PREFACE

This book is an introduction to the design of digital electronic circuits. A course in digital system design is now standard in both electrical engineering and computer science curricula. Computer science students in general are good at assimilating algorithmic solutions to problems, while electrical engineering students absorb hardware concepts more readily. In each chapter of this book I have attempted therefore to blend the theoretical and practical implementation aspects of digital hardware design. Thus the book is suitable for use in both curricula at the sophomore/junior level. It covers a majority of topics for the ACM curriculum 79 course CS4[1] and the IEEE Computer Society's model program core SA6.[2] It is also suitable for self-study, for professionals unsophisticated in digital hardware design, and as a reference for modern techniques in logic design for those used to older design methodologies.

The book covers topics ranging from number system theory to asynchronous circuit design. Prior knowledge of electronics or hardware is not necessary to understand the majority of topics discussed. Appendix B provides a quick introduction to electrical circuit analysis.

Chapter 1 presents the three popular number systems: binary, octal, and hexadecimal, with emphasis on various data representation schemes in binary. Chapter 2 is a formal introduction to Boolean algebra and its application to logic circuit design. This chapter also provides an introduction to integrated circuits (IC) and their characteristics. Chapter 3 presents the two popular (graphic and tabular) logic minimization techniques. Logic minimization was a topic of great importance in the early 1970s when digital hardware costs were high. With the progress in IC technology, hardware costs have come down drastically, thereby reducing the importance of logic minimization. Chapter 3 can therefore be skipped without loss of continuity.

Two chapters are devoted to combinational circuit design and analysis. Chapter 4 introduces the analysis and design procedures along with implementation schemes using ICs. Chapter 6 describes the popular ICs available for combinational circuit design and the modular, top-down design methodology.

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