

BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.



Theory and Design of Modern Pressure Vessels (2nd ed.)

Author John F. Harvey
Publisher Van Nostrand Reinhold Company, 1974
Pages 436
Price \$19.95
Reviewer Ralph M. Richard

As stated by the author in the Preface, the primary objective of this book is to take the reader through the first steps and the practical considerations encountered in the design of pressure vessels. The author has done this in a comprehensive manner through his treatment of the primary and secondary stresses arising from pressure, temperature, fatigue, and creep. Design considerations include economics, fabrication, and material selection.

This book presents a brief good review of the basic theory of plates, shells, and material behavior germane to pressure vessel analysis, including a comprehensive treatment of discontinuity stresses. All mathematical notation is conventional and requires only a basic understanding of the calculus and strength of materials.

An adequate number of well-posed problems, along with the answers, as well as numerous useful tables and graphs are presented. Reference lists at the end of each chapter are very comprehensive.

The features listed above, I feel,

make this book an excellent reference and guide; indeed, it would serve as a good textbook at the senior and first-year graduate level of instruction.

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Handbook of Mathematical Calculations

Authors Karen Assaf and Said A. Assaf
Publisher The Iowa State University Press (1974)
Pages 309
Reviewer K. F. Hansen

This book purports to be a reference text to present the basic concepts of mathematics and their applications to scientific and engineering problems. According to the Preface, the authors had three points in mind:

1. to reach the student of science who shies away from courses

because he believes he learns things better in words than equations

2. to reach working technicians, nurses, and the like who have forgotten the basic principles involved in calculations and/or mathematical manipulations
3. to provide a convenient outline with examples and practical problems for instructors involved in teaching mathematics in fundamental and applied science subjects.

According to the introduction, the book was written for "... anybody who has a need to read or to use mathematics in his daily activities but who has either not had the mathematics background or has not used it often enough to remember how to use it."

The book is divided into three major segments. The first is a review of mathematics, including measurement, number systems, fractions, various algebraic manipulations, logarithms, theory of equations, trigonometry, and a touch of calculus. The second portion deals with mathematical applications and takes up such topics as equations; formulas; applications in the chemical field; use of graphs; thermodynamics applications such as gas laws, calculation of density, mass, volume and the like; a bit of some review of mechanics such as force, motion, gravitation laws, work, energy, and the like; and assorted other applications such as radioactivity, geometrical optics, and electromagnetic radiation. The third portion deals with statistics, the notation of statistics,

the normal distribution, probability, permutations and combinations; chi-square law, correlation, and least-squares and confidence limits. There is also an extensive appendix which contains a number of tables, conversion factors, some further geometric and trigonometric identities, and tables of functions.

The section on mathematical review is, in my opinion, not very good. The selection of topic material is reasonably broad, but the descriptions of concepts are either too terse or completely lacking. Thus, someone who does not understand the binary system would have great difficulties in understanding the discussion on p. 5 of the text regarding binary numbers. For instance, the authors state "... the number two is the base, and therefore is represented by the symbol 10." This without even introducing the binary digits and binary operations. They then say "... In this system the fundamental numbers are 1, 10. The basic additional fact in this system is $1 + 1 = 10$." One cannot help but wonder what zero is in the system they define. Similarly, other mathematical ideas are not presented with adequate description. The discussion on logarithms is also very poor. Thus, the authors make the statement "... although any number can be made the base for a set of logarithms, three numbers are most often used." It would seem the authors should take care in pointing out that 1 and 0 would make a somewhat difficult base to use for a logarithm system. Further, the authors refer to natural logarithms, which is hardly surprising, except this is the first and only reference to the number e , and they make no explanation or introduction as to why e is an important irrational number. Indeed, the book does not even define rational and irrational numbers. If one were attempting to make a mathematical review, it seems to me such matters ought to be included. Throughout the

section on mathematical review, I was bothered by the fact that descriptions were neither very exact nor very informative. If one already understood most of the mathematics involved, the book would be useless; on the other hand, if one did not understand it, it would be very hard to learn from the book.

One can compare this with the sections in Burington's *Tables*, where there are very concise and clear definitions of quantities; I would consider Burington's a better mathematical review than this book, although Burington's is not written from that point of view at all.

The second section of the book on mathematical applications is somewhat more interesting and better written than the first part. The review of calculation of chemical compositions and the like is quite well done. The use of forms of graphs is also quite well done. It is evident the authors' personal experience deals mostly with chemical matters, and for those who are not familiar with various calculations and applications in the field, the book may serve as worthwhile review. Also, the discussion of applications of the perfect gas law are reasonably germane. However, for many of the applications, unless one knew the physics or chemistry underlying the calculations, the discussion would not be very informative. Nevertheless, I thought the second chapter was more useful than the first.

The section on statistics was also reasonably informative, and here the authors did take care to give the appropriate definitions of statistical quantities: the mean, variance, standard deviations, and the like. Nevertheless, there are still some examples of oversight. For instance, on p. 192 the authors introduce the frequency function for random variables without even defining what it is. On p. 209 the authors state "... It is sometimes desired to fit

a set of experimental data for y as a function of x with the formula giving the most accurate representation of the results." The authors do not explain what type of formulas might be considered or even mention measures of error. Indeed, the discussion implies that least squares are used simply to fit straight lines to data.

The material in the appendix is a collection of all sorts of things, including information from chemistry, thermodynamics, tables of symbols, the Greek and Russian alphabets, conversion factors, and others. The tables in the appendix that would be most useful, such as tables of integrals, are very incomplete compared to other available sources. By and large, the selection of information for the appendix seems random, and one could fill it out with any number of other tables if one chose.

In summary, my feelings regarding the book are that for the nuclear industry there would be no reason to purchase such a handbook. Anyone practicing in the field would know more than the book contains and would find it useless. A technician or assistant would find the book very difficult to learn from. If I were looking for reference material, I would find better references in the library than this book. For my personal library I cannot compare this book favorably with the *Chemical Rubber Handbook*, Burington's *Tables*, or others. Thus, in my opinion, this is a book that falls in between the cracks, and it does not fill any particular need for nuclear engineers.

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