant's foreword to this volume: "It will be highly welcome to English speaking students that Petrovsky's masterly lectures on this important subject are now being made accessible through the present translation from the Russian original."

J. B. DIAZ

Fünfstellige Tafeln der Kreis-und Hyperbelfunktionen sowie der Funktionen e^x und e^{-x} mit den natürlichen Zahlen als Argument. By Keiichi Hayashi. Walter de Gruyter & Co., Berlin, 1955. iv + 182 pp. $3.00.

As far as this reviewer can determine, this is a photo-offset reproduction of the 1921 edition of this work, the contents of which are well known and need not be detailed here.

W. PRAGER

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BOOK REVIEWS

(*Continued from p. 370*)

Transactions of the symposium on computing, mechanics, statistics and partial differential equations. Vol. II. Symposium on Applied Mathematics Sponsored by The American Mathematical Society and Office of Ordnance Research, U.S. Army. 216 pp. $5.00.

These transactions of the second symposium on applied mathematics are reprinted from the Communications on Pure and Applied Mathematics Vol. VIII, No. 1 (1955). The eleven papers presented cover a wide range of topics, many in relatively new fields of interest or fields that lie in between well established ones. One very interesting feature of the group of papers is the surprising amount of overlap in the topics despite the tremendous scope of the conference. Indeed many of the papers are primarily descriptive surveys and seem to concentrate attention on the amalgamation of diverse topics into new fields.

The following lists the authors and the general topic or condensed title of the paper: P. M. Morse (operations research), J. Neyman (inductive inference), H. O. Hartley (analysis of variance), J. E. Mayer (statistical mechanics), M. R. Hestenes (iterative computation methods), J. Todd (numerical analysis), A. A. Bennett (ordnance computations), C. A. Truesdell (rate theory of elasticity), J. J. Stoker (stability of mechanical systems), F. Bureau (divergent integrals), and W. Feller (differential operators).

G. F. NEWELL

Engineering analysis. By D. W. Ver Planck and B. R. Teare, Jr. John Wiley & Sons, Inc., New York, and Chapman & Hall, Ltd., London, 1954. xii + 344 pp. $6.00.

This book is intended as an aid for students taking a course in "engineering analysis" such as the authors have been teaching for many years. The authors recognize that, throughout most engineering curricula, instructors try to present their students with carefully constructed and clearly worded problems whose solution will serve as exercises in acquiring familiarity with new principles and methods. In professional practice the engineer is never confronted with nicely stated problems, but rather with situations involving numerous uncertainties (physical, financial, and human) out of which he must construct his own problems and find their solution in a form which enables him to choose a definite plan of action. The sort of course which the authors teach is aimed at introducing the student to these facts of engineering life by posing him a series of practical situations, stated informally and even somewhat vaguely. The student must formulate precise problems, apply the basic principles of mechanics, thermodynamics, and electricity and magnetism, set up definite mathematical problems, and finally solve them in a usable way.

This book provides many interesting examples of such situations. It provides also many hints on how to attack them in an efficient and orderly way, as well as chapters reviewing the essential tools. One chapter summarizes basic physical principles (of mechanics, thermodynamics and heat flow, electricity and magnetism, and electric circuits). Another chapter reviews some basic mathematics, particularly standard elementary methods of solving ordinary differential equations. A final chapter gives useful suggestions on the interpretation and checking of mathematical results. The most interesting parts of the book will probably be those in which examples are studied in detail of the breaking down of complex situations into solvable mathematical problems whose answers enable the engineer to arrive at a decision. This is the most difficult part of professional practice, and one wonders how much can be learned by formal study and how much can be learned only from personal experience, more or less painful. However, there seems no doubt that the authors have made a valiant and commendable effort to help the student realize what sort of dilemmas will confront him in practice, and at the same time help him to develop confidence that with common sense, good working habits, and knowledge of some basic physical laws, he can make satisfactory progress in analyzing them.

P. S. SYMONDS

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BOOK REVIEWS

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Mathematics of engineering systems. By Derek F. Lawden. Methuen & Co., Ltd., London, and John Wiley & Sons, Inc., New York, 1954. viii + 380 pp. $5.75.

This book provides a course in applied mathematics in which a selection of topics of interest in modern engineering and applied science are treated on an intermediate level. After an introductory chapter which includes complex numbers there are two chapters on linear ordinary differential equations with constant coefficients. The classical methods are treated in the first of these, with applications to problems of servomechanisms and stability; modern methods are taken up in the second, involving the use of standard inputs (unit steps, unit impulse, and sinusoidal functions) and the Laplace transform. Chapter 4 is concerned with Fourier series and integrals and applications of Fourier transforms. The final chapter provides a brief introduction to non-linear differential equations, in which main attention is paid to Van der Pol's and to Duffing's equation. This is a book of mathematics, not of engineering; but the large number of examples refer to practical engineering problems. They are drawn mostly from electrical engineering (electronic amplifiers and oscillators, electric circuits, and servomechanisms), but the book should be of interest to engineers and scientists in many fields.

P. S. SYMONDS

La Théorie des Fonctions de Bessel. By Gerard Pétiau. Renseignements et Vente au Service des Publications du CNRS, Paris, 1955. 477 pp. $7.20.

This book would be a very valuable addition to the literature on Bessel functions if it were not lacking some rather vital features. The most serious omission is an alphabetical index. This is seldom of much value in trying to find an equation but it does serve an important function in finding some things and the lack of one seriously reduces the usefulness of the book. The book contains references for most topics of recent development and for certain topics of related interest to the main topics but there is no general list of references and by and large the system of references is rather weak. The book is also lacking a preface; thus there is nowhere in the book any discussion of the scope or extent to which this book supersedes previous works on Bessel functions or even for what purpose the book was intended.

On the more favorable side, the book does contain a tremendous collection of formulas. Most of the derivations are short and the book seems to be arranged with this particularly in mind. Many formulas and even some interesting topics are not to be found in some of the standard references (for example Watson's "The Theory of Bessel Functions" or the recent Bateman Manuscript Project "Higher Transcendental Functions") There is a short chapter on Bessel integral functions

$$Ji_n(x) = -\int_x^\infty u^{-1}J_n(u)\,du$$

and related integrals. There are also some definite integrals that are not easily found elsewhere.

The scope of the book is extensive. The first 328 pages are devoted to the properties of Bessel functions and related functions. It includes much of the material in Watson's treatise plus some more recent topics. The next 107 pages describes some of the principal applications particularly in relation to the solution of partial differential equations. By comparison this part is much more illustrative than exhaustive. In addition there are 14 pages of short tables and 11 pages of graphs.

The derivations of some of the formulas employ standard mathematical techniques which are of a somewhat advanced nature. This, coupled with the scarcity of references, will make the book difficult to follow for a person not well trained in mathematics.

G. F. NEWELL