Numerical Methods in Electromagnetism

Description: Electromagnetics is the foundation of our electric technology. It describes the fundamental principles upon which electricity is generated and used. This includes electric machines, high voltage transmission, telecommunication, radar, and recording and digital computing. This book will serve both as an introductory text for graduate students and as a reference book for professional engineers and researchers. This book leads the uninitiated into the realm of numerical methods for solving electromagnetic field problems by examples and illustrations. Detailed descriptions of advanced techniques are also included for the benefit of working engineers and research students.

Comprehensive descriptions of numerical methods
In-depth introduction to finite differences, finite elements, and integral equations
Illustrations and applications of linear and nonlinear solutions for multi-dimensional analysis
Numerical examples to facilitate understanding of the methods
Appendices for quick reference of mathematical and numerical methods employed

Contents:
1. Basic Principles of Electromagnetic Fields
2. Overview of Computational Methods in Electromagnetics
3. The Finite Difference Method
4. Variational and Galerkin Methods
5. Shape Functions
6. The Finite Element Method
7. Integral Equations
8. Open Boundary Problems
9. High-Frequency Problems with Finite Elements
10. Low-Frequency Applications
11. Solution of Equations

A. Vector Operators
B. Triangle Area in Terms of Vertex Coordinates
C. Fourier Transform Method
D. Integrals of Area Coordinates
E. Integrals of Volume Coordinates
F. Gauss-Legendre Quadrature Formulae, Abscissae and, Weight Coefficients
G. Shape Functions for 1D Finite Elements
H. Shape Functions for 2D Finite Elements
I. Shape Functions for 3D Finite Elements
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