

DRILL PROBLEMS : CHAPTER 2

D2.1

$$(a) \quad \mathbf{R}_{AB} = (5+6) \mathbf{a}_x + (8-4) \mathbf{a}_y + (-2-7) \mathbf{a}_z = 11\mathbf{a}_x + 4\mathbf{a}_y - 9\mathbf{a}_z$$

$$(b) \quad R_{AB} = \sqrt{11^2 + 4^2 + 9^2} = 14.76 \text{ m}$$

$$(c) \quad \mathbf{F}_{BA} = \frac{(-20 \times 10^{-6})(50 \times 10^{-6})}{4\pi \frac{(10^{-9})}{36\pi} (14.76^2)} \mathbf{a}_{BA} = -0.0413 \frac{(-11\mathbf{a}_x - 4\mathbf{a}_y + 9\mathbf{a}_z)}{14.76} = 30.78\mathbf{a}_x + 11.19\mathbf{a}_y - 25.18\mathbf{a}_z \text{ mN}$$

$$(d) \quad \mathbf{F}_{BA} = \frac{(-20 \times 10^{-6})(50 \times 10^{-6})}{4\pi \times 8.854 \times 10^{-12} (14.76^2)} \mathbf{a}_{BA} = -0.04125 \frac{(-11\mathbf{a}_x - 4\mathbf{a}_y + 9\mathbf{a}_z)}{14.76} = 30.74\mathbf{a}_x + 11.18\mathbf{a}_y - 25.15\mathbf{a}_z \text{ mN}$$

D2.2

$$(a) \quad \mathbf{r} - \mathbf{r}_A = -25\mathbf{a}_x + 30\mathbf{a}_y - 15\mathbf{a}_z, \quad |\mathbf{r} - \mathbf{r}_A| = 41.43$$

$$\mathbf{r} - \mathbf{r}_B = 10\mathbf{a}_x - 8\mathbf{a}_y - 12\mathbf{a}_z, \quad |\mathbf{r} - \mathbf{r}_B| = 17.54$$

$$E_A = -1.57 \frac{(-25\mathbf{a}_x + 30\mathbf{a}_y - 15\mathbf{a}_z)}{41.43} = 9480\mathbf{a}_x - 11300\mathbf{a}_y + 5600\mathbf{a}_z$$

$$E_B = 14.61 \frac{(10\mathbf{a}_x - 8\mathbf{a}_y - 12\mathbf{a}_z)}{17.54} = 83300\mathbf{a}_x - 66600\mathbf{a}_y - 99900\mathbf{a}_z$$

$$E_T = E_A + E_B = 9248\mathbf{a}_x - 77.9\mathbf{a}_y - 94.3\mathbf{a}_z \frac{\text{kV}}{\text{m}}$$

$$(b) \quad \mathbf{r} - \mathbf{r}_A = -10\mathbf{a}_x + 50\mathbf{a}_y + 35\mathbf{a}_z, \quad |\mathbf{r} - \mathbf{r}_A| = 61.84$$

$$\mathbf{r} - \mathbf{r}_B = 25\mathbf{a}_x + 12\mathbf{a}_y + 38\mathbf{a}_z, \quad |\mathbf{r} - \mathbf{r}_B| = 47.04$$

$$E_A = -7050 \frac{(-10\mathbf{a}_x + 50\mathbf{a}_y + 35\mathbf{a}_z)}{61.84} = 1140\mathbf{a}_x - 5700\mathbf{a}_y - 3990\mathbf{a}_z$$

$$E_B = 20300 \frac{(25\mathbf{a}_x + 12\mathbf{a}_y + 38\mathbf{a}_z)}{47.04} = 10700\mathbf{a}_x + 5180\mathbf{a}_y + 16400\mathbf{a}_z$$

$$E_T = E_A + E_B = 1184\mathbf{a}_x - 52\mathbf{a}_y + 1241\mathbf{a}_z \frac{\text{kV}}{\text{m}}$$

D2.3

$$(a) \quad \text{Sum} = 2 + 0 + \frac{2}{5} + 0 + \frac{2}{17} + 0 = 2.517$$

$$(b) \quad \text{Sum} = \frac{1.1}{11.18} + \frac{1.01}{22.62} + \frac{1.001}{46.05} + \frac{1.0001}{89.44} = 0.1755$$



Theory And Computation Of Electromagnetic Fields Solution Manual

Raffaela Di Napoli



Theory And Computation Of Electromagnetic Fields Solution Manual:

Theory and Computation of Electromagnetic Fields in Layered Media Vladimir Okhmatovski, Shucheng Zheng, 2024-04-09 Explore the algorithms and numerical methods used to compute electromagnetic fields in multi layered media In *Theory and Computation of Electromagnetic Fields in Layered Media* two distinguished electrical engineering researchers deliver a detailed and up to date overview of the theory and numerical methods used to determine electromagnetic fields in layered media The book begins with an introduction to Maxwell s equations the fundamentals of electromagnetic theory and concepts and definitions relating to Green s function It then moves on to solve canonical problems in vertical and horizontal dipole radiation describe Method of Moments schemes discuss integral equations governing electromagnetic fields and explains the Michalski Zheng theory of mixed potential Green s function representation in multi layered media Chapters on the evaluation of Sommerfeld integrals procedures for far field evaluation and the theory and application of hierarchical matrices are also included along with A thorough introduction to free space Green s functions including the delta function model for point charge and dipole current Comprehensive explorations of the traditional form of layered medium Green s function in three dimensions Practical discussions of electro quasi static and magneto quasi static fields in layered media including electrostatic fields in two and three dimensions In depth examinations of the rational function fitting method including direct spectra fitting with VECTFIT algorithms Perfect for scholars and students of electromagnetic analysis in layered media *Theory and Computation of Electromagnetic Fields in Layered Media* will also earn a place in the libraries of CAD industry engineers and software developers working in the area of computational electromagnetics

Theory and Computation of Electromagnetic Fields Jian-Ming Jin, 2011-03-16 This book is intended to serve as a textbook for an entry level graduate course on electromagnetics first seven chapters and for an advanced level graduate course on computational electromagnetics last five chapters Whereas there are several textbooks available for the graduate electromagnetics course no textbook is available for the advanced course on computational electromagnetics This book is intended to fill this void and present electromagnetic theory in a systematic manner so that students can advance from the first course to the second without much difficulty Even though the first part of the book covers the standard basic electromagnetic theory the coverage is different from that in existing textbooks This is mainly the result of the undergraduate curriculum reform that occurred during the past two decades Many universities reduced the number of required courses in order to give students more freedom to design their own portfolio As a result only one electromagnetics course is required for undergraduate students in most electrical engineering departments in the country New graduate students come to take the graduate electromagnetics course with a significant difference in their knowledge of basic electromagnetic theory To meet the challenge to benefit all students of backgrounds this book covers both fundamental theories such as vector analysis Maxwell s equations and boundary conditions and transmission line theory and advanced

topics such as wave transformation addition theorems and scattering by a layered sphere

Parallel Solution of Integral Equation-Based EM Problems in the Frequency Domain Y. Zhang, T. K. Sarkar, 2009-06-29 A step by step guide to parallelizing cem codes The future of computational electromagnetics is changing drastically as the new generation of computer chips evolves from single core to multi core The burden now falls on software programmers to revamp existing codes and add new functionality to enable computational codes to run efficiently on this new generation of multi core CPUs In this book you ll learn everything you need to know to deal with multi core advances in chip design by employing highly efficient parallel electromagnetic code Focusing only on the Method of Moments MoM the book covers In Core and Out of Core LU Factorization for Solving a Matrix Equation A Parallel MoM Code Using RWG Basis Functions and ScaLAPACK Based In Core and Out of Core Solvers A Parallel MoM Code Using Higher Order Basis Functions and ScaLAPACK Based In Core and Out of Core Solvers Turning the Performance of a Parallel Integral Equation Solver Refinement of the Solution Using the Conjugate Gradient Method A Parallel MoM Code Using Higher Order Basis Functions and Plapack Based In Core and Out of Core Solvers Applications of the Parallel Frequency Domain Integral Equation Solver Appendices are provided with detailed information on the various computer platforms used for computation a demo shows you how to compile ScaLAPACK and PLAPACK on the Windows operating system and a demo parallel source code is available to solve the 2D electromagnetic scattering problems Parallel Solution of Integral Equation Based EM Problems in the Frequency Domain is indispensable reading for computational code designers computational electromagnetics researchers graduate students and anyone working with CEM software

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

Scientific and Technical Aerospace Reports , 1995 International Conference of Computational Methods in Sciences and Engineering (ICCMSE 2004) Theodore Simos, George Maroulis, 2019-04-29 The International Conference of Computational Methods in Sciences and Engineering ICCMSE is unique in its kind It regroups original contributions from all fields of the traditional Sciences Mathematics Physics Chemistry Biology Medicine and all branches of Engineering The aim of the conference is to bring together computational scientists from several disciplines in order to share methods and ideas More than 370 extended abstracts have been submitted for consideration for presentation in ICCMSE 2004 From these 289 extended abstracts have been selected after international peer review by at least two independent reviewers

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Atomindex ,1987 **Nuclear Science Abstracts** ,1967 **Scientific Computing in Electrical Engineering** Martijn van Beurden,Neil V. Budko,Gabriela Ciuprina,Wil Schilders,Harshit Bansal,Ruxandra Barbulescu,2024-02-29 This volume comprises selected papers presented at the 14th International Conference on Scientific Computing in Electrical Engineering SCEE 2022 held in Amsterdam The Netherlands in July 2022 The aim of the SCEE 2022 conference was to bring together scientists mathematicians electrical engineers computer scientists and physicists from universities and industry to have in depth discussions of the latest scientific results in Computational Science and Engineering relevant to Electrical Engineering and to stimulate and inspire active participation of young researchers This extensive reference work is divided into four parts Part I Circuit Simulation and Design Part II Device Simulation Part III Computational Electromagnetics Part IV Mathematical and Computational Methods Each part starts with a general introduction followed by the respective contributions The book will appeal to mathematicians and electricalengineers Further it introduces algorithm and program developers to recent advances in the other fields while industry experts will be introduced to new programming tools and mathematical methods

Technical Abstract Bulletin Defense Documentation Center (U.S.),1964

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for the nitration 4.01 ml of nitric acid 4.00 ml of sulfuric acid and 4.56 ml bromobenzene were used to complete the reaction with these measurements bromobenzene was found to be the limiting reagent since only 4.56 ml of bromobenzene was used the amount of product predicted to be recovered was 8.7533 g

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the aim of the experiment is to determine and study electrophilic aromatic substitution reaction especially nitration of methyl benzoate to give methyl m nitrobenzoate thus determine the weight melting point and percentage yield of the pure methyl m nitrobenzoate abstract

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in this experiment we will carry out the nitration of bromobenzene bromine substituted on an aromatic ring is an ortho para directing group it will direct an incoming electrophile to the ortho and para positions it is also deactivating meaning that its reactions will be slower than the identical reactions of benzene

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section 20711 lab experiment nitration of bromobenzene introduction the chemical reaction of nitration consists of a nitro group being added to or substituted in a molecule nitration can basically be carried out by a mixture of concentrated nitric acid and sulfuric acid this mixture is useful to obtain the active nitronium ion

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1 go to the restroom and wash the affected area with lots of soap and water the soap in the lab is not suitable for this purpose 2 return to the lab and apply mineral oil to the affected area 3 the summary to this warning is not to touch any part of your body while performing this experiment if you must leave the lab for any reason 1

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in the nitration of bromobenzene a mixture of sulfuric acid and nitric acid react with one another nitric acid the weaker of the two acids will serve as base to form nitronium ion bromobenzene will attack the nitronium ion by nucleophilic attack

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then actual is your actual findings yield actual theoretical $\times 100$ what are the possible side reactions of nitration of bromobenzene dinitration can occur at ortho para or at both ortho positions occurs in overheating meta product happens very rarely because bromine is an ortho para director

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the soap in the lab is not suitable for this purpose 2 return to the lab and apply mineral oil to the affected area theory and explanation of the nitration of bromobenzene if the temperature of the reaction mixture exceeds 60 °C

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the bromine substituent in bromobenzene is an ortho para director the para position is favored due to steric effects in the reaction that takes place in this lab a nitro group is substituted onto bromobenzene at the para position to form 1-bromo-4-nitrobenzene

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study with quizlet and memorize flashcards containing terms like reacting sulfuric and nitric acid together produces the nitronium ion alone nitric acid is not a strong enough electrophile to react with bromobenzene sulfuric acid is added to the nitric acid the reverse rxn can overheat and boil easily includes a claisen adaptor and

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over 5 minutes slowly pipet this bromobenzene into the icy cold nitration mixture HNO_3 3 mL H_2SO_4 4 mL in the 125 mL flask and stir continue to stir the reaction mixture in the ice bath for 30 minutes do not heat in a new 250 mL erlenmeyer

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on the right the arenium cation has a nitro set with incredibly small 0.6 Å bond distances this will result in an optimization failure as the atoms are even close for the programme to accommodate their electrons demonstration of creating the p arenium cation by nitration of bromobenzene

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the purpose of this lab was to observe where substituents are added on a benzene ring by way of electrophilic aromatic substitution the electrophilic source in the nitration of bromobenzene comes from a nitronium ion NO_2^+ which acts as the electrophilic species

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nitration of bromobenzene is an electrophilic aromatic substitution reaction the electrophile will be formed from 4 0ml of nitric acid and 4 0ml of sulfuric acid and will then react with 4 5ml of bromobenzene this will produce o bromonitrobenzene and p bromonitrobenzene

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experimental spectra reaction a fluorobenzene stock fluorobenzene 1 h 1 h 19 f 19 f 13 c nmr fid for reference only sample 1 h 1 h 19 f 19 f 13 c nmr eas nitration of fluorobenzene crude product not available for submission for credit

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chem 2261 lab 5 nitration of bromobenzene introduction an electrophilic aromatic substitution reaction is an important process that allows for intermediate chemical structures to be used as precursors to pharmaceuticals and other industrially produced chemicals by adding different functional groups into an aromatic ring

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