EASTERN UNIVERSITY, SRI LANKA

FIRST EXAMINATION IN SCIENCE - 2001/2002

(APRIL 2002)

PH 102 PHYSICAL OPTICS I

Time: 01 hour.

Answer ALL Questions

1. Draw a clearly labelled diagram of the experimental arrangement which would help to demonstrate straight line wedge fringes. Give a brief discussion on the formulation of such fringes.
Show that the phase difference between the beams that produce interfering fringes in a thin transparent film of varying thickness is

$$\frac{2\pi}{\lambda} 2\mu d Cos\theta$$

where the symbols have their usual meanings.

A parallel beam of monochromatic light of wave length 5460 A^0 falls at the angle of incidence of 30^0 on the surface of a very thin wedge of glass. The straight parallel interfering fringes were observed and it was found that the distance between successive bright fringes is exactly $1mm$. Calculate the angle of wedge which has the refractive index $\mu = 1.5$.

2. Explain what is meant by "fringes of equal thickness" and "fringes of equal inclination".
An equi-convex lens is placed on a flat plate in a Newton's ring arrangement. The refractive index of the glass is 1.5 and the focal length of the lens is 1 meter. The wave length of the light used is $589nm$.

   (i) Draw a simple diagram to show how a single beam is divided to produce interfering pattern in Newton's ring arrangement.

   (ii) Find the order of the bright ring of radius $20mm$.

   (iii) How many bright rings would be produced if the water of refractive index 1.33 is between the lens and the flat plate.