seminar or advanced topics course for applied mathematicians and theoretically oriented electrical engineers. The presentation is apt to be too austere for most engineers even though precision in and basic understanding of network analysis have become increasingly important with the growing use of computer-aided analysis and design. The book fills a vital gap in providing researchers with a solid point of departure for further work not only in network analysis involving R, L and C elements, but also in certain aspects of network synthesis.

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The Unified Theory of Electrical Machines, by Charles V. Jones. 542 pages, illustr., 6 x 10 in. London, Butterworths, 1967. Price, 90s. (about $12.75). New York, Plenum Press, 1968. Price, $18.00.

Jones has written an interesting book, in which the author expresses his ideas in considerable detail (542 pages), with candor. Although matrices are used extensively to emphasize the unity of development, one is not overwhelmed by them; and experimental confirmation, in fact justification, is continuously supplied. Why certain steps are being taken is usually refreshingly clear, and the reader's confidence is maintained by the inclusion of the experimentally obtained data. The careful, convincing development of the Steinmetz equivalent circuit of the transformer, and the rather full coverage of the balanced normal steady-state operation of synchronous machines, including saturation, are typical of the author's thoroughness.

The book is divided into three parts—preliminary and unifying concepts, slip ring (induction and synchronous) machines, and commutator machines.

The first quarter of the book (thirteen chapters, each short) is devoted to development of voltage and torque equations of magnetically coupled electric circuits, without saturation; measurement of self and mutual inductance; equivalent circuit representation of hysteresis, eddy-current losses and saturation; elementary matrix manipulations applied to electric circuits (seven chapters); equivalent circuits of the transformer; discussion of operational calculus.

Slip ring machines are covered in seven chapters, which include the three-phase to two-phase transformation of the induction machine; transformation of the three-phase synchronous machine with one damper winding on each axis; transformation to the Park form; induction-machine equivalent circuits for normal operation; symmetrical components applied to induction machines; balanced stead-state operation of synchronous machines; transient and unbalanced synchronous machine operation.

The final portion (seven chapters) treats commutator machines, including commutation!; d–q primitive machines; examples of simple d.c. machines; cross-field machines; single-phase commutator motors; three-phase commutator machines; Schrage motor. Although only 34 problems are given, they illustrate well, and in some instances are part of, the text. The style, format, notation and figures are quite appealing.

In summary, the author has included most of the usual methods and techniques of machine analysis, together with numerous examples, but has not hesitated to include his own ideas also which makes this volume a particularly welcome addition to any library of books on machines.

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Electromagnetism and Quantum Theory, by D. M. Grimes. 151 pages, diagrams, 5 x 8 in. New York, Academic Press, 1969. Price $9.00.

The treatment of electromagnetism and quantum theory in this book is unique in

a number of respects and may well set the pattern for the way these subjects are taught in the future. At the same time, the treatment of quantum theory is probably too unconventional to fit comfortably in the present-day pedagogical approach to the subject that has come to be accepted at most schools. The book is concerned with the scientific basis of each discipline and the relationship between them. The most singularly unique feature of the book is that Dr. Grimes develops quantum theory as an off-shoot of electromagnetism, rather than vice versa as is commonly done. Therefore this book should be particularly appealing to those whose primary training is in the classical branches of physics: e.g. electromagnetism.

There are seventeen chapters. In the first four, Grimes deduces the equations of classical mechanics and electromagnetism from the postulates of special relativity. The next three chapters contain an analysis of the absorption and emission of electromagnetic radiation by small objects. The role of the reactive field is emphasized. Although the role of the reactive field in electromagnetic radiation has long been known, particularly in antenna theory, the approach introduced here of incorporating it into the differential equation of motion of charged particles is new and informative. It leads to a description of classical radiation in terms similar to those of quantized radiation. The ratio of exchanged energy to angular momentum, obtainable otherwise only by quantum mechanical techniques, follows as a direct result.

Chapter 8 contains a review of what is known about the electron *per se*. In Chapter 9 Grimes induces the Schrödinger equation on the basis of his earlier chapters and the additional postulate that a stable solution to the atomic problem exists. Chapters 10 and 11 contain a description of the results of the Schrödinger equation that is conventional save for his discussion about the exclusion principle. For that principle, he considers the interaction energy between two electrons bound by the same potential. These electrons can traverse all possible paths in phase-space only if their wave functions are antisymmetric, i.e. the exclusion principle is satisfied.

Chapter 12 contains an application of the Manley–Rowe equations to atomic systems and concludes from them that the ratio of exchanged energy to frequency is constant. The next three chapters contain a brief discussion of the Schrödinger equation using harmonic, spherical and Coulomb potentials and Chapter 16 contains a brief discussion of absorption and emission processes. Chapter 17 shows that space quantization will result in systems which contain an appropriate electric quadrupolar moment and that space quantization, therefore, need not necessarily imply the existence of non-electromagnetic forces.

To fully appreciate the viewpoint presented in this book, the reader should have as a background at least one graduate course in both electromagnetism and quantum theory. It is regrettable that the book is very short, sometimes to the point of being sketchy. A more lengthy discussion of the many significant ideas presented in the book would have made it much more readable. Also, the inclusion of more problems would have enhanced its usefulness as a text. Nevertheless, Dr. Grimes has made an important contribution to the literature with this book by pointing out that classical electromagnetism is perhaps even more basic to the understanding of nature at the atomic level than has been realized to date. For all those who feel they would enjoy a refreshingly different and highly interesting view of quantum theory, the book is highly recommended.

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The Photographic Action of Ionizing Radiations, by R. H. Herz. 629 pages, diagrams, illustr., 6 × 9 in. New York, John Wiley, 1969. Price, $22.50.

This 600-page volume brings together under one cover a collection of material related to the principles and practices of photographing ionizing radiations, whose