EASTERN UNIVERSITY, SRI LANKA

FIRST EXAMINATION IN SCIENCE - 2002/2003

(FIRST SEMESTER)

(JUNE-AUGUST 2004)

EXTERNAL DEGREE

EXPH 102-PHYSICAL OPTICS I

Time: 01 hour.

Answer All questions.

1. (a) Derive an expression for fringe width obtained on a screen when monochromatic light from a narrow slit falls on two parallel slits.

   (b) A beam of light consisting of two wavelengths $6500A^0$ and $5200A^0$ is used to obtain interference fringes in a Young's double slit experiment.

   (i) Find the distance of the third bright fringe on the screen from the central maximum for $\lambda = 6500A^0$.

   (ii) What is the least distance from the central maximum when the bright fringe due to both the wavelengths coincide.

   Assume that the distance between the slits is $2mm$ and the distance between the planes of slits and the screen is $120cm$.

2. (a) Sketch a diagram for the experimental arrangement for Newton's rings when convex side of a convex lens placed on a glass surface'

   (b) Show that the diameter of the dark ring in the newton's ring experiment is given by

$$d_m^2 = (4R\lambda)m$$

   where d_m is the diameter of the m^{th} order dark ring and R is the radius of the curvature.

   In a Newton's ring experiment the diameter of the 5^{th} dark ring is reduced half of its value on introducing a liquid below the convex surface. Calculate the refractive index of the liquid.

You may assume the following expression for the path difference between two rays

$$\triangle = 2\mu dcos\theta - \frac{\lambda}{2}$$

where the symbols have their usual meanings.