



Finite Elements In Electrical And Magnetic Field Problems

J. Caldwell, R. Bradley



Finite Elements In Electrical And Magnetic Field Problems:

Finite Elements for Electrical Engineers Peter Peet Silvester, Ronald L. Ferrari, 1996-09-05 Like the earlier editions this text begins by deriving finite elements for the simplest familiar potential fields then advances to formulate finite elements for a wide range of applied electromagnetics problems A wide selection of demonstration programs allows the reader to follow the practical use of the methods

Finite Elements in Electrical and Magnetic Field Problems M. V. K. Chari, Peter Peet Silvester, 1980 Finite elements the basic concepts and an application to 3 D magnetostatic problems The fundamental equations of electric and magnetic fields Shape functions Software engineering aspects of finite elements Finite element solution of magnetic and electric field problems in electrical machines and devices Numerical analysis of Eddy Current problems The high order polynomial finite element method in electromagnetic field computation Transient solution of the diffusion equation by discrete Fourier transformation Mutually constrained partial differential and integral equation field formulations Applications of integral equation methods to the numerical solution of magnetostatic and Eddy Current problems

Finite Elements in Electrical and Magnetic Field Problems M. V. K. Chari, P. P. Silvester, 1980 **Numerical Computation of Electric and Magnetic Fields** Charles W. Steele, 2013-03-09 For well over a decade the numerical approach to field computation has been gaining progressively greater importance Analytical methods offield computation are at best unable to accommodate the very wide variety of configurations in which fields must be computed On the other hand numerical methods can accommodate many practical configurations that analytical methods cannot With the advent of high speed digital computers numerical field computations have finally become practical However in order to implement numerical methods of field computation we need algorithms numerical methods and mathematical tools that are largely quite different from those that have been traditionally used with analytical methods Many of these algorithms have in fact been presented in the large number of papers that have been published on this subject in the last two decades And to some of those who are already experienced in the art of numerical field computations these papers in addition to their own original work are enough to give them the knowledge that they need to perform practical numerical field computations

Numerical Analysis of Electromagnetic Fields Pei-bai Zhou, 2012-12-06 Numerical methods for solving boundary value problems have developed rapidly Knowledge of these methods is important both for engineers and scientists There are many books published that deal with various approximate methods such as the finite element method the boundary element method and so on However there is no textbook that includes all of these methods This book is intended to fill this gap The book is designed to be suitable for graduate students in engineering science for senior undergraduate students as well as for scientists and engineers who are interested in electromagnetic fields Objective Numerical calculation is the combination of mathematical methods and field theory A great number of mathematical concepts principles and techniques are discussed and many computational techniques are considered in dealing with practical problems The purpose of this book is to provide

students with a solid background in numerical analysis of the field problems The book emphasizes the basic theories and universal principles of different numerical methods and describes why and how different methods work Readers will then understand any methods which have not been introduced and will be able to develop their own new methods Organization Many of the most important numerical methods are covered in this book All of these are discussed and compared with each other so that the reader has a clear picture of their particular advantage disadvantage and the relation between each of them The book is divided into four parts and twelve chapters

Analysis and Computation of Electric and Magnetic Field Problems K. J. Binns,P. J. Lawrenson,2013-10-22 Analysis and Computation of Electric and Magnetic Field Problems Second Edition is a comprehensive treatment of both analytical and numerical methods for the derivation of two dimensional static and quasi static electric and magnetic fields The essence of each method of solution is emphasized and the scopes of the different methods are described with particular regard to the influence of digital computers This book is comprised of 12 chapters and begins with an introduction to the fundamental theory of electric and magnetic fields The derivation of quantities of physical interest such as force inductance and capacitance from the field solution is explained The next section deals with the methods of images and separation of variables and presents direct solutions of Laplace s equation and of Poisson s equation The basic solutions are developed rigorously from considerations of surface charges and are expressed in complex variable form Subsequent chapters discuss transformation methods as well as line and doublet sources the transformation of regions exterior to finite boundaries and the powerful numerical methods used to enlarge the scope of conformal transformation The last section is devoted to finite difference methods and the Monte Carlo method along with all classes of boundary shape and condition This monograph is intended primarily for engineers physicists and mathematicians as well as degree students towards the end of their courses

Electromagnetics through the Finite Element Method José Roberto Cardoso,2016-10-03 Shelving Guide Electrical Engineering Since the 1980s more than 100 books on the finite element method have been published making this numerical method the most popular The features of the finite element method gained worldwide popularity due to its flexibility for simulating not only any kind of physical phenomenon described by a set of differential equations but also for the possibility of simulating non linearity and time dependent studies Although a number of high quality books cover all subjects in engineering problems none of them seem to make this method simpler and easier to understand This book was written with the goal of simplifying the mathematics of the finite element method for electromagnetic students and professionals relying on the finite element method for solving design problems Filling a gap in existing literature that often uses complex mathematical formulas Electromagnetics through the Finite Element Method presents a new mathematical approach based on only direct integration of Maxwell s equation This book makes an original scholarly contribution to our current understanding of this important numerical method

Inverse Problems and Optimal Design in Electricity and Magnetism Pekka Neittaanmäki,M. Rudnicki,A. Savini,1996-01-11 The impact of optimization

methods in electromagnetism has been much less than in mechanical engineering and particularly the solution of inverse problems in structural mechanics This book addresses this omission it will serve as a guide to the theory as well as the computer implementation of solutions It is self contained covering all the mathematical theory necessary

The Finite Element Method in Electromagnetics Jian-Ming Jin, 2015-02-18 A new edition of the leading textbook on the finite element method incorporating major advancements and further applications in the field of electromagnetics The finite element method FEM is a powerful simulation technique used to solve boundary value problems in a variety of engineering circumstances It has been widely used for analysis of electromagnetic fields in antennas radar scattering RF and microwave engineering high speed high frequency circuits wireless communication electromagnetic compatibility photonics remote sensing biomedical engineering and space exploration The Finite Element Method in Electromagnetics Third Edition explains the method's processes and techniques in careful meticulous prose and covers not only essential finite element method theory but also its latest developments and applications giving engineers a methodical way to quickly master this very powerful numerical technique for solving practical often complicated electromagnetic problems Featuring over thirty percent new material the third edition of this essential and comprehensive text now includes A wider range of applications including antennas phased arrays electric machines high frequency circuits and crystal photonics The finite element analysis of wave propagation scattering and radiation in periodic structures The time domain finite element method for analysis of wideband antennas and transient electromagnetic phenomena Novel domain decomposition techniques for parallel computation and efficient simulation of large scale problems such as phased array antennas and photonic crystals Along with a great many examples The Finite Element Method in Electromagnetics is an ideal book for engineering students as well as for professionals in the field

Introduction to Magnetism and Magnetic Materials David Jiles, 2015-09-18 A long overdue update this edition of Introduction to Magnetism and Magnetic Materials is a complete revision of its predecessor While it provides relatively minor updates to the first two sections the third section contains vast updates to reflect the enormous progress made in applications in the past 15 years particularly in magnetic recording

Electric and Magnetic Fields R. Belmans, A. Nicolet, 2012-12-06 This book contains the edited versions of the papers presented at the Second International Workshop on Electric and Magnetic Fields held at the Katholieke Universiteit van Leuven Belgium in May 1994 This Workshop deals with numerical solutions of electromagnetic problems in real life applications The topics include coupled problems thermal mechanical electric circuits CAD CAM applications 3D eddy current and high frequency problems optimisation and application oriented numerical problems This workshop was organised jointly by the AIM Association of Engineers graduated from de Montefiore Electrical Institute together with the Departments of Electrical Engineering of the Katholieke Universiteit van Leuven Prof R Belmans the University of Gent Prof J Melkebbek and the University of Liege Prof W Legros These laboratories are working together in the framework of the Pole d Attraction Interuniversitaire Inter

University Attractie Pole 51 on electromagnetic systems led by the University of Liege and the research work they perform covers most of the topics of the Workshop One of the principal aims of this Workshop was to provide a bridge between the electromagnetic device designers mainly industrialists and the electromagnetic field computation developers Therefore this book contains a continuous spectrum of papers from application of electromagnetic models in industrial design to presentation of new theoretical developments

The Intermediate Finite Element Method Darrell W. Pepper, 2017-11-01 This book is a follow up to the introductory text written by the same authors The primary emphasis on this book is linear and nonlinear partial differential equations with particular concentration on the equations of viscous fluid motion Each chapter describes a particular application of the finite element method and illustrates the concepts through example problems A comprehensive appendix lists computer codes for 2 D fluid flow and two 3 D transient codes

Electromagnetic Fields in Mechatronics, Electrical and Electronic Engineering Andrzej Krawczyk, Sławomir Wiak, Xose M. Lopez-Fernandez, 2006 More and more researchers engage into investigation of electromagnetic applications especially these connected with mechatronics information technologies medicine biology and material sciences It is readily seen when looking at the content of the book that computational techniques which were under development during the last three decades and are still being developed serve as good tools for discovering new electromagnetic phenomena It means that the field of computational electromagnetics belongs to an application area rather than to a research area This publication aims at joining theory and practice thus the majority of papers are deeply rooted in engineering problems being simultaneously of high theoretical level The editors hope to touch the heart of the matter in electromagnetism The book focuses on the following issues

Computational Electromagnetics Electromagnetic Engineering Coupled Field and Special Applications Micro and Special Devices Bioelectromagnetics and Electromagnetic Hazard and Magnetic Material Modelling Abstracted in Inspec

Field Models in Electricity and Magnetism Paolo Di Barba, Antonio Savini, Sławomir Wiak, 2008-02-20 Covering the development of field computation in the past forty years this book is a concise comprehensive and up to date introduction to methods for the analysis and synthesis of electric and magnetic fields A broad view of the subject of field models in electricity and magnetism ranging from basic theory to numerical applications is offered The approach throughout is to solve field problems directly from partial differential equations in terms of vector quantities

Industrial Electromagnetics Modelling J. Caldwell, R. Bradley, 2012-12-06 During the past few years the rapid development of computer technology has made high power computing facilities more readily accessible to a greater proportion of our industrial and academic community This development coupled with the recent upsurge in mathematical modelling and computer simulation has led to significant developments in electromagnetic field theory and its applications to industry In view of such developments and the present high interest to both academics and industry the theme chosen for the Polymodel 6 Conference held at Newcastle upon Tyne in May 1983 was Industrial Electromagnetics Modelling To date the North East Polytechnics Mathematical Modelling and

Computer Simulation Group has organised five successful Polymodel conferences each with a different theme The objectives of the Polymodel group include the promotion of collaborative research between Newcastle Sunderland and Teesside Polytechnics and industry in the areas of mathematical modelling and computer simulation The aim of the Polymodel 6 Conference was to call on and use the modelling and computer simulation expertise of eminent academics and industrialists who are deeply involved in the area of electro magnetics These proceedings have a twofold purpose in that they contain current analytical and numerical techniques relevant to electromagnetic field problems and useful ideas on the modelling and simulation techniques which are most appropriate It was also felt important to include implications of computer developments both hardware and software on such work

Introduction to Magnetism and Magnetic Materials, Second Edition David C. Jiles, 1998-06-16 Few subjects in science are more difficult to understand than magnetism according to Encyclopedia Britannica However there is a strong demand today for scientists and engineers with skills in magnetism because of the growing number of technological applications utilizing this phenomenon This textbook responds to the need for a comprehensive introduction of the basic concepts of the science Introduction to Magnetism and Magnetic Materials has been thoroughly revised since the first edition to include recent developments in the field The early chapters comprise a discussion of the fundamentals of magnetism These chapters include more than 60 sample problems with complete solutions to reinforce learning The later chapters review the most significant recent developments in four important areas of magnetism hard and soft magnetic materials magnetic recording and magnetic evaluation of materials These later chapters also provide a survey of the most important areas of magnetic materials for practical applications Extensive references to the principal publications in magnetism are listed at the end of each chapter which offer the reader rapid access to more specialized literature Students in various scientific areas will benefit from this book including those in physics materials science metallurgy and electrical engineering , Principles of Magnetostatics Richard C. Fernow, 2023-02-09 This 2016 book now OA explains the mathematical theory behind the forces and fields resulting from the steady electrical currents Numerical Methods for Problems in Infinite Domains D. Givoli, 2013-10-22 This volume reviews and discusses the main numerical methods used today for solving problems in infinite domains It also presents in detail one very effective method in this class namely the Dirichlet to Neumann DtN finite element method The book is intended to provide the researcher or engineer with the state of the art in numerical solution methods for infinite domain problems such as the problems encountered in acoustics and structural acoustics fluid dynamics meteorology and many other fields of application The emphasis is on the fundamentals of the various methods and on reporting recent progress and forecasting future directions An appendix at the end of the book provides an introduction to the essentials of the finite element method and suggests a short list of texts on the subject which are categorized by their level of mathematics *Electromagnetic Fields in Electrical Engineering* A. Savini, J. Turowski, 2012-12-06 This book is the collection of the contributions offered at the

International Symposium on Electromagnetic Fields in Electrical Engineering ISEF 87 held in Pavia Italy in September 1987
The Symposium was attended by specialists engaged in both theoretical and applied research in low frequency electromagnetism The charming atmosphere of Pavia and its ancient university provided a very effective environment to discuss the latest results in the field and at the same time to enjoy the company of colleagues and friends coming from over 15 countries The contributions have been grouped into 7 chapters devoted to fundamental problems computer programs transformers rotating electrical machines mechanical and thermal effects various applications and synthesis respectively Such a classification is merely to help the reader because a few papers could be put in several chapters Over the past two decades electromagnetic field computations have received a big impulse by the large availability of digital computers with better and better performances in speed and capacity Many various methods have been developed but not all of them appear convenient enough for practical engineering use In fact the technical and industrial challenges set some principal attributes and criteria for good computation methods They should be relatively easy to use fit into moderately sized computers yield useful design data maintain flexibility with minimum cost in time and effort

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