EASTERN UNIVERSITY, SRI LANKA

FIRST EXAMINATION IN SCIENCE – 2016/2017

SECOND SEMESTER (MARCH/APRIL 2019)

PH 102 PHYSICAL OPTICS I

Time: 01 hour.

Answer ALL Questions

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1. Considering light as a wave, obtain an expression for the resultant intensity pattern arising due to interference of two monochromatic light beams of the same wavelength but different intensities. Obtain the condition for minimum and maximum intensities.

   In a Young's Double Slit Experiment, two straight and parallel narrow slits are illuminated by a monochromatic light of wavelength 5900 Å. Fringes are observed on a screen distanced 0.60 m from the double slit, and measured to be of width 0.12 mm. Find the separation between the double slits.

2. Figure 1 shows two mutually coherent monochromatic light beams obtained by division of amplitude, and the phase difference between the two beams are given by $\delta = \frac{2\pi}{\lambda} 2d\cos\theta \pm \pi$, where "+" is when $\mu < \mu_1$ and "–" is when $\mu > \mu_1$.

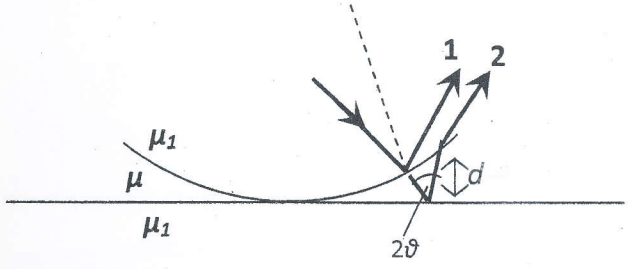

Figure 1

(a) If r_m is the radius of m^{th} order dark fringe and R is the radius curvature of the curved surface, then show that the height of the film at m^{th} order is given by $d_m = \frac{r_m^2}{2R}$.

(b) Distinguish "fringes of equal thickness" from "fringes of eq inclination".

(c) If the condition for dark fringes is $\delta = (2m + 1)\pi$, where m is integer, then deduce that the height of the air film at m^{th} orde $d_m = \frac{m\lambda}{2}$.

(d) If radius of curvature R = 26.1 m and wavelength of the fri observed is 568 nm, then calculate the radius of 10^{th} order dark ri