

the subject-matter of the next two chapters. The authors' aim in treating Fourier's series and the Bessel functions as simply and practically as possible has been well fulfilled. Chapter vii is concerned with the methods of fitting data to empirical equations, numerical integration and differentiation and interpolation. Illustrations are given in Chapter viii of the many graphical methods in use in chemical engineering design, together with a short section on alignment charts. The final chapter wisely discusses the theory of errors and the precision of measurements. A few practical exercises are placed in an appendix at the end and a good index is provided.

The subject-matter is very clearly treated and, as stated in the preface, "it should be possible for anyone with a good grounding in the calculus to follow the text without difficulty". The authors also commendably point out that there is no quick and easy method of gaining proficiency in any branch of mathematics without sustained, serious and concentrated study. This is a very necessary warning to all practical students, and especially to those for whom this valuable book has been prepared.

Mathematics for Actuarial Students

By Harry Freeman. (Published for the Institute of Actuaries.) Part 1: Elementary Differential and Integral Calculus. Pp. viii+184. 9s. net. Part 2: Finite Differences, Probability and Elementary Statistics. Pp. xiii+340. 25s. net. (Cambridge: At the University Press, 1939.)

THESE two volumes are designed to replace the author's "Elementary Treatise on Actuarial Mathematics", published in 1931. The replacement is rendered necessary by changes in the mathematical requirements of the examinations controlled by the Institute of Actuaries. Part 1 contains the chapters on trigonometry and elementary calculus taken, with little change, from the earlier book. Part 2 is almost a new work, for the remaining text of the former treatise has not only been re-written and expanded to bring it up to date, but also new chapters on elementary statistics have been added. The first nine chapters, occupying 203 of the 330 pages of text, are devoted to finite differences, and the treatment of this somewhat difficult subject is both interesting and sound. The four remaining chapters are concerned with an elementary discussion of simple probability and statistics. Here, again, the author has developed the subjects with clarity and skill.

In both books, the text is well illustrated by worked-out examples, and each chapter concludes with a good set of exercises for the practice of the student. In addition, each part contains a number of miscellaneous problems placed at the end. Answers to all the examples are also given.

The books are excellently printed and should not only be useful to candidates for the Institute's examinations, but also of practical value to all students of the important branches of mathematics dealt with.

Higher Mathematics

With Applications to Science and Engineering. By Prof. Richard Stevens Burington and Charles Chapman Torrance. Pp. xiii+844. (New York and London: McGraw-Hill Book Co., Inc., 1939.) 30s.

WHILE special stress is laid, in the book under notice, on the practical application of mathematics to physics and engineering, yet the book compares favourably with a work on abstract rigorous analysis, although, as would be expected, the rigour is not carried so far as in a purely academic treatise. Of the nine chapters, the first four are concerned with the calculus of a real variable. These include the theorems of Rolle, Taylor, Green and Stokes; the Riemann theory of integration; ordinary and linear simultaneous differential equations with applications to electrical networks; numerical integration; brief discussions of Legendre and Bessel functions and series including the theorems of Féjér and Fourier. Chapter v is devoted to complex variables and elliptic functions, with applications to the pendulum and the rectification of an elliptic arc. Then follows in Chapter vi a consideration of determinants and matrices together with the elements of vector analysis, differential geometry and tensor analysis. Partial differential equations are dealt with in Chapter vii, whilst the last two chapters are devoted to the calculus of variations, analytical dynamics and an introduction to the theory of the real variable. The book concludes with a useful bibliography and a full index.

The text is, on the whole, clearly written, though obvious considerations of space have prevented a few topics from being as fully treated as might be wished. It is also well illustrated, both by carefully drawn figures and by fully worked-out practical problems, while numerous and judiciously chosen examples are provided for the student's practice. The authors have not only fulfilled their aim admirably but also have produced an interesting book, characterized by some excellent features, which should prove very useful to all students of applied science as well as to those of pure mathematics.

MEDICAL SCIENCES

Fundamental Principles of Bacteriology

With Laboratory Exercises. By Prof. A. J. Salle. Pp. xiii+679. (New York and London: McGraw-Hill Book Co. Inc., 1939.) 24s.

THIS book, as the author is careful to point out, is intended to serve as a ground-work for those who are beginning the study of bacteriology as a biological science; it is in no sense an advanced text-book on the subject. In nearly seven hundred pages of excellent print the elementary principles are covered, ranging from the physiology and morphology of micro-organisms to the bacteriology of water, soil, air, food, etc., with short chapters also on infection and immunity and the diseases of plants and animals. An attempt has also been made to make the work a