EASTERN UNIVERSITY, SRI LANKA

SECOND EXAMINATION IN SCIENCE - 2008/2009

FIRST SEMESTER (PROPER/REPEAT)

(March 2010)

PH 203 PHYSICAL OPTICS II

ime: 01 hour.

nswer ALL Questions

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1. Distinguish between Fraunhofer and Fresnel diffractions in terms of the experimental arrangement used.

   The diffraction intensity distribution from a single-slit of width a is given by:

$$I = I_0\left(\frac{Sin\beta}{\beta}\right)^2$$

   Where $\beta = \frac{\pi a Sin\theta}{\lambda}$, I is the intensity and other symbols have their usual meanings.

   (a) Write down the condition for maximum and minimum intensity fringes in a single-slit diffraction.

   Draw the I versus β graph for a single slit Fraunhofer diffraction. (Show the values of principle maxima and minima clearly in the graph).

(b) Show that for a Fraunhofer diffraction by single slit, the direction of the minimum on either side of the central maximum is given by,

$$\theta = \frac{\lambda}{a}.$$ where a is the width of the slit and $a >>> \lambda$.

(Hint: You may assume that $Sin\theta \approx \theta$ and $\beta = \frac{\pi a Sin\theta}{\lambda}$)

A telescope is being used to resolve parallel lines coming from the moon. Calc the width of the rectangular aperture which is in front of the telescope, if you ne resolve the parallel lines one kilometer apart.

Assume the light has the wavelength $\lambda = 500 \times 10^{-9} m$ and the distance of the from the telescope is 4×10^5 kilometers.

2. Define the term "Resolving power of the telescope". Give the mathematical for resolving power of the telescope.

Two stars have an angular separation of 1×10^{-6} radian. They both emit lig wavelengths $5770 A^0$ and $5790 A^0$. How large a diameter of the lens in the telesc needed to separate the images of the two stars?