Preface

You may be wondering why we chose the NASCAR photo for the cover. We actually chose it for several reasons. Obviously, it is very exciting; in fact, we tried to have McGraw-Hill modify the car in the lead to have a McGraw-Hill logo on it and "Alexander and Sadiku," on the side of the car! Another, but not so obvious, reason is that half the cost of a new car is in its electronics (circuits!). But the most important reason is that a winning car needs a "team" to make it happen! And, working together as a team is very important to the successful engineer, something we strongly encourage in this text.

FEATURES

Retained from Previous Editions

The main objective of the third edition of this book remains the same as in the first and second editions—to present circuit analysis in a manner that is clearer, more interesting, easier to understand than other texts, and to assist the student in beginning to see the "fun" in engineering. This objective is achieved in the following ways:

- **Chapter Openers and Summaries**

  Each chapter opens with a discussion about how to enhance skills that contribute to successful problem solving as well as successful careers or a career-oriented talk on a sub-discipline of electrical engineering. This is followed by an introduction that links the chapter with the previous chapters and states the chapter objectives. The chapter ends with a summary of key points and formulas.

- **Problem-Solving Methodology**

  Chapter 1 introduces a six-step method for solving circuit problems that is used consistently throughout the book and media supplements to promote sound problem-solving practices.

- **Student-Friendly Writing Style**

  All principles are presented in a lucid, logical, step-by-step manner. As much as possible, we avoid wordiness and giving too much detail that could hide concepts and impede overall understanding of the material.

- **Boxed Formulas and Key Terms**

  Important formulas are boxed as a means of helping students sort out what is essential from what is not. Also, to ensure that students clearly understand the key elements of the subject matter, key terms are defined and highlighted.

- **Margin Notes**

  Marginal notes are used as a pedagogical aid. They serve multiple uses such as hints, cross-references, more exposition, warnings, reminders not to make some particular common mistakes, and problem-solving insights.

- **Worked Examples**

  Thoroughly worked examples are liberally given at the end of every section. The examples are regarded as a part of the text and are clearly explained without asking the reader to fill in missing steps. Thoroughly worked examples give students a good understanding of the solution process and the confidence to solve problems themselves. Some of the problems are solved in two or three different ways to facilitate a substantial comprehension of the subject material as well as a comparison of different approaches.

- **Practice Problems**

  To give students practice opportunity, each illustrative example is immediately followed by a practice problem with the answer. The students can follow the example step by step to aid in the solution of the practice problem without flipping pages or looking at the end of the book for answers. The practice problem is also intended to test the students understanding of the preceding example. It will reinforce their grasp of the material before they move on to the next section. Complete solutions to the practice problems are available to students on ARIS.

- **Application Sections**

  The last section in each chapter is devoted to practical application aspects of the concepts covered in the chapter. The material covered in the chapter is applied to at least one or two practical problems or devices. This helps the students see how the concepts are applied to real-life situations.

- **Review Questions**

  Ten review questions in the form of multiple-choice objective items are provided at the end of each chapter with answers. The review questions are intended to cover the little "tricks" that the examples and end-of-chapter problems may not cover. They serve as a self-test device and help students determine how well they have mastered the chapter.

- **Computer Tools**

  In recognition of the requirements by ABET® on integrating computer tools, the use of *PSpice, MATLAB,* and *KCIDE for Circuits* are encouraged in a student-friendly manner. *PSpice* is covered early on in the text so that students can become familiar and use it throughout the text. *KCIDE for Circuits* is new to this text. It is a brand new, state-of-the-art software system designed to help the students maximize their chance of success in problem solving. It is introduced in Appendix D.

- **Historical Tidbits**

  Historical sketches throughout the text provide profiles of important pioneers and events relevant to the study of electrical engineering.

- **Early Op Amp Discussion**

  The operational amplifier (op amp) as a basic element is introduced early in the text.

- **Fourier and Laplace Transforms Coverage**

  To ease the transition between the circuit course and signals and systems courses, Fourier and Laplace transforms are covered lucidly and thoroughly. The chapters are developed in a manner that the interested instructor can go from solutions of first-order circuits to Chapter 15. This then allows a very natural progression from Laplace to Fourier to AC.

New to this Edition

A course in circuit analysis is perhaps the first exposure students have to electrical engineering. We have included several new features to help students feel at home with the subject.

- **Extended Examples**

  Examples worked in detail according to the six-step problem-solving method provide a roadmap for students to solve problems in a consistent fashion. At least one example in each chapter is developed in this manner.

- **EC 2000 Chapter Openers**

  Based on ABET's new skill-based CRITERION 3, these chapter openers are devoted to discussions as to how students can acquire the skills that will lead to a significantly enhanced career as an engineer. Because these skills are so very important to the student while in college as well as in their career, we will use the heading, *"Enhancing your Skills and your Career."*

- **Homework Problems**

  Over 300 new end-of-chapter problems provide students with plenty of practice as well as reinforce key concepts.

- **Homework Problem Icons**

  Icons are used to highlight problems that relate to engineering design as well as problems that can be solved using *PSpice* or *MATLAB*.

- ***KCIDE for Circuits* Appendix D**

  A new Appendix D provides a tutorial on the Knowledge Capturing Integrated Design Environment (*KCIDE for Circuits*) software.

Organization

This book was written for a two-semester or three-quarter course in linear circuit analysis. The book may also be used for a one-semester course by a proper selection of chapters and sections by the instructor. It is broadly divided into three parts.

- Part 1, consisting of Chapters 1 to 8, is devoted to dc circuits. It covers the fundamental laws and theorems, circuits techniques, and passive and active elements.
- Part 2, which contains Chapters 9 to 14, deals with ac circuits. It introduces phasors, sinusoidal steady-state analysis, ac power, rms values, three-phase systems, and frequency response.

- Part 3, consisting of Chapters 15 to 19, is devoted to advanced techniques for network analysis. It provides students with a solid introduction to the Laplace transform, Fourier series, Fourier transform, and two-port network analysis.

The material in three parts is more than sufficient for a two-semester course, so the instructor must select which chapters or sections to cover. Sections marked with the dagger sign (†) may be skipped, explained briefly, or assigned as homework. They can be omitted without loss of continuity. Each chapter has plenty of problems grouped according to the sections of the related material and diverse enough that the instructor can choose some as examples and assign some as homework.

As stated earlier, we are using three icons with this edition. We are using (PSpice icon) to denote problems that either require *PSpice* in the solution process, where the circuit complexity is such that *PSpice* would make the solution process easier, and where *PSpice* makes a good check to see if the problem has been solved correctly. We are using (MATLAB icon) to denote problems where *MATLAB* is required in the solution process, where *MATLAB* makes sense because of the problem makeup and its complexity, and where *MATLAB* makes a good check to see if the problem has been solved correctly. Finally, we use (design icon) to identify problems that help the student develop skills that are needed for engineering design. More difficult problems are marked with an asterisk (*). Comprehensive problems follow the end-of-chapter problems. They are mostly applications problems that require skills learned from that particular chapter.

Prerequisites

As with most introductory circuit courses, the main prerequisites, for a course using the text, are physics and calculus. Although familiarity with complex numbers is helpful in the later part of the book, it is not required. A very important asset of this text is that ALL the mathematical equations and fundamentals of physics needed by the student, are included in the text.

Supplements

Knowledge Capturing Integrated Design Environment for Circuits (*KCIDE for Circuits*) This new software, developed at Cleveland State University and funded by NASA, is designed to help the student work through a circuits problem in an organized manner using the six-step problem-solving methodology in the text. *KCIDE for Circuits* allows students to work a circuit problem in *PSpice* and *MATLAB*, track the evolution of their solution, and save a record of their process for future reference. In addition, the software automatically generates a Word document and/or a PowerPoint presentation. Appendix D contains a description of how to use the software.

C.O.S.M.O.S This CD, available to instructors only, is a powerful solutions manual tool to help instructors streamline the creation of assignments, quizzes, and tests by using problems and solutions from the textbook, as well as their own custom material. Instructors can edit textbook end-of-chapter problems as well as track which problems have been assigned.

Although the textbook is meant to be self-explanatory and act as a tutor for the student, the personal contact in teaching is not forgotten. It is hoped that the book and supplemental materials supply the instructor with all the pedagogical tools necessary to effectively present the material.

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