PHYS 408 2010/11 term 2

Homework problem set #8 problems 1-3
Assigned: 13/03/2011
Written Solution due 18/03/2011 5 PM in Hennings 328
If you collaborated with anyone, please write their name at the top of your HW

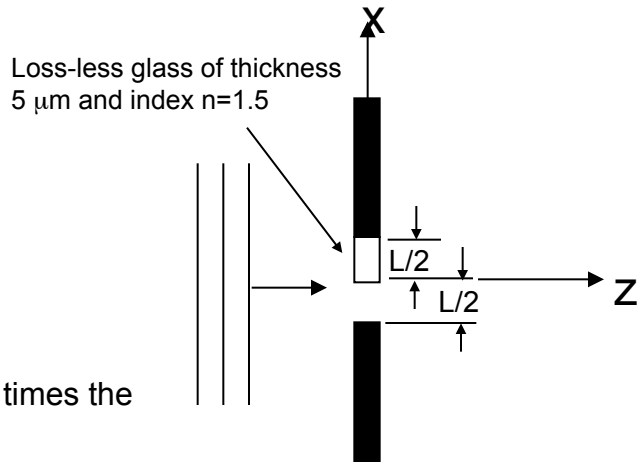
Problem 1 (30 marks) (This isn't a typo)

Look at the HW #7 solutions I posted and pick one problems that you may have gotten wrong. Describe in words what you may have done wrong and what your misconceptions were. And explain what you didn't understand and what techniques you needed to know in order to solve the problem. Explain in words what you have learned from this.

If you feel you solved all of the problems correctly, then pick a problem and try to find and explain three misconceptions that might lead a person to answer wrongly. To be an expert, you must learn to identify the possible conceptual difficulties that a person may have in order to communicate with them effectively

Problem 2 (35 Marks) This is an old exam question

A plane wave traveling with wavelength λ_o =1 μm in the z-direction is incident on an aperture along the x-axis at z=0 with the follow setup. Ignore any reflections off of the glass piece and only consider the x-z plane. For |x|>L/2 no light is transmitted



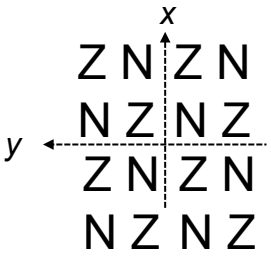
a) The image function is equal to the input wave times the aperture What is the image function f(x)?

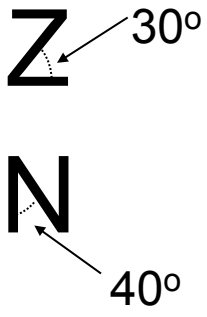
b) **Working in the x-z plane only**, calculate the far-field (Fraunhofer) pattern produced. Sketch BOTH the intensity and field patterns.

c) repeat a) and b) with a plane wave incident at an angle θ with respect to the z axis

Problem 3 (35 marks)

Using the 4-f system covered in class on Thursday, you have an input image that looks like this with identical Ns and Zs at the shown angles:





Design a filter that when placed at the mask plane, makes the output image 4 only have Ns in it. As you will note, this is similar to an exercise in the Fourier lab using a ""lazy-x" filter. Use that filter as a starting point for your filter design. For this problem you need to calculate the correct angle of the "x" and its relative orientation in the mask plane.