

**REA's**

# **Problem Solvers**

## **ELECTROMAGNETICS**

### **A Complete Solution Guide to Any Textbook**

- For Homework, Test Preparation, Exams
- For use with introductory and advanced texts and courses
- Includes every type of problem that may be assigned by your instructor or given on a test
- Each problem worked out in step-by-step detail, enabling you to understand the subject fully
- Will save you hours of time in finding solutions to problems



*Research & Education Association*

# Electromagnetics Problem Solver Problem Solvers Solution Guides

**Research & Education Association  
Editors**



## **Electromagnetics Problem Solver Problem Solvers Solution Guides:**

**Electromagnetics** Editors of Rea, Research and Education Association Editors, 1984-01-17 Each Problem Solver is an insightful and essential study and solution guide chock full of clear concise problem solving gems All your questions can be found in one convenient source from one of the most trusted names in reference solution guides More useful more practical and more informative these study aids are the best review books and textbook companions available Nothing remotely as comprehensive or as helpful exists in their subject anywhere Perfect for undergraduate and graduate studies Here in this highly useful reference is the finest overview of electromagnetics currently available with hundreds of electromagnetics problems that cover everything from dielectrics and magnetic fields to plane waves and transmission lines Each problem is clearly solved with step by step detailed solutions DETAILS The PROBLEM SOLVERS are unique the ultimate in study guides They are ideal for helping students cope with the toughest subjects They greatly simplify study and learning tasks They enable students to come to grips with difficult problems by showing them the way step by step toward solving problems As a result they save hours of frustration and time spent on groping for answers and understanding They cover material ranging from the elementary to the advanced in each subject They work exceptionally well with any text in its field PROBLEM SOLVERS are available in 41 subjects Each PROBLEM SOLVER is prepared by supremely knowledgeable experts Most are over 1000 pages PROBLEM SOLVERS are not meant to be read cover to cover They offer whatever may be needed at a given time An excellent index helps to locate specific problems rapidly TABLE OF CONTENTS Introduction SECTION I Chapter 1 Vector Analysis Scalars and Vectors Gradient Divergence and Curl Line Surface and Volume Integrals Stoke s Theorem Chapter 2 Electric Charges Charge Densities and Distributions Coulomb s Law Electric Field Chapter 3 Electric Field Intensity Electric Flux Gauss s Law Charges Chapter 4 Potential Work Potential Potential and Gradient Motion in Electric Field Energy Chapter 5 Dielectrics Current Density Resistance Polarization Boundary Conditions Dielectrics Chapter 6 Capacitance Capacitance Parallel Plate Capacitors Coaxial and Concentric Capacitors Multiple Dielectric Capacitors Series and Parallel Combinations Potential Stored Energy and Force in Capacitors Chapter 7 Poisson s and Laplace Equations Laplace s Equation Poisson s Equation Iteration Method Images Chapter 8 Steady Magnetic Fields Biot Savart s Law Ampere s Law Magnetic Flux and Flux Density Vector Magnetic Potential H Field Chapter 9 Forces in Steady Magnetic Fields Forces on Moving Charges Forces on Differential Current Elements Forces on Conductors Carrying Currents Magnetization Magnetic Boundary Conditions Potential Energy of Magnetic Fields Chapter 10 Magnetic Circuits Reluctance and Permeance Determination of Ampere Turns Flux Produced by a Given mmf Self and Mutual Inductance Force and Torque in Magnetic Circuits Chapter 11 Time Varying Fields and Maxwell s Equations Faraday s Law Maxwell s Equations Displacement Current Generators Chapter 12 Plane Waves Energy and the Poynting Vector Normal Incidence Boundary Conditions Plane Waves in Conducting Dielectric Media Plane Waves in Free Space Plane Waves and Current Density Chapter 13 Transmission Lines

Equations of Transmission Lines Input Impedances Smith Chart Matching Reflection Coefficient Chapter 14 Wave Guides and Antennas Cutoff Frequencies for TE and TM Modes Propagation and Attenuation Constants Field Components in Wave Guides Absorbed and Transmitted Power Characteristics of Antennas Radiated and Absorbed Power of Antennas SECTION II Summary of Electromagnetic Propagation in Conducting Media II 1 Basic Equations and Theorems Maxwell's Equation Auxiliary Potentials Harmonic Time Variation Particular Solutions for an Unbounded Homogenous Region with Sources Poynting Vector Reciprocity Theorem Boundary Conditions Uniqueness Theorems TM and TE Field Analysis II 2 Plane Waves Uniform Plane Waves Nonuniform Plane Waves Reflection and Refraction at a Plane Surface Refraction in a Conducting Medium Surface Waves Plane Waves in Layered Media Impedance Boundary Conditions Propagation into a conductor with a Rough Surface II 3 Electromagnetic Field of Dipole Sources Infinite Homogenous Conducting Medium Semi Infinite Homogenous Conducting Medium Static Electric Dipole Harmonic Dipole Sources Far Field Near Field Quasi Static Field Layered Conducting Half Space II 4 Electromagnetic Field of Long Line Sources and Finite Length Electric Antennas Infinite Homogenous Conducting Medium Long Line Source Finite Length Electric Antenna Semi Infinite Homogenous Conducting Medium Long Line Source Finite Length Electric Antenna Layered Conducting Half Space Long Line Source Finite Length Electric Antenna Appendix Parameters of Conducting Media Dipole Approximation Scattering Antenna Impedance ELF and VLF Atmospheric Noise Index WHAT THIS BOOK IS FOR Students have generally found electromagnetics a difficult subject to understand and learn Despite the publication of hundreds of textbooks in this field each one intended to provide an improvement over previous textbooks students of electromagnetics continue to remain perplexed as a result of numerous subject areas that must be remembered and correlated when solving problems Various interpretations of electromagnetics terms also contribute to the difficulties of mastering the subject In a study of electromagnetics REA found the following basic reasons underlying the inherent difficulties of electromagnetics No systematic rules of analysis were ever developed to follow in a step by step manner to solve typically encountered problems This results from numerous different conditions and principles involved in a problem which leads to many possible different solution methods To prescribe a set of rules for each of the possible variations would involve an enormous number of additional steps making this task more burdensome than solving the problem directly due to the expectation of much trial and error Current textbooks normally explain a given principle in a few pages written by an electromagnetics professional who has insight into the subject matter not shared by others These explanations are often written in an abstract manner that causes confusion as to the principle's use and application Explanations then are often not sufficiently detailed or extensive enough to make the reader aware of the wide range of applications and different aspects of the principle being studied The numerous possible variations of principles and their applications are usually not discussed and it is left to the reader to discover this while doing exercises Accordingly the average student is expected to rediscover that which has long been established and practiced but not always published or

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The Electronics Problem Solver Max Fogiel,1995      *Numerical Analysis Problem Solver* Research and Education Association,1983-01-01 The Problem Solvers are an exceptional series of books that are thorough unusually well organized and structured in such a way that they can be used with any text No other series of study and solution guides has come close to the Problem Solvers in usefulness quality and effectiveness Educators consider the Problem Solvers the most effective series of study aids on the market Students regard them as most helpful for their school work and studies With these books students do not merely memorize the subject matter they really get to understand it Each Problem Solver is over 1 000 pages yet each saves hours of time in studying and finding solutions to problems These solutions are worked out in step by step detail thoroughly and clearly Each book is fully indexed for locating specific problems rapidly An essential subject for students in mathematics computer science engineering and science The 19 chapters cover basic as well as advanced methods of numerical analysis A large number of related applications are included

Complex Variables Problem Solver Emil G. Milewski,1998-01-01      **Electronics Problem Solver (REA)** REA Editors,You-Liang (Edward) Gu,2013-03-19 Each Problem Solver is an insightful and essential study and solution guide chock full of clear concise problem solving gems All your questions can be found in one convenient source from one of the most trusted names in reference solution guides More useful more practical and more informative these study aids are the best review books and textbook companions available Nothing remotely as comprehensive or as helpful exists in their subject anywhere Perfect for undergraduate and graduate studies Here in this highly useful reference is the finest overview of electronics currently available with hundreds of electronics problems that cover everything from circuits and transistors to amplifiers and generators Each problem is clearly solved with step by step detailed solutions

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*Automatic Control Systems/Robotics Problem Solver* , **Geometry - Plane, Solid and Analytic Problem Solver** The Editors of REA, Ernest Woodward, 2012-08-09 The Problem Solvers are an exceptional series of books that are thorough unusually well organized and structured in such a way that they can be used with any text No other series of study and solution guides has come close to the Problem Solvers in usefulness quality and effectiveness Educators consider the Problem Solvers the most effective series of study aids on the market Students regard them as most helpful for their school work and studies With these books students do not merely memorize the subject matter they really get to understand it Each Problem Solver is over 1 000 pages yet each saves hours of time in studying and finding solutions to problems These solutions are worked out in step by step detail thoroughly and clearly Each book is fully indexed for locating specific problems rapidly Covers topics in plane and solid space geometry Pictorial diagrams with thorough explanations on solving problems incongruence parallelism inequalities

similarities triangles circles polygons constructions and coordinate analytic geometry An invaluable aid for students **The genetics problem solver** , The Problem Solvers are an exceptional series of books that are thorough unusually well organized and structured in such a way that they can be used with any text No other series of study and solution guides has come close to the Problem Solvers in usefulness quality and effectiveness Educators consider the Problem Solvers the most effective series of study aids on the market Students regard them as most helpful for their school work and studies With these books students do not merely memorize the subject matter they really get to understand it Each Problem Solver is over 1 000 pages yet each saves hours of time in studying and finding solutions to problems These solutions are worked out in step by step detail thoroughly and clearly Each book is fully indexed for locating specific problems rapidly Thorough coverage is given to cell mechanics chromosomes Mendelian genetics sex determination mutations and alleles bacterial and viral genetics biochemistry immunogenetics genetic engineering probability and statistics **Finite and Discrete Math Problem Solver** Research & Education Association Editors,Lutfi A. Lutfiyya,2012-09-05 h Problem Solver is an insightful and essential study and solution guide chock full of clear concise problem solving gems All your questions can be found in one convenient source from one of the most trusted names in reference solution guides More useful more practical and more informative these study aids are the best review books and textbook companions available Nothing remotely as comprehensive or as helpful exists in their subject anywhere Perfect for undergraduate and graduate studies Here in this highly useful reference is the finest overview of finite and discrete math currently available with hundreds of finite and discrete math problems that cover everything from graph theory and statistics to probability and Boolean algebra Each problem is clearly solved with step by step detailed solutions DETAILS The PROBLEM SOLVERS are unique the ultimate in study guides They are ideal for helping students cope with the toughest subjects They greatly simplify study and learning tasks They enable students to come to grips with difficult problems by showing them the way step by step toward solving problems As a result they save hours of frustration and time spent on groping for answers and understanding They cover material ranging from the elementary to the advanced in each subject They work exceptionally well with any text in its field PROBLEM SOLVERS are available in 41 subjects Each PROBLEM SOLVER is prepared by supremely knowledgeable experts Most are over 1000 pages PROBLEM SOLVERS are not meant to be read cover to cover They offer whatever may be needed at a given time An excellent index helps to locate specific problems rapidly TABLE OF CONTENTS Introduction Chapter 1 Logic Statements Negations Conjunctions and Disjunctions Truth Table and Proposition Calculus Conditional and Biconditional Statements Mathematical Induction Chapter 2 Set Theory Sets and Subsets Set Operations Venn Diagram Cartesian Product Applications Chapter 3 Relations Relations and Graphs Inverse Relations and Composition of Relations Properties of Relations Equivalence Relations Chapter 4 Functions Functions and Graphs Surjective Injective and Bijective Functions Chapter 5 Vectors and Matrices Vectors Matrix Arithmetic The Inverse and Rank of a Matrix Determinants

Matrices and Systems of Equations Cramer's Rule Special Kinds of Matrices Chapter 6 Graph Theory Graphs and Directed Graphs Matrices and Graphs Isomorphic and Homeomorphic Graphs Planar Graphs and Colorations Trees Shortest Path's Maximum Flow Chapter 7 Counting and Binomial Theorem Factorial Notation Counting Principles Permutations Combinations The Binomial Theorem Chapter 8 Probability Probability Conditional Probability and Bayes Theorem Chapter 9 Statistics Descriptive Statistics Probability Distributions The Binomial and Joint Distributions Functions of Random Variables Expected Value Moment Generating Function Special Discrete Distributions Normal Distributions Special Continuous Distributions Sampling Theory Confidence Intervals Point Estimation Hypothesis Testing Regression and Correlation Analysis Non Parametric Methods Chi Square and Contingency Tables Miscellaneous Applications Chapter 10 Boolean Algebra Boolean Algebra and Boolean Functions Minimization Switching Circuits Chapter 11 Linear Programming and the Theory of Games Systems of Linear Inequalities Geometric Solutions and Dual of Linear Programming Problems The Simplex Method Linear Programming Advanced Methods Integer Programming The Theory of Games Index WHAT THIS BOOK IS FOR

Students have generally found finite and discrete math difficult subjects to understand and learn Despite the publication of hundreds of textbooks in this field each one intended to provide an improvement over previous textbooks students of finite and discrete math continue to remain perplexed as a result of numerous subject areas that must be remembered and correlated when solving problems Various interpretations of finite and discrete math terms also contribute to the difficulties of mastering the subject In a study of finite and discrete math REA found the following basic reasons underlying the inherent difficulties of finite and discrete math No systematic rules of analysis were ever developed to follow in a step by step manner to solve typically encountered problems This results from numerous different conditions and principles involved in a problem that leads to many possible different solution methods To prescribe a set of rules for each of the possible variations would involve an enormous number of additional steps making this task more burdensome than solving the problem directly due to the expectation of much trial and error Current textbooks normally explain a given principle in a few pages written by a finite and discrete math professional who has insight into the subject matter not shared by others These explanations are often written in an abstract manner that causes confusion as to the principle's use and application Explanations then are often not sufficiently detailed or extensive enough to make the reader aware of the wide range of applications and different aspects of the principle being studied The numerous possible variations of principles and their applications are usually not discussed and it is left to the reader to discover this while doing exercises Accordingly the average student is expected to rediscover that which has long been established and practiced but not always published or adequately explained The examples typically following the explanation of a topic are too few in number and too simple to enable the student to obtain a thorough grasp of the involved principles The explanations do not provide sufficient basis to solve problems that may be assigned for homework or given on examinations Poorly solved examples such as these can be presented in abbreviated form which leaves out much

explanatory material between steps and as a result requires the reader to figure out the missing information. This leaves the reader with an impression that the problems and even the subject are hard to learn completely the opposite of what an example is supposed to do. Poor examples are often worded in a confusing or obscure way. They might not state the nature of the problem or they present a solution which appears to have no direct relation to the problem. These problems usually offer an overly general discussion never revealing how or what is to be solved. Many examples do not include accompanying diagrams or graphs denying the reader the exposure necessary for drawing good diagrams and graphs. Such practice only strengthens understanding by simplifying and organizing finite and discrete math processes. Students can learn the subject only by doing the exercises themselves and reviewing them in class obtaining experience in applying the principles with their different ramifications. In doing the exercises by themselves students find that they are required to devote considerable more time to finite and discrete math than to other subjects because they are uncertain with regard to the selection and application of the theorems and principles involved. It is also often necessary for students to discover those tricks not revealed in their texts or review books that make it possible to solve problems easily. Students must usually resort to methods of trial and error to discover these tricks therefore finding out that they may sometimes spend several hours to solve a single problem. When reviewing the exercises in classrooms instructors usually request students to take turns in writing solutions on the boards and explaining them to the class. Students often find it difficult to explain in a manner that holds the interest of the class and enables the remaining students to follow the material written on the boards. The remaining students in the class are thus too occupied with copying the material off the boards to follow the professor's explanations. This book is intended to aid students in finite and discrete math overcome the difficulties described by supplying detailed illustrations of the solution methods that are usually not apparent to students. Solution methods are illustrated by problems that have been selected from those most often assigned for class work and given on examinations. The problems are arranged in order of complexity to enable students to learn and understand a particular topic by reviewing the problems in sequence. The problems are illustrated with detailed step by step explanations to save the students large amounts of time that is often needed to fill in the gaps that are usually found between steps of illustrations in textbooks or review outline books. The staff of REA considers finite and discrete math a subject that is best learned by allowing students to view the methods of analysis and solution techniques. This learning approach is similar to that practiced in various scientific laboratories particularly in the medical fields. In using this book students may review and study the illustrated problems at their own pace students are not limited to the time such problems receive in the classroom. When students want to look up a particular type of problem and solution they can readily locate it in the book by referring to the index that has been extensively prepared. It is also possible to locate a particular type of problem by glancing at just the material within the boxed portions. Each problem is numbered and surrounded by a heavy black border for speedy identification.

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