PREFACE

This book was written primarily as a graduate-level text, but it should also be useful as a reference book. The organization is somewhat different from that normally found in engineering books. The material is arranged according to similarity of mathematical techniques instead of according to devices (antennas, waveguides, cavities, etc.). This organization reflects the main purpose of the book—to present mathematical techniques for handling electromagnetic engineering problems. In the sense that theorems are proved and formulas derived, the book is theoretical. However, numerous practical examples illustrate the theory, and in this sense the book is practical. The experimental aspect of the subject is not considered explicitly.

The term *time-harmonic* has been used in the title to indicate that only sinusoidally time-varying fields are considered. To describe such fields, the adjective *a-c* (alternating-current) has been borrowed from the corresponding specialization of circuit theory. Actually, much of the theory can easily be extended to arbitrarily time-varying fields by means of the Fourier or Laplace transformations.

The nomenclature and symbolism used is essentially the same as that of the author's earlier text, "Introduction to Electromagnetic Engineering," except for the following change. Boldface script letters denote instantaneous vector quantities and boldface block letters denote complex vectors. This is a departure from the confusing convention of using the same symbol for the two different quantities, instantaneous and complex. Also, the complex quantities are chosen to have rms (root-mean-square) amplitudes, which corresponds to the usual a-c circuit theory convention.

The many examples treated in the text are intended to be simple treatments of practical problems. Most of the complicated formulas are illustrated by numerical calculations or graphs. To augment the examples, there is an extensive set of problems at the end of each chapter. Many of these problems are of theoretical or practical significance, and are therefore listed in the index. Answers are given for most of the problems.

Some of the material of the text appears in book form for the first time. References are given to the original sources when they are known.

However, it has not been possible to trace each concept back to its original inventor; hence many references have probably been omitted. For this the author offers his apologies. Credit has also been given to persons responsible for the original calculations of curves whenever possible. A bibliography of books for supplemental reading is given at the end of the text.

The book has been used for a course directly following an introductory course and also for a course following an intermediate one. On the former level, the progress was slower than on the latter, but the organization of the book seemed satisfactory in both cases. There is more than enough material for a year's work, and the teacher will probably want to make his own choice of topics.

The author expresses his sincere appreciation to everyone who in any way contributed to the creation of this book. Thanks to W. R. LePage, whose love for learning and teaching inspired the author; to V. H. Rumsey, from whom the author learned many of his viewpoints; to H. Gruenberg, who read the galleys; to colleagues and students, for their many valuable comments and criticisms; and, finally, to the several secretaries who so expertly typed the manuscript.

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