

## Power Electronics Circuits By Umanand

This book aims to offer a thorough study and reference textbook on electrical machines and drives. The basic idea is to start from the pure electromagnetic principles to derive the equivalent circuits and steady-state equations of the most common electrical machines (in the first parts). Although the book mainly concentrates on rotating field machines, the first two chapters are devoted to transformers and DC commutator machines. The chapter on transformers is included as an introduction to induction and synchronous machines, their electromagnetics and equivalent circuits. Chapters three and four offer an in-depth study of induction and synchronous machines, respectively. Starting from their electromagnetics, steady-state equations and equivalent circuits are derived, from which their basic properties can be deduced. The second part discusses the main power-electronic supplies for electrical drives, for example rectifiers, choppers, cycloconverters and inverters. Much attention is paid to PWM techniques for inverters and the resulting harmonic content in the output waveform. In the third part, electrical drives are discussed, combining the traditional (rotating field and DC commutator) electrical machines treated in the first part and the power electronics of part two. Field orientation of induction and synchronous machines are discussed in detail, as well as direct torque control. In addition, also switched reluctance machines and stepping motors are discussed in the last chapters. Finally, part 4 is devoted to the dynamics of

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traditional electrical machines. Also for the dynamics of induction and synchronous machine drives, the electromagnetics are used as the starting point to derive the dynamic models. Throughout part 4, much attention is paid to the derivation of analytical models. But, of course, the basic dynamic properties and probable causes of instability of induction and synchronous machine drives are discussed in detail as well, with the derived models for stability in the small as starting point. In addition to the study of the stability in the small, a chapter is devoted to large-scale dynamics as well (e.g. sudden short-circuit of synchronous machines). The textbook is used as the course text for the Bachelor's and Master's programme in electrical and mechanical engineering at the Faculty of Engineering and Architecture of Ghent University. Parts 1 and 2 are taught in the basic course 'Fundamentals of Electric Drives' in the third bachelor. Part 3 is used for the course 'Controlled Electrical Drives' in the first master, while Part 4 is used in the specialised master on electrical energy.

This book includes the original, peer-reviewed research papers from the 9th Frontier Academic Forum of Electrical Engineering (FAFEE 2020), held in Xi'an, China, in August 2020. It gathers the latest research, innovations, and applications in the fields of Electrical Engineering. The topics it covers including electrical materials and equipment, electrical energy storage and device, power electronics and drives, new energy electric power system equipment, IntelliSense and intelligent equipment, biological electromagnetism and its applications, and insulation and discharge computation for

power equipment. Given its scope, the book benefits all researchers, engineers, and graduate students who want to learn about cutting-edge advances in Electrical Engineering.

While most books approach power electronics and renewable energy as two separate subjects, *Power Electronics for Renewable and Distributed Energy Systems* takes an integrative approach; discussing power electronic converters topologies, controls and integration that are specific to the renewable and distributed energy system applications. An overview of power electronic technologies is followed by the introduction of various renewable and distributed energy resources that includes photovoltaics, wind, small hydroelectric, fuel cells, microturbines and variable speed generation. Energy storage systems such as battery and fast response storage systems are discussed along with application-specific examples. After setting forth the fundamentals, the chapters focus on more complex topics such as modular power electronics, microgrids and smart grids for integrating renewable and distributed energy. Emerging topics such as advanced electric vehicles and distributed control paradigm for power system control are discussed in the last two chapters. With contributions from subject matter experts, the diagrams and detailed examples provided in each chapter make *Power Electronics for Renewable and Distributed Energy Systems* a sourcebook for electrical engineers and consultants working to deploy various renewable and distributed energy systems and can serve as a comprehensive

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guide for the upper-level undergraduates and graduate students across the globe.

Special Features:

- Power semiconductor devices are viewed from the physics, circuit, modeling and thermal viewpoints for a better understanding of the devices.
- AC-DC, DC-DC, DC-AC converters and magnetic devices are treated from both the conceptual and design perspectives.
- A separate chapter is included that addresses the analysis and design of linear regulators.
- A chapter is included to address the modeling methods to obtain dynamic models of power electronics systems. The method of bond graph is introduced for modeling power electronics systems.
- The design of discrete domain controllers in both classical and state space approach are included which addresses the needs of power electronic systems.
- Optimal and robust control design methods as applied to power electronics systems are addressed.
- Discrete numerical algorithms for digital implementation with respect to power electronics systems are addressed in a separate chapter.
- A separate chapter is devoted to the thermal aspects like heat sink sizing for power electronics systems.
- Design integration by specifying and designing for reliability with power electronics system examples is another unique feature of this book.

The appendices include the following:

- o Derivation of the area product for a saturable-core transformer.
- o Representative list of commonly used core types and their physical parameters.
- o Representative list of commonly used wire gauges.
- o Laplace transforms and z-transforms of few time domain signals.
- o List of specifications for the induction motor used for controller design.
- o Description of all the object parameters for

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various electronic components from the reliability prediction viewpoint. Pedagogy includes:

- o 600+ illustrations and line diagrams.
- o 480+ descriptive questions.
- o 440+ objective questions.
- o 200+ unsolved problems.
- o 50+ explanatory examples and solved problems.

Companion CD contains:

- Reliability prediction toolbox
- Bond graph simulation toolbox
- Several circuit and design examples

About The Book: This book on power electronics spans a wide knowledge base such as power devices, drives, circuit topologies, magnetics, system modeling, control configurations, digital processing, thermal and reliability aspects. The book has been broadly divided into two types of topics viz. (a) circuit-oriented aspects and (b) system-oriented aspects. The first seven chapters deal with circuit-oriented aspects of power electronics systems and the remaining chapters deal with system-oriented aspects like controls and reliability.

The World's #1 Guide to Power Supply Design Now Updated! Recognized worldwide as the definitive guide to power supply design for over 25 years, *Switching Power Supply Design* has been updated to cover the latest innovations in technology, materials, and components. This Third Edition presents the basic principles of the most commonly used topologies, providing you with the essential information required to design cutting-edge power supplies. Using a tutorial, how-and-why approach, this expert resource is filled with design examples, equations, and charts. The Third Edition of *Switching Power Supply Design* features:

- Designs for many of the most useful switching power supply topologies
- The core principles required to solve day-to-day

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design problems A strong focus on the essential basics of transformer and magnetics design New to this edition: a full chapter on choke design and optimum drive conditions for modern fast IGBTs Get Everything You Need to Design a Complete Switching Power Supply: Fundamental Switching Regulators \* Push-Pull and Forward Converter Topologies \* Half- and Full-Bridge Converter Topologies \* Flyback Converter Topologies \* Current-Mode and Current-Fed Topologies \* Miscellaneous Topologies \* Transformer and Magnetics Design \* High-Frequency Choke Design \* Optimum Drive Conditions for Bipolar Power Transistors, MOSFETs, Power Transistors, and IGBTs \* Drive Circuits for Magnetic Amplifiers \* Postregulators \* Turn-on, Turn-off Switching Losses and Low Loss Snubbers \* Feedback-Loop Stabilization \* Resonant Converter Waveforms \* Power Factor and Power Factor Correction \* High-Frequency Power Sources for Fluorescent Lamps, and Low-Input-Voltage Regulators for Laptop Computers and Portable Equipment

HCTL Open International Journal of Technology Innovations and Research (IJTIR) [ISSN (Online): 2321-1814] is an International, Open-Access, Peer-Reviewed, Online journal devoted to various disciplines of Science and Technology. HCTL Open IJTIR is a bi-monthly journal published by HCTL Open Publications Solutions, India and Hybrid Computing Technology Labs, India. - Get more information at: <http://ijtir.hctl.org/>

A comprehensive, up-to-date and lucidly written book meeting with the long-felt need for a complete text for undergraduate and postgraduate courses. The book is mainly

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concerned with detailed analysis and design of converters, inverters and power control circuits using solid-state devices. It covers the various types of transformation of energy and discusses the circuits and equipment basic to most electronic devices in use today. With its wide coverage and detailed analysis, is an ideal text for undergraduate and postgraduate and students of electrical engineering and electronics. It would also be highly useful to practicing engineers in the field of power control.

Extensively revised and expanded to present the state-of-the-art in the field of magnetic design, this third edition presents a practical approach to transformer and inductor design and covers extensively essential topics such as the area product,  $A_p$ , and core geometry,  $K_g$ . The book provides complete information on magnetic materials and core characteristics using step-by-step design examples and presents all the key components for the design of lightweight, high-frequency aerospace transformers or low-frequency commercial transformers. Written by a specialist with more than 47 years of experience in the field, this volume covers magnetic design theory with all of the relevant formulas.

With this revised edition we aim to present a text on Power Electronics for the UG level which will provide a comprehensive coverage of converters, choppers, inverters and motor drives. All this, with a rich pedagogy to support the conceptual understanding and integral use of PSPICE.

This book develops some methods and structures to improve the power inverters for different applications in a single-phase or three-phase output in recent years. The reduction of the switching devices and multilevel inverters as changing structure for the power inverters and PDM and PWM methods as changing control methods for the power inverter are studied in this book. Moreover, power inverters are developed to supply open-ended loads. Furthermore, the basic and advanced aspects of the electric drives that are control based are taught for induction motor (IM) based on power inverters suitable for both undergraduate and postgraduate levels. The main objective of this book is to provide the necessary background to improve and implement the high-performance inverters. Once the material in this book has been mastered, the reader will be able to apply these improvements in the power inverters to his or her problems for high-performance power inverters.

The increasing demand for electronic devices for private and industrial purposes lead designers and researchers to explore new electronic devices and circuits that can perform several tasks efficiently with low IC area and low power consumption. In addition, the increasing demand for portable devices intensifies the call from industry to design sensor elements, an efficient storage cell, and large capacity memory elements. Several industry-related issues have also



forced a redesign of basic electronic components for certain specific applications. The researchers, designers, and students working in the area of electronic devices, circuits, and materials sometimes need standard examples with certain specifications. This breakthrough work presents this knowledge of standard electronic device and circuit design analysis, including advanced technologies and materials. This outstanding new volume presents the basic concepts and fundamentals behind devices, circuits, and systems. It is a valuable reference for the veteran engineer and a learning tool for the student, the practicing engineer, or an engineer from another field crossing over into electrical engineering. It is a must-have for any library.

Practical rules and strategies designed to protect electronic systems from damage by transient overvoltages include symptoms and threats, remedies, protective devices and their applications, and validation of protective measures. 1989 edition.

This book presents the latest cutting-edge technology in high-power converters and medium voltage drives, and provides a complete analysis of various converter topologies, modulation techniques, practical drive configurations, and advanced control schemes. Supplemented with more than 250 illustrations, the author illustrates key concepts with simulations and experiments. Practical

problems, along with accompanying solutions, are presented to help you tackle real-world issues.

The definitive guide to switchmode power supply design--fully updated Covering the latest developments and techniques, Switchmode Power Supply Handbook, third edition is a thorough revision of the industry-leading resource for power supply designers. New design methods required for powering small, high-performance electronic devices are presented. Based on the authors' decades of experience, the book is filled with real-world solutions and many nomograms, and features simplified theory and mathematical analysis. This comprehensive volume explains common requirements for direct operation from the AC line supply and discusses design, theory, and practice. Engineering requirements of switchmode systems and recommendations for active power factor correction are included. This practical guide provides you with a working knowledge of the latest topologies along with step-by-step approaches to component decisions to achieve reliable and cost-effective power supply designs. Switchmode Power Supply Handbook, third edition covers: Functional requirements of direct off-line switchmode power supplies Power components selection and transformer designs for converter circuits Transformer, choke, and thermal design Input filters, RFI control, snubber circuits, and auxiliary systems Active power factor

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correction system design Worked examples of would components Examples of fully resonant and quasi-resonant systems A resonant inverter fluorescent ballast An example of high-power phase shift modulated system A new MOSFET resonant inverter drive scheme A single-control, wide-range wave oscillator Power semiconductor devices are discussed in first chapter. SCR, GTO, LASCOR, RCT, MCT, characteristics, rating turn-off and turn-on is presented. Power BJT, MOSFET, IGBT, driving circuits, protection and snubber circuits are also discussed. Commutation circuits and series and parallel operation are presented. Single and three phase controlled converters are given in second chapter. Half wave, full wave, midpoint, semiconverters, full converters, dual converters and effect of source inductance is also given. Operation with resistive and inductive load is discussed. Third chapter presents AC voltage controllers and cycloconverters. On-off control, phase control, triac based controllers are given. Cycloconverters and operations with inductive as well as resistive load are discussed. Choppers are given in fourth chapter. Step down, step up, voltage, current and load commutated choppers are given. Classification is also discussed. Last chapter presents inverters. Half bridge, full bridge, quasi square wave, push-pull, thyristorized inverters with resistive and inductive loads are given. Switching techniques for PWM inverters are also given.

Presents A Systematic Approach To The Design Of Transformers Used In Switched Mode Power Converters (Smpcs). Various Design Aspects And Many Practical

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Examples Are Covered In The Book. The Design Techniques Illustrated In The Book Have Been Tested At Cedt Over The Past Several Years. The Book Contains A Mathematical Analysis Of The Various Transformer Topologies Encountered In Switched Mode Power Converters. Design Of Inductors And Current Transformers Are Also Treated In Detail. Included Also Are The Various Core Materials And Types That Are Commonly Used In Smpcs. This Book Also Introduces The Reader To Computer Aided Design Of Transformers. The Book Would Be Of Immense Use To Design Engineers In The Electronic/Electrical Industry, Senior Undergraduate And Graduate Students And Faculty Of Electronic And Electrical Engineering.

Electric vehicles/hybrid electric vehicles (EV/HEV) commercialization is still a challenge in industries in terms of performance and cost. The performance along with cost reduction are two tradeoffs which need to be researched to arrive at an optimal solution. This book focuses on the convergence of various technologies involved in EV/HEV. The book brings together the research that is being carried out in the field of EV/HEV whose leading role is by optimization techniques with artificial intelligence (AI). Other featured research includes green drive schemes which involve the possible renewable energy sources integration to develop eco-friendly green vehicles, as well as Internet of Things (IoT)-based techniques for EV/HEVs. Electric vehicle research involves multi-disciplinary expertise from electrical, electronics, mechanical engineering and computer science. Consequently, this book serves as a point of convergence

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wherein all these domains are addressed and merged and will serve as a potential resource for industrialists and researchers working in the domain of electric vehicles. "Discusses the essential concepts of power electronics through MATLAB examples and simulations"--

A clear explanation of the technology for producing and delivering electricity *Electric Power Systems* explains and illustrates how the electric grid works in a clear, straightforward style that makes highly technical material accessible. It begins with a thorough discussion of the underlying physical concepts of electricity, circuits, and complex power that serves as a foundation for more advanced material. Readers are then introduced to the main components of electric power systems, including generators, motors and other appliances, and transmission and distribution equipment such as power lines, transformers, and circuit breakers. The author explains how a whole power system is managed and coordinated, analyzed mathematically, and kept stable and reliable. Recognizing the economic and environmental implications of electric energy production and public concern over disruptions of service, this book exposes the challenges of producing and delivering electricity to help inform public policy decisions. Its discussions of complex concepts such as reactive power balance, load flow, and stability analysis, for example, offer deep insight into the complexity of electric grid operation and demonstrate how and why physics constrains economics and politics. Although this survival guide includes mathematical equations and

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formulas, it discusses their meaning in plain English and does not assume any prior familiarity with particular notations or technical jargon. Additional features include: \* A glossary of symbols, units, abbreviations, and acronyms \* Illustrations that help readers visualize processes and better understand complex concepts \* Detailed analysis of a case study, including a Web reference to the case, enabling readers to test the consequences of manipulating various parameters With its clear discussion of how electric grids work, Electric Power Systems is appropriate for a broad readership of professionals, undergraduate and graduate students, government agency managers, environmental advocates, and consumers.

‘CONCEPTS OF ELECTRICAL AND ELECTRONICS ENGINEERING’ is intended to be used as a text book for I Semester Diploma in Computer Science and Engineering. This book is designed for comprehensively covering all topics relevant to the subject. Each and every topic has been explained in a very simple language as per the syllabus prescribed by the Board of Technical Education, Karnataka. This book is divided into ten chapters: Chapter 1 - Electric Current and DC Circuits Chapter 2 - Electrostatics Chapter 3 - Electromagnetic Induction Chapter 4 - AC Fundamentals Chapter 5 - Transformers Chapter 6 - Protection of Electric and Electronic Circuits Chapter 7 - Motors Chapter 8 - Electronic Components Chapter 9 - Basics of Electronics Chapter 10 - Op-amp The text provides detailed explanations and uses numerous easy-to-follow examples accompanied by diagrams and step-by-step solutions. Illustrative problems

are presented in terms of commonly used voltages and current ratings. To enhance the utility of the book, important points and review questions (objective and descriptive type) have been included at the end of each chapter. Model question papers have been provided to help students prepare better for the semester examinations. It is hoped that the book will be of immense use to teachers and students of Polytechnics. Suggestions for improvement in the future editions of this book will be appreciated. I wish to express my gratitude to MEI Polytechnic, Bangalore for providing me an opportunity to bring out this text book. I am grateful to Sri. Nitin S. Shah, M/s Sapna Book House, Bangalore for publishing this book. I am thankful to M/s Datalink, Bangalore for meticulous processing of the manuscript of this book.

Designed for polytechnic and undergraduate students of electrical/electronics, this book offers short questions and answers at the end of chapters. It is also suitable for those preparing for professional courses like AMIE and AMITE.

Encouraged by the response to the first edition and to keep pace with recent developments, Fundamentals of Electrical Drives, Second Edition incorporates greater details on semi-conductor controlled drives, includes coverage of permanent magnet AC motor drives and switched reluctance motor drives, and highlights new trends in drive technology. Contents were chosen to satisfy the changing needs of the industry and provide the appropriate coverage of modern and conventional drives. With the large number of examples, problems, and solutions provided, Fundamentals of

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Electrical Drives, Second Edition will continue to be a useful reference for practicing engineers and for those preparing for Engineering Service Examinations.

Simulation of Power Electronic Circuits covers a wide spectrum of topics from fundamentals of circuit simulation to a variety of power electronics applications. It enables the readers to appreciate what goes into simulation tools, how equations are assembled, how they are solved, what are the factors affecting accuracy of numerical methods, why only certain methods are useful for circuit simulation, etc. Detailed treatment of fundamentals of circuit simulation is combined with theoretical treatment of several power electronics circuits and systems, which makes the book a valuable resource for students of power electronics. The book also enables teachers of power electronics to assign meaningful simulation problems as home work assignments, something that will help the student to significantly enhance his/her understanding of the subject.

This comprehensive introduction to power semiconductor devices, their characteristics, and their ratings will take you step-by-step through the most important topics in the field. Highly applications-oriented, this course presents the student with six projects which offer the opportunity to simulate results on a computer using software such as SPICE or PSpice. This course is ideal for engineers, engineering managers, technicians, and anyone with an interest in the theory, analysis, design, or applications of power electronics circuits and systems.



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This book presents bond graph model-based fault detection with a focus on hybrid system models. The book addresses model design, simulation, control and model-based fault diagnosis of multidisciplinary engineering systems. The text begins with a brief survey of the state-of-the-art, then focuses on hybrid systems. The author then uses different bond graph approaches throughout the text and provides case studies. The two-volume set of LNCS 11941 and 11942 constitutes the refereed proceedings of the 8th International Conference on Pattern Recognition and Machine Intelligence, PReMI 2019, held in Tezpur, India, in December 2019. The 131 revised full papers presented were carefully reviewed and selected from 341 submissions. They are organized in topical sections named: Pattern Recognition; Machine Learning; Deep Learning; Soft and Evolutionary Computing; Image Processing; Medical Image Processing; Bioinformatics and Biomedical Signal Processing; Information Retrieval; Remote Sensing; Signal and Video Processing; and Smart and Intelligent Sensors. Power Electronics Basics: Operating Principles, Design, Formulas, and Applications provides fundamental knowledge for the analysis and design of modern power electronic devices. This concise and user-friendly resource: Explains the basic concepts and most important terms of power electronics Describes the power assemblies, control, and passive components of semiconductor power switches Covers the control of power electronic devices, from mathematical modeling to the analysis of the electrical processes Addresses pulse-width modulation, power quality control, and

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multilevel, modular, and multicell power converter topologies Discusses line-commutated and resonant converters, as well as inverters and AC converters based on completely controllable switches Explores cutting-edge applications of power electronics, including renewable energy production and storage, fuel cells, and electric drives Power Electronics Basics: Operating Principles, Design, Formulas, and Applications supplies graduate students, industry professionals, researchers, and academics with a solid understanding of the underlying theory, while offering an overview of the latest achievements and development prospects in the power electronics industry.

Power Electronics is intended to be an introductory text in power electronics, primarily for the undergraduate electrical engineering student. The text is written for some flexibility in the order of the topics. Much of the text includes computer simulation using PSpice as a supplement to analytical circuit solution techniques.

Chapter 1: The Principles of Switching Power Conversion Chapter 2: DC-DC Converter Design and Magnetics Chapter 3: Off-line Converter Design and Magnetics Chapter 4: The Topology FAQ Chapter 5: Optimal Core Selection Chapter 6: Component Ratings, Stresses, Reliability and Life Chapter 7: Optimal Power Components Selection Chapter 8: Conduction and Switching Losses Chapter 9: Discovering New Topologies Chapter 10: Printed Circuit Board Layout Chapter 11: Thermal Management Chapter 12: Feedback Loop Analysis and

Stability Chapter 13: Paralleling, Interleaving and Sharing Chapter 14: The Front-End of AC-DC Power Supplies Chapter 15: DM and CM Noise in Switching Power Supplies Chapter 16: Fixing EMI across the Board Chapter 17: Input Capacitor and Stability Chapter 18: The Math behind the Electromagnetic Puzzle Chapter 19: Solved Examples Appendix A.

In many university curricula, the power electronics field has evolved beyond the status of comprising one or two special-topics courses. Often there are several courses dealing with the power electronics field, covering the topics of converters, motor drives, and power devices, with possibly additional advanced courses in these areas as well. There may also be more traditional power-area courses in energy conversion, machines, and power systems. In the breadth vs. depth tradeoff, it no longer makes sense for one textbook to attempt to cover all of these courses; indeed, each course should ideally employ a dedicated textbook. This text is intended for use in introductory power electronics courses on converters, taught at the senior or first-year graduate level. There is sufficient material for a one year course or, at a faster pace with some material omitted, for two quarters or one semester. The first class on converters has been called a way of enticing control and electronics students into the power area via the "back door". The power electronics field is quite broad, and includes fundamentals in

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the areas of • Converter circuits and electronics • Control systems • Magnetics • Power applications • Design-oriented analysis This wide variety of areas is one of the things which makes the field so interesting and appealing to newcomers. This breadth also makes teaching the field a challenging undertaking, because one cannot assume that all students enrolled in the class have solid prerequisite knowledge in so many areas.

Detailed explanations suitable for self-instruction are given for the design and operation of a large variety of power supplies and converters. Provides a sound basis of theoretical knowledge while stressing practical methods, allowing the reader to apply the ideas in the text to all types of circuits. Discusses transient circuit analysis, Fourier analysis, electric machine theory, and elementary control system theory, and goes on to discuss various types of systems and their physical appearance, circuits including thyristors and the method of rating and classifying them. Individual classes of converter are examined in succeeding chapters. Numerical examples based on practical experience are included. This text provides coverage of computer simulation and introductory material on power calculations, as it treats power computations, rectifiers, dc-dc converters and dc power supplies, inverters, and resonant converters.

**POWER ELECTRONICS: ESSENTIALS & APPLICATIONS (With CD )**

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Market\_Desc: · Electrical Engineering Students · Electrical Engineering Instructors· Power Electronics Engineers Special Features: · Easy to follow step-by-step in depth treatment of all the theory.· Computer simulation chapter describes the role of computer simulations in power electronics. Examples and problems based on Pspice and MATLAB are included.· Introductory chapter offers a review of basic electrical and magnetic circuit concepts.· A new CD-ROM contains the following:· Over 100 of new problems of varying degrees of difficulty for homework assignments and self-learning.· PSpice-based simulation examples, which illustrate basic concepts and help in design of converters.· A newly-developed magnetic component design program that demonstrates design trade-offs.· PowerPoint-based slides, which will improve the learning experience and the ease of using the book About The Book: The text includes cohesive presentation of power electronics fundamentals for applications and design in the power range of 500 kW or less. It describes a variety of practical and emerging power electronic converters made feasible by the new generation of power semiconductor devices. Topics included in this book are an expanded discussion of diode rectifiers and thyristor converters as well as chapters on heat sinks, magnetic components which present a step-by-step design approach and a computer simulation of power electronics which introduces numerical techniques

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and commonly used simulation packages such as PSpice, MATLAB and EMTP.

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