ELECTROMAGNETICS HAYT 8 EDITION

DRILL SOLUTION FROM CHAPTERS 1 TO 5

CHAPTER 1

D1.1. Given points $M(-1, 2, 1)$, $N(3, -3, 0)$, and $P(-2, -3, -4)$, find: (a) $\mathbf{R}_{MN}$; (b) $\mathbf{R}_{MN} + \mathbf{R}_{MP}$; (c) $|\mathbf{r}_M|$; (d) $\mathbf{a}_{MP}$; (e) $|2\mathbf{r}_P - 3\mathbf{r}_N|$.

(a) $\mathbf{R}_{MN} = (3-(-1))\mathbf{a}_x + (-3-2)\mathbf{a}_y + (0-1)\mathbf{a}_z = 4\mathbf{a}_x - 5\mathbf{a}_y - \mathbf{a}_z$

(b) $\mathbf{R}_{MN} + \mathbf{R}_{MP} = \mathbf{R}_{MN} + (-2-(-1))\mathbf{a}_x + (-3-2)\mathbf{a}_y + (-4-1)\mathbf{a}_z$
   $= \mathbf{R}_{MN} - \mathbf{a}_x - 5\mathbf{a}_y - 5\mathbf{a}_z = 4\mathbf{a}_x - 5\mathbf{a}_y - \mathbf{a}_z - \mathbf{a}_x - 5\mathbf{a}_y - 5\mathbf{a}_z$
   $= 3\mathbf{a}_x - 10\mathbf{a}_y - 6\mathbf{a}_z$

(c) $|\mathbf{r}_M| = \sqrt{(-1)^2 + 2^2 + 1^2} = \sqrt{6} = 2.45$

(d) $\mathbf{a}_{MP} = \dfrac{-\mathbf{a}_x - 5\mathbf{a}_y - 5\mathbf{a}_z}{\sqrt{(-1)^2 + (-5)^2 + (-5)^2}} = \dfrac{-\mathbf{a}_x - 5\mathbf{a}_y - 5\mathbf{a}_z}{\sqrt{51}} = -0.14\mathbf{a}_x - 0.7\mathbf{a}_y - 0.7\mathbf{a}_z$

(e) $2\mathbf{r}_P - 3\mathbf{r}_N = 2(-2\mathbf{a}_x - 3\mathbf{a}_y - 4\mathbf{a}_z) - 3(3\mathbf{a}_x - 3\mathbf{a}_y) = -4\mathbf{a}_x - 6\mathbf{a}_y - 8\mathbf{a}_z - 9\mathbf{a}_x + 9\mathbf{a}_y$
   $= -13\mathbf{a}_x + 3\mathbf{a}_y - 8\mathbf{a}_z$

$|2\mathbf{r}_P - 3\mathbf{r}_N| = \sqrt{(-13)^2 + 3^2 + (-8)^2} = 11\sqrt{2} = 15.56$

D1.2. A vector field $\mathbf{S}$ is expressed in rectangular coordinates as $\mathbf{S} = \{125/[(x-1)^2 + (y-2)^2 + (z+1)^2]\}[(x-1)\mathbf{a}_x + (y-2)\mathbf{a}_y + (z+1)\mathbf{a}_z]$. (a) Evaluate $\mathbf{S}$ at $P(2, 4, 3)$. (b) Determine a unit vector that gives the direction of $\mathbf{S}$ at P. (c) Specify the surface $f(x, y, z)$ on which $|\mathbf{S}| = 1$.

(a) $\mathbf{S} = \dfrac{125}{(2-1)^2 + (4-2)^2 + (3+1)^2}[(2-1)\mathbf{a}_x + (4-2)\mathbf{a}_y + (3+1)\mathbf{a}_z]$

$= \dfrac{125}{1^2 + 2^2 + 4^2}(\mathbf{a}_x + 2\mathbf{a}_y + 4\mathbf{a}_z) = \dfrac{125}{21}(\mathbf{a}_x + 2\mathbf{a}_y + 4\mathbf{a}_z)$

$= 5.95\mathbf{a}_x + 11.9\mathbf{a}_y + 23.8\mathbf{a}_z$

(b) $\mathbf{a}_S = \dfrac{5.95\mathbf{a}_x + 11.9\mathbf{a}_y + 23.8\mathbf{a}_z}{\sqrt{5.95^2 + 11.9^2 + 23.8^2}} = \dfrac{5.95\mathbf{a}_x + 11.9\mathbf{a}_y + 23.8\mathbf{a}_z}{27.27}$

$= 0.218\mathbf{a}_x + 0.436\mathbf{a}_y + 0.873\mathbf{a}_z$

(c) $1 = |\mathbf{S}| =$

$\sqrt{\left[\dfrac{125(x-1)}{(x-1)^2 + (y-2)^2 + (z+1)^2}\right]^2 + \left[\dfrac{125(y-2)}{(x-1)^2 + (y-2)^2 + (z+1)^2}\right]^2 + \left[\dfrac{125(z+1)}{(x-1)^2 + (y-2)^2 + (z+1)^2}\right]^2}$

$1 = \sqrt{\dfrac{125^2[(x-1)^2 + (y-2)^2 + (z+1)^2]}{[(x-1)^2 + (y-2)^2 + (z+1)^2]^2}} = \dfrac{125\sqrt{(x-1)^2 + (y-2)^2 + (z+1)^2}}{(x-1)^2 + (y-2)^2 + (z+1)^2}$

Transposing,

$\dfrac{(x-1)^2 + (y-2)^2 + (z+1)^2}{\sqrt{(x-1)^2 + (y-2)^2 + (z+1)^2}} = 125$

Conjugating,

$\dfrac{(x-1)^2 + (y-2)^2 + (z+1)^2}{\sqrt{(x-1)^2 + (y-2)^2 + (z+1)^2}} \cdot \dfrac{\sqrt{(x-1)^2 + (y-2)^2 + (z+1)^2}}{\sqrt{(x-1)^2 + (y-2)^2 + (z+1)^2}} = 125$

$\sqrt{(x-1)^2 + (y-2)^2 + (z+1)^2} = 125$

D1.3. The three vertices of a triangle are located at $A(6, -1, 2)$, $B(-2, 3, -4)$, and $C(-3, 1, 5)$. Find: (a) $\mathbf{R}_{AB}$; (b) $\mathbf{R}_{AC}$; (c) the angle θ_{BAC} at vertex A; (d) the (vector) projection of $\mathbf{R}_{AB}$ on $\mathbf{R}_{AC}$.

(a) $\mathbf{R}_{AB} = (-2-6)\mathbf{a}_x + (3-(-1))\mathbf{a}_y + (-4-2)\mathbf{a}_z$
   $= -8\mathbf{a}_x + 4\mathbf{a}_y - 6\mathbf{a}_z$

(b) $\mathbf{R}_{AC} = (-3-6)\mathbf{a}_x + (1-(-1))\mathbf{a}_y + (5-2)\mathbf{a}_z$
   $= -9\mathbf{a}_x + 2\mathbf{a}_y + 3\mathbf{a}_z$

(c) Locating angle θ_{BAC},

$\mathbf{R}_{AB} \cdot \mathbf{R}_{AC} = (-8)(-9) + 4(2) + (-6)3 = 72 + 8 - 18 = 62$

Using dot product,

Drill Problems Solution Of Engineering Electromagnetics Chapter 1

David K. Cheng

Drill Problems Solution Of Engineering Electromagnetics Chapter 1:

   Engineering Electromagnetics William Hart Hayt,John A. Buck,2006 Now in its Seventh Edition Bill Hayt and John Buck s Engineering Electromagnetics is a classic book that has been updated for electromagnetics today This widely respected book stresses fundamentals and problem solving and discusses the material in an understandable readable way Numerous illustrations and analogies are provided to aid the reader in grasping difficult concepts In addition independent learning is facilitated by the presence of many examples and problems Jacket   **Electromagnetic Concepts and Applications** Stanley V. Marshall,Gabriel G. Skitek,1990   *Elements of Engineering Electromagnetics* Nannapaneni Narayana Rao,2004 This book with its versatile approach includes thorough coverage of statics with an emphasis on the dynamics of engineering electromagnetics It integrates practical applications numerical details and completely covers all relevant principles Topics include vectors and fields Maxwell s Equations fields and waves electromagnetic potentials devices circuits and systems and transmission line essentials for digital electronics The second part of the book covers communications guided wave principles electronics and photonics and radiation and antennae A valuable resource for computer engineering and electrical engineering professionals   **Choice** Richard K. Gardner,Phyllis Grumm,1976   Applied Electromagnetics Stuart M. Wentworth,2025-09-09 A timely and authoritative update to a leading text on the applied electromagnetics of transmission lines In the newly revised second edition of Applied Electromagnetics Early Transmission Lines Approach experienced engineer and professor Stuart Wentworth delivers an up to date and authoritative discussion of the electromagnetic foundations of signal transmission The book explains practical applications for wireless systems transmission lines waveguides including optical fiber and antennas Wentworth provides a detailed theoretical grounding of the subject and combines it with hands on MATLAB simulations available on the web that help students understand critical concepts Brand new end of chapter problems at a broad range of difficulty levels Many more drill and example problems Worked solutions provided on the companion website Extensively updated material as well as entirely new material on metamaterials and patch antennas Perfect for undergraduate students of electrical engineering Applied Electromagnetics Early Transmission Lines Approach will also benefit researchers and educators in electrical engineering   Fundamentals of Electromagnetics with Engineering Applications Stuart M. Wentworth,2005   *Proceedings of the IRE.* ,1950   The Log Analyst ,1993

   Elements of Engineering Electromagnetics Nannapaneni Narayana Rao,2000 Successful text with a versatile approach including thorough coverage of statics with an emphasis on the dynamics of engineering electromagnetics It integrates practical applications numerical details and the thorough coverage of principles NEW Two part coverage Fundamental Elements and Applied Elements Associates the chapters on Applied Elements with major technologies based on Maxwells equations Serves the needs of twenty first century electromagnetics education with Chapters 1 6 comprehensive for a one semester introductory course and Chapters 7 12 accessible for follow up on elective courses for electrical

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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 Propogation 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 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 electromagnetics 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 electromagnetics 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 electromagnetics 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 electromagnetics 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 **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

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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 electromagnetics 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 **Engineering Electromagnetics** Balanis,Constantine A. Balanis,1989-10-24

Engineering Electromagnetics. Solutions to Problems William Hart Hayt,1958 *Elements of Engineering Electromagnetics* Nannapaneni Narayana Rao,1987 **Problems and Solutions on Electromagnetism** Yung-kuo Lim,1993 Electrostatics Magnetostatic field and quasi stationary electromagnetic fields Circuit analysis Electromagnetic waves Relativity particle field interactions Engineering Electromagnetics William H. Hayt,196? **Solved Problems in Electromagnetics** Félix Salazar Bloise,Rafael Medina Ferro,Ana Bayón Rojo,Francisco Gascón Latasa,2016-10-27 This book presents the fundamental concepts of electromagnetism through problems with a brief theoretical introduction at the beginning of each chapter The present book has a strong didactic character It explains all the mathematical steps and the theoretical concepts connected with the development of the problem It guides the reader to understand the employed procedures to learn to solve the exercises independently The exercises are structured in a similar way The chapters begin with easy problems increasing progressively in the level of difficulty This book is written for students of physics and engineering in the framework of the new European Plans of Study for Bachelor and Master and also for tutors and lecturers **Introduction to Engineering Electromagnetic Fields** Korada Umashankar,1989 This is a textbook designed to provide analytical background material in the area of Engineering Electromagnetic Fields for the senior level undergraduate and preparatory level graduate electrical engineering students It is also an excellent reference book for researchers in the field of computational electromagnetic fields The textbook covers Static Electric and Magnetic Fields The basic laws governing the Electrostatics Magnetostatics with engineering examples are presented which are enough to understand the fields and the electric current and charge sources Dynamic Electromagnetic Fields The Maxwell s equations in Time Domain and solutions the Maxwell s equations in Frequency Domain and solutions Extensive approaches are presented to solve partial differential equations satisfying electromagnetic boundary value problems Foundation to electromagnetic field radiation guided wave propagation is discussed to expose at the undergraduate level application of the Maxwell s equations to practical engineering problems **Fundamentals of Engineering Electromagnetics** David K. Cheng,1993-02

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