Control of Nuclear Reactors and Power Plants

By M. A. Schultz. (McGraw-Hill Series in Nuclear Engineering.) Pp. viii+313. (London: McGraw-Hill Publishing Company, Ltd., 1955.) 52*s*. 6*d*.

THE author sets out to analyse the characteristics of nuclear power plants, primarily using servo techniques. As an example of the method, skilfully applied to a set of problems, the work is of value; although perhaps more to those whose interest is in the method rather than the problems. This opinion is advanced for two reasons. First, the servo method gives qualitative information on stability, rather than quantitative data on the course of transients. The latter problems, in my experience, predominate in the field of reactor control. Particularly in the base-load power reactors now being designed in Britain, there is little difficulty with stability against oscillatory tendencies, simply due to the wide spacing of the time-constants of the effects which comprise the control sequence. Certain problems might conceivably arise from distributed effects, but these would not be amenable to servo methods of solution. Second, the design of a control system for a nuclear reactor is a project which justifies considerable, one might say unlimited, attention and effort. If the particular equations cannot be solved by conventional methods, numerical solutions using digital computors, or graphical solutions using analogue computors, could be obtained. The speedy methods of frequency diagrams, admirably adapted to the repetition design of similar systems, seem too cursory in the present context.

The curves of Figs. 3.1 and 3.2 appear to be reproduced on too small a scale to be useful, and, so far as they can be read, do not satisfy the obvious condition $\Sigma A_j = 1$.

On p. 122, eqn. 5.3 should read $v = A\omega \cos \omega t$, and on the same page, the statement "rod mass $= m$, in poundals" should presumably read "in slugs".

Referring to Fig. 10.7, the point of inflexion at 0·1 sec. suggests that a period of artificial acceleration is followed by deceleration, followed by acceleration again under gravity. This does not correspond with the explanation in the text.

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High Vacuum Technique

Theory, Practice, Industrial Applications and Properties of Materials. By J. Yarwood. Third edition, revised. Pp. vii+208. (London: Chapman and Hall, Ltd., 1955.) 25*s*. net.

SINCE the end of the Second World War, when the second edition of J. Yarwood's well-known and useful handbook of vacuum practice was first published, both the demand for, and the supply of, vacuum apparatus have increased manifold. In addition, several innovations have been introduced: ultra-high vacua of 10^{-10} mm. of mercury and less have been attained and measured, and many new applications of vacuum procedures have been made. Nevertheless, fundamentally, vacuum practice remains the same, and in the third edition of his monograph Yarwood resists quite rightly the temptation to omit the standard basic material in favour of more attractive modern applications of vacuum techniques to industrial processes.

The text is illustrated by a large number of line-drawings which are remarkably clear, well drawn and beautifully reproduced. There are an extensive bibliography and numerous references to scientific articles and manufacturers' catalogues. Many useful data are contained in the several tables which are scattered throughout the text. One wonders, however, why the author did not adopt some standard accepted form for the abbreviations of the titles of the periodicals to which reference is made, and in addition why some authors' names are quoted in full and others not. But these are trivial blemishes, and the volume still remains one of the best elementary text-books on the subject of vacuum technique to which to introduce students of science, and for industrial and other research workers to have close at hand for rapid reference.

Methods of Mathematical Physics

By Sir Harold Jeffreys and Bertha Swirles (Lady Jeffreys). Third edition. Pp. x+714. (Cambridge: At the University Press, 1956.) 84*s*. net.

THIS important work first appeared in 1946 (see *Nature*, **160**, 139; 1947); four years later a second edition, considerably revised, was issued. A third edition is now called for, and the authors have made further improvements, though on a much smaller scale. "Some theorems are stated more explicitly, a few proofs are added, and some are shortened"; others are generalized or given in more detail. After ten years, a book so widely used must now approach complete freedom from errors and misprints, thanks to the aid of many readers. The index combines subject and author references; the latter might appropriately include mention of acknowledgment in the prefaces.

Intuitionism

An Introduction. By Prof. A. Heyting. (Studies in Logic and the Foundations of Mathematics.) Pp. viii+132. (Amsterdam: North-Holland Publishing Company, 1956.) 13.50 guilders; 27*s*.

TO the intuitionist, mathematical existence is synonymous with construction; to inquire whether a number which cannot be constructed nevertheless exists is to go outside the domain of mathematics, and enter that of metaphysics. The programme is positive, but may also claim the negative virtue of avoiding some of the paradoxes which beset the logical foundations of classical mathematics, so the classical mathematician may well wish to know how much of his domain must be sacrificed to purchase this freedom, and to see, for example, how a theory of measure and integration can be built up in a domain in which a bounded monotonic sequence need not tend to a limit. Under Brouwer's primacy, much work has been done in The Netherlands, and Prof. A. Heyting, of Amsterdam, has had the happy idea of producing a missionary tract. In the first chapter, a dialogue between an intuitionist, a classical mathematician, a formalist and others sets the stage and the intuitionist offers to produce his wares for inspection. Thus chapters on algebra, integration, logic, are specific examples of intuitionistic mathematics at work, cutting a cautious path through the tangle of difficulties, with a good deal of useful comment. Reading the book still requires the utmost concentration, but granted this, the fascination of the topic begins to emerge and it may well be that some young mathematicians will be encouraged by it to meet Prof. Heyting's call for more workers in this field. Those who feel themselves to be too old to learn new tricks will nevertheless be grateful to the author for this successful attempt to explain the intuitionist point of view and programme.

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