

## OPTI380A

### Prelab Questions – Lab 12 2009

All pre lab questions must be submitted at the beginning of each laboratory session. They are designed to prepare you for the lab so that you can finish the lab on-time. You will receive zero credit for the pre lab questions, if you come to the lab without answering the pre lab questions. Post lab questions must be handed in class at the beginning of each lecture after the completion of the lab.

- (1) Describe the phenomena of diffraction.
- (2) What are the locations for the Rayleigh-Sommerfeld, Fresnel and Fraunhofer diffraction regions? You need to describe the meaning of all the variables to get full credit.
- (3) The electric field distribution of the far field or Fraunhofer diffraction of a slit is given by

$$U(x, y) = \frac{4w_x w_y e^{jkz}}{j\lambda z} e^{j\frac{k}{2z}(x^2+y^2)} \operatorname{sinc}\left(\frac{2\pi w_x x}{\lambda z}\right) \operatorname{sinc}\left(\frac{2\pi w_y y}{\lambda z}\right)$$

Write down the equation for the intensity,  $I(x,y)$ . Generate axial profile plots of  $I(x,y)$  for  $w_x = 200\mu\text{m}$  and  $w_y = 400\mu\text{m}$  for  $\lambda = 632\text{ nm}$ ,  $z = \pi w_y^2 / \lambda$ .

Figure 1: Schematic of a slit

