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ELECTRONICS and CIRCUIT ANALYSIS using MATLAB

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PREFACE

MATLAB is a numeric computation software for engineering and scientific calculations. MATLAB is increasingly being used by students, researchers, practicing engineers and technicians. The causes of MATLAB popularity are legion. Among them are its iterative mode of operation, built-in functions, simple programming, rich set of graphing facilities, possibilities for writing additional functions, and its extensive toolboxes.

The goals of writing this book are (1) to provide the reader with simple, easy, hands-on introduction to MATLAB; (2) to demonstrate the use of MATLAB for solving electronics problems; (3) to show the various ways MATLAB can be used to solve circuit analysis problems; and (4) to show the flexibility of MATLAB for solving general engineering and scientific problems.

Audience

The book can be used by students, professional engineers and technicians. The first part of the book can be used as a primer to MATLAB. It will be useful to all students and professionals who want a basic introduction to MATLAB. Parts 2 and 3 are for electrical and electrical engineering technology students and professionals who want to use MATLAB to explore the characteristics of semiconductor devices and the application of MATLAB for analysis and design of electrical and electronic circuits and systems.

Organization

The book is divided into three parts: Introduction to MATLAB, Circuit analysis applications using MATLAB, and electronics applications with MATLAB. It is recommended that the reader work through and experiment with the examples at a computer while reading Chapters 1, 2, and 3. The hands-on approach is one of the best ways of learning MATLAB.

Part II consists of Chapters 4 to 8. This part covers the applications of MATLAB in circuit analysis. The topics covered in Part II are dc analysis, transient analysis, alternating current analysis, and Fourier analysis. In addition, two-port networks are covered. I have briefly covered the underlying theory and concepts, not with the aim of writing a textbook on circuit analysis and electronics. Selected problems in circuit analysis have been solved using MATLAB.

Part III includes Chapters 9, 10, 11 and 12. The topics discussed in this part are diodes, semiconductor physics, operational amplifiers and transistor circuits. Application of MATLAB for problem solving in electronics is discussed. Extensive examples showing the use of MATLAB for solving problems in electronics are presented.

Each chapter has its own bibliography and exercises.

Text Diskette

Since the text contains a large number of examples that illustrate electronics and circuit analysis principles and applications with MATLAB, a diskette is included that contains all the examples in the book. The reader can run the examples without having to enter the commands. The examples can also be modified to suit the needs of the reader.

Acknowledgments

I appreciate the suggestions and comments from a number of reviewers including Dr. Murari Kejariwal, Dr. Reginald Perry, Dr. Richard Wilkins, Mr. Warsame Ali, Mr. Anowarul Huq and Mr. John Abbey. Their frank and positive criticisms led to considerable improvement of this work.

I am grateful to Mr. Zhong You for typing and running some of the MATLAB programs in this book and I am also grateful to Mr. Carl Easton and Mr. Url Woods for drawing the circuit diagrams found in the text. I thank Ms. Debbie Hawkins and Cheryl Wright who typed several parts of this book. I am appreciative of Ms. Judith Hansen for her editing services. Special thanks go to Ms. Nora Konopka, at CRC Press, who took an early interest in this book and offered me any assistance I needed to get it completed. I thank Ms. Mimi Williams, at CRC Press, for thoroughly proofreading the manuscript.

The questions and comments from electrical engineering students at Prairie View A&M University led to rewriting some sections of this work. Special thanks go to the students who used various drafts of this book and provided useful comments.

A final note of gratitude goes to my wife, Christine N. Okyere, who encouraged me to finish the book in record time. With equanimity and understanding, she stood by me during the endless hours I spent writing.

DEDICATION

Dedicated to my family members
Christine, John II and Angela
for
their unfailing love, support and encouragement

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