Version 10/21/06

EECS 210 Applied Electromagnetic Theory

Fall 2006
Tu, Th 12:30-2
400 Cory

Office Hours
M, (W), 11AM
Tu, Th, (F) 10AM

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Midterm Exam

October 24, 2006

Open Book, Open Notes, Open Homework
Write directly on this exam

Sign Your Name:_____

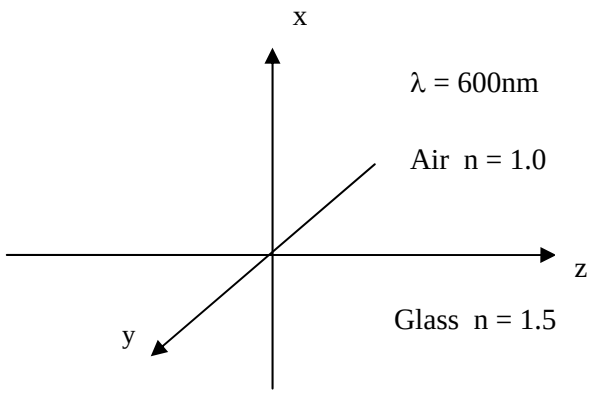
Print Your Name:_____

Problem	Possible	Score
I	50	
II	50	
III	50	
Total	150	

I. (50 Points) Plane Waves:

$$E_x = 0.5E_0 e^{i\frac{2\pi n_G}{\lambda}\left(0.3x + k_y y + 0.6z\right)}$$

$$E_y = 1.0E_0 e^{i\frac{2\pi n_G}{\lambda}\left(0.3x + k_y y + 0.6z\right)}$$



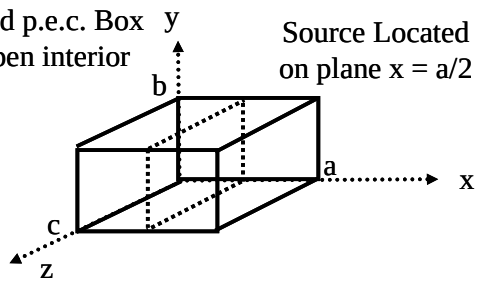
a) (10 Points) Find the angle that this wave makes with the y- axis **in the glass**.

b) (10 points) Write out the full (x,y,z) plane wave behavior of the transmitted field. (Leave the phasor amplitude and relative phase as an unknown).

c) (20 Points) Find all **six** components of the vectors E and H traveling in the upward direction **inside the glass**.

c) (10 Points) Evaluate the Poynting vector component in the y-direction due to waves traveling in the +y-direction **in the glass**.

II. (50 Points) Boundary Value Problem: Grounded p.e.c. Box With open interior



a) (15 points) Find the potential inside the inside the box when the potential on the plane x = a/2 is given by $\Phi(y,z)|_{x=a/2} = F\sin(\frac{3\pi y}{b})\sin(\frac{2\pi z}{c})$

b) (15 points) Find the charge on the plane x= a/2 associated with this potential.

c) (20 Points) Write one sentence that names and outlines the methodology for each of the possible ways that could be used to solve for the potential produced by a charge distribution inside the box above.

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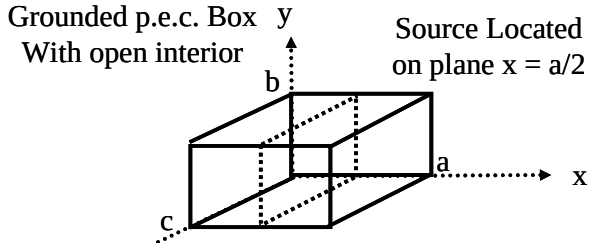
III. (50 Points) Integral Representation



a) (12 Points) Use the concept of a general Green's function to write an integral equation for the potential at a point (x1, y1, z1) where $x1 < a/2$.

b) (12 Points) Specify the boundary conditions on the Green's function such that **only the potential on the plane a/2 is needed** to find the potential at a point (x1, y1, z1) where $x1 < a/2$.

c) (12 Points) Write down an eigenfunction expansion for this Green's Function.

d) (14 Points) Describe how the integral representation in a) could be converted into an integral equations to find the charge on the walls for $x < a/2$.