Review for Optics Exam 1

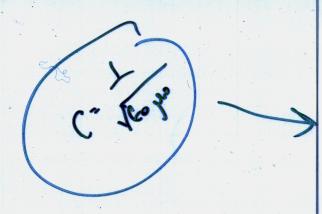
Info

- Take in the Testing Center, 2/7 (Thurs) through 2/12
- (Tues)
 3 hour time limit, 1% penalty per minute for going over
- Late fee if you start it 2/12 after 6 pm
- Closed book, closed notes
- I will give you the most difficult equations; the simpler equations (definitions, fundamental laws & relationships, etc) you will be expected to have memorized—see following pages
- It's worth 16% of your final course grade
 coller letters No constants formulas feets stored. (You will sign a statement)
 What to study complex numbers

- HW problems
- Sample exam problems from pages 111-117 in P&W (except the ones with "crystals"—those are from chap 5)
- Class notes
- Reading quizzes
- Textbook
- Old exams from students who took this class from other profs in the past
- Problems from the book that were not assigned
- Problems from other Optics books, such as Hecht

Important equations

Will be given if needed (unless e.g. part of a multiplechoice quiz-like problem)



Fundamental vector calc thms: $\sqrt{(\nabla f)^2} = \int_0^{\infty} -f_0 -f_0$ gradient $\sqrt{(\nabla f)^2} = \int_0^{\infty} -f_0 -f_0$ divergence $\sqrt{(\nabla f)^2} = \sqrt{(\nabla f)^2} = \sqrt$ Need to have memorized (not necessarily comprehensive)

Values of fundamental constants in standard units to three decimal places:

In rectangular coordinates,
how to take:
gradient vf

divergence 表示。 第一章

curl — Laplacian

Random vector theorems,

like
$$\nabla \times (\nabla \times \vec{A}) = \nabla (\nabla \cdot \vec{A}) - \nabla^2 \vec{A}$$

$$\nabla \cdot (\nabla \times \vec{A}) = 0$$
, etc.

Coulomb's law in vector

form

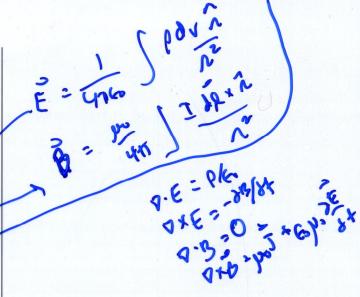
B-S law in vector form Equation of continuity

Eqn for bound charge (ρ)
Defn of D

Defn of H = B -M= 13

Defin of χ

Defn of polarization current



4 fundamental Maxwell's equations (aka vacuum eqns)

Relationship between c, ε_0 , μ_0 Defin of dipole moment Defn of polarization

Relationship between ε_r and

$$\chi = \frac{1+\chi}{n=\sqrt{1+\chi}}$$

Two modified Maxwell equations in matter

Basic wave stuff:
$$\lambda f = v$$
, $f = 1/T$, $k = 2\pi/\lambda$, $\omega = 2\pi/T$

rectory we spolar to rectory we saw Largh amp Largh E = Eoe (L.r-w) e to cos (L.r-w) + d)

real E = Eo cos (L.r-w) + d)

L= tradictions

P&W's complicated wave equation with 3 sources on RHS

Solution to driven/damped oscillator X = 250 where the second of the sec

Lorentz oscillator model's value for complex $\chi \& n$

Defn of plasma freq

Basic wave equation $\omega/k = v = c/n$

Complex number stuff from handout and section 0.2 E and B as complex plane waves

Magnitudes of E and B

$$\frac{\omega/\widetilde{k} = c/\widetilde{n}}{\text{Defn of } \kappa} \qquad \tilde{n} = n + i \frac{\kappa}{\widetilde{n}} = \sqrt{1+2}$$

Relationship between n and χ k_{real} and k_{imag} : decaying sine wave, relationship to $n \& \kappa$

absorption length, $1/\alpha$

Ne -N2-iWY]
1 + We
derem.

How to convert χ formula for use with multiple resonant freqs; oscillator strength

Complex $\chi \& n$ for $\chi = \frac{w_{\Gamma}}{-iw_{\Gamma}-w^{2}}$ $\chi = \sqrt{1+\chi}$

Defn of DC conductivity

Energy store 1:

Energy stored in electric & 112 Start 1 8 2 dv magnetic fields

Poynting Theorem

Fresnel Equations for r and t p-polarization at an angle s-polarization at an angle Defins of α and β

Complicated evanescent wave formula

Defn of Poynting vector Directions of E, B, and \hat{k} & S Relationship between I and E_0 $I = \langle s \rangle = \langle s \rangle = \langle s \rangle$ Snell's Law

1,50,2 n25002

Normal incidence formulas: subset of angle formulas Reflectance, transmittance/ transmission R= | - | - | - | - | Brewster's angle condition TIR condition n, são, = nzs = (90°)

Jones vectors for linear polarized light Jones vectors for:

RCP

LCP

elliptical

Complicated eqn for α of elliptically polarized light

Jones matrices for:

linear polarizer at θ

 $\lambda/4$ fast axis at θ

 $\lambda/2$ fast axis at θ

Jones matrices for:
reflection
transmission

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