BOOK REVIEWS

Engineering Mathematics, Vol. I by R. S. L. Srivastava. Tata McGraw-Hill Publishing Company Limited, 12/4 Asaf Ali Road, New Delhi 110 002, 1980, pp xiv + 511. Price Rs. 28·50.

It is stated by the author that this book is the first of a two-volume set intended as an introduction to those branches of post-calculus mathematics which are of great practical value to the analytical engineer. In the order of appearance, the chapter titles are a review of algebra, analytic geometry and calculus; complex numbers; infinite series, products and integrals; vectors and solid geometry; partial differentiation; integrals with several variables; matrices and determinants; ordinary differential equations of the first order; ordinary differential equations of higher orders; power series method: Legendre and Bessel functions; Laplace transformation. Thus this volume will be useful for mathematics curriculum of traditional undergraduate engineering courses. It is not mentioned anywhere as to what would be the contents of the proposed volume 2.

The book is written in an old orthodox way. This observation is reinforced if we look at the bibliography. Out of the 12 books mentioned, 10 are from the fifties or earlier period and the remaining 2 from the sixties. Nothing innovative is noticed in the contents or presentation of the material in this book and books on such engineering mathematics are available.

Modern day analytical engineer is using computers in his work and future-day analytical engineer whom we are training now is expected to use them still more widely. Advent of computers has made an impact on mathematics and this should be seen in the contents of books on engineering mathematics. Some hints as how to bring about this can be had from the book by Peter Lax *et al*[1]. The reviewer feels that the authors of texts on engineering mathematics should pay attention to this aspect as such an approach will improve the quality of training of the analytical engineers.

The treatment is claimed to be rigorous and unified. It would have been preferable then to introduce the concept of vector as an element of vector space also and link it with its physical concept as a quantity possessing direction along with magnitude. Similarly it is necessary to define a matrix as a function (as is done for a sequence) and not in terms of its representation as an rectangular array. It is essential that the rank of a matrix is also defined in terms of the number of independent rows (or columns) and its equivalence with the definition given in the book (as the largest value of r for which there exists an $r \times r$ submatrix with nonvanishing determinant) mentioned. The reviewer feels that such orientation will equip the analytical engineer better for his

work in future. Otherwise there is a danger that the engineering student carries a superfluous impression that a matrix is a rectangular array enclosed within parentheses, while a determinant is a square array enclosed between vertical bars (as defined in this book). Even an undergraduate engineering student must know that a rectangular array is just a representation of a matrix, and concept of matrix is something more than that. Similarly he should know that a determinant of order n is a sum of terms $\Sigma e_{i_1 i_2 \cdots i_n} a_{1 i_1} a_{2 i_2} \cdots a_{n i_n}$ where $i_1 i_2 \ldots i_n$ has a value $+1$, 0 or -1 depending on the type of permutation $(i_1, i_2, \ldots, i_n)$ of $(1, 2, \ldots, n)$. Then only he will really appreciate the difference between a determinant and a matrix. Otherwise he may get some manipulative skill but will stand to loose in proper understanding of concepts which is so important.

The analytical engineer (in fact, even a pure mathematics student) should know that Cramer's rule, if employed, would require more than 2 million years (even when a computer capable of performing 2 million operations per second and running continuously is used to solve a system of 20 equations in 20 unknowns (*See* refs. 3 and 4). And he should know it while he is studying this method rather than waiting to know it while studying numerical analysis or getting a shock by knowing it when he faces such a problem. The reviewer feels that books on mathematics should bring these facts to the notice of present day engineering students and make the treatment really unified.

There is a difference between one-to-one function and one-to-one correspondence (see Rudin[2]). But this author considers these two concepts to be same (p 26). Though the concept of function is explained correctly with the examples on p 22 by pointing out the difference between general relation and its particular case, *viz*, function, the statement of the definition of function on p 23 has gone wrong. What is stated is " to every x belonging to a set X of real numbers, there is assigned a real number y ". What is needed to be stated is " ..... there is assigned one and only one real number y ". In modern mathematical treatments a function by definition is single valued. Further the reviewer feels that the horizon of the analytical engineer will be widened (which is necessary in the present days) if a general diffnition of function (even in a review chapter) for any two sets domain and codomain is given rather than restricting the definition to a function of a real variable. Such a modern approach will make him appreciate versatility and beauty of mathematics more and at the same time equip him better to study other subjects useful to him, like probability theory, because probability is a particular type of function. Nobody will deny that probability theory is an essential tool in the armory of present day analytical engineer.

In the treatment of differential equations, which forms the life blood of engineers, important and useful topics like singular points of first order equations, phase plane, methods of solving boundary value and eigenvalue problems do not find place in the book. Picard's method is separated from the existence-uniqueness theorems. In fact it could have been profitably used in giving the proof of these theorems. The linear independence of functions is discussed in general in the beginning of section 9.1.1. For a fuller understanding it should have been explained that the implication, linear dependence

implies Wronskian $W = 0$, cannot be reversed. This would have brought out clearly the significance of theorem 4 (p. 365) when the functions assume the role of solutions of a differential equation.

A real variable can tend to $+\infty$ *or* $-\infty$, while in complex plane there is only one point at infinity. It should have been explained in the chapter on complex numbers as to why this difference arises even though one can go to infinity in two directions on both the real and imaginary axes of the Argand diagram.

There are some misprints like the section number 7.3 in place of 8.3 (p. 332). The book in 2 volumes is designed for a two-year (or 3 semester on the basis of 3 lectures and 2 tutorial classes per week) course work. There is enough collection of solved examples and exercises in the book. Answers are provided to selected problems.

1. PETER LAX *et al.* — *Calculus with applications and computations,* Springer Verlag, 1976, **1.**
2. RUDIN — *Principles of mathematical analysis,* McGraw-Hill, Kogakusha, 1964, p. 22.
3. YOUNG, D. H. AND GREGORY, R. T. — *A survey of numerical mathematics,* Addison-Wesley, 1973, **2,** p. 790.
4. FORSYTH, G. E. *et al.* — *Computer methods for mathematical computations,* Prentice-Hall, Inc., 1977, p. 30.

V. G. TIKEKAR

Television Engineering by Arvind Dhake. Published by Tata McGraw-Hill Publishing Company Limited, New Delhi 110 002, 1979, pp. 462, Price Rs. 30.

This is purported to be a text book suitable for engineering students at the degree, diploma and technician levels. It has 25 chapters covering the whole field from fundamentals to modern techniques employed in television. By and large, good part of the book deals with television receiver as this topic takes up about 13 chapters, the remaining being concerned with fundamentals, television cameras, transmission and relay systems, testing and alignment, CCTV, colour television, etc. The treatment is largely confined to black-and-white television bearing in mind the current needs of the country.

The author starts with review of the development and history of TV and goes on to the basic principles of the television system using an iconoscope camera. The characteristics of vision being of fundamental importance, the author goes on to describe the structure of the eye, its potentialities and limitations. The choice of aspect ratio, repetition frequency, number of lines, etc., are then arrived at and the handwidth of the signal calculated. TV standards used in various region are given. The author has used terms like 'hum bar' and 'rolling ripples' without proper elucidation which may cause some confusion in the readers.

The chapter on television cameras includes a section on lenses. Modern camera tubes, such as the plumbicon and vidicon are adequately dealt with. Deflection systems and video processing are described.

The chapter on studio equipment, the organisation of the control room and introduction of special effects gives comprehensive though brief coverage. Video recording has been dealt with in detail. Modern techniques such as holographic recording have also been included.

Chapter 7 on TV transmission and relay systems deals with transmitters, antennas, diplexes and other elements which constitute the system. Calculation of coverage, field strength, etc., are also included. It would have been instructive if the author had included the circuits of important parts (such as the output stages) of the transmitter. The propagation of television signals is dealt with in chapter 8. The phenomena associated with transmission at VHF and UHF are described. Chapters 9 and 10 are concerned with antennas for reception. Starting with the basic types and their characteristics, the author goes on to practical antennas, booster amplifiers, etc. Methods of calculating S/N ratio are given. A section deals with antennas measurements. These chapters are informative and well written.

Chapters 11 to 22, making up almost half the book, deal with receivers. Detailed treatment is given of the various stages of the receivers, the picture tube, deflection circuits, etc. Circuits employing vaccum tubes, transistors and integrated circuits are given. Design details of circuits are included. This is no doubt a very comprehensive coverage which will be useful to those engaged in the design of receivers. The explanation of the operation of the circuits is clear. In the opinion of the reviewer, vaccum tube circuits have been allotted more space than desired. The attention given to integrated circuits, particularly the new families could have been increased keeping in mind the changing technologies.

All chapters have review questions, but very few problems. Introduction of some problems would have made the book more useful.

The remaining chapters cover testing and alignment of receivers, closed circuit television (CCTV) and colour television. The chapters on testing would prove useful particularly to technicians engaged in servicing. The chapter on colour TV is clear and concise but the author has not fully explained how the colour TV signal is compatible with black-and-white receivers.

On the whole, the book makes a valuable contribution to the literature on television available in this country. The comprehensive coverage in a modestly priced book will be appreciated by the students. There are places where the language and explanation could have been improved but these are not likely to reduce the value of the book.

N. S. NAGARAJA

Engineering Mechanics, Statics by P. Dayaratnam. Tata McGraw-Hill Publishing Co., New Delhi 110 002, 1979, pp. 316, Price Rs. 19·50.

The book presents statics which is a part of the engineering mechanics from fundamentals and solves numerous problems systematically illustrating the basic principles. It contains 8 chapters, two appendices and an index.

In the first chapter entitled 'concepts in statics', description of force, moment, equilibrium of forces, free-body diagrams are covered. The second chapter deals with details of mechanical supports and supporting conditions. It contains brief information on static stability and statical indeterminacy and mechanisms. Simple mechanical systems like pulleys, inclined planes, levers, springs, gears and differential chain-pulley blocks are covered in the third chapter. Friction is covered in the fourth chapter wherein inclined planes, wedges, spikes, screws, belts and ropes, discs and bearings are described. Analysis of simple axial force structures, graphic statics and method of virtual work are described in the fifth, sixth and seventh chapters respectively. The last chapter contains information on properties of sections. The appendices give some information on sectional properties and moment of inertia values useful in analysis.

The book contains numerous problems both solved and to be solved. Hence this should prove very useful to students and teachers.

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