EASTERN UNIVERSITY, SRI LANKA

FIRST EXAMINATION IN SCIENCE – 2013/2014

FIRST SEMESTER (April/ May- 2016)

PH 102 PHYSICAL OPTICS-I

l hour.

ALL Questions

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t is meant by interference of light and explain the conditions necessary for the erence fringes to be visible.

e arrangement shown in figure 1, the phase difference between the two interfering ns is given by $\delta = \frac{2\pi}{\lambda}\left(\frac{xd}{D}\right) + (\alpha_1 - \alpha_2)$, where $(\alpha_1 - \alpha_2)$ is the initial phase difference.

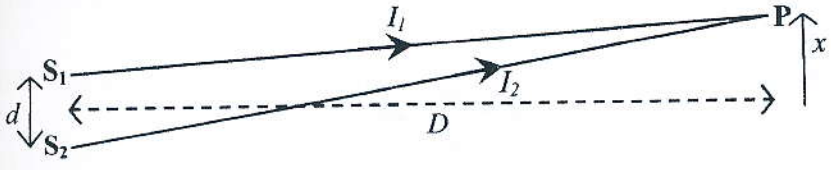

Figure 1

w the Lloyd's Mirror experimental arrangement by a schematic diagram and describe the necessary conditions to observe interference are met with a single source.

w that the phase difference in the Lloyd's Mirror experiment is given by,

$$\delta = \frac{2\pi}{\lambda}\left(\frac{xd}{D}\right) + \pi$$

re the symbols have their usual meanings.

Lloyd's mirror experiment, a source of 580 nm wavelength is placed in front of a screen 00 cm to obtain the interference fringes. Calculate the distance between the source and image (virtual source), if the fourth order dark fringe is measured to be 5 cm above the izontal axis through the mirror. Take the condition for dark fringe formation is $= (2m + 1)\pi$, where m is an integer.

2. Distinguish the methods "division of wave front" and "division of amplitude" which are to obtain two mutually coherent beams from a single source to observe interference.

Consider a thin transparent wedge film of varying thickness and having refractive index μ

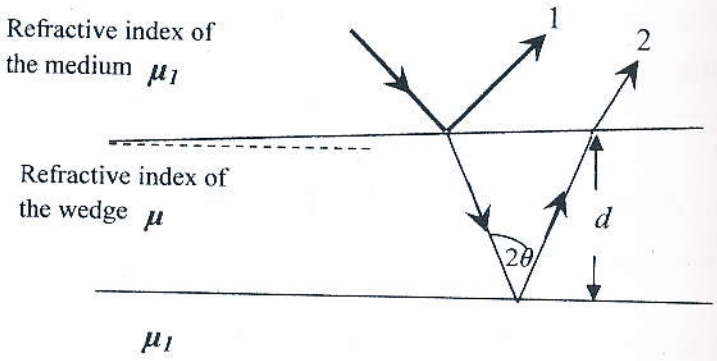

Figure 2

(a) Show that the phase difference between the two interfering beams (i.e. beams 1 and 2) is given by,

$$\delta = \frac{2\pi}{\lambda} 2\mu d \cos\theta \pm \pi ,$$

where "+" is when $\mu < \mu_1$ and "–" is when $\mu > \mu_1$.

(b) In a Wedge Film experimental arrangement, show that the width of a bright fringe is given by,

$$\beta = \frac{\lambda D}{2d}$$

Take the condition for bright fringe formation as $\delta = 2m\pi$, where m is an integer.

(c) Interfering fringes are observed in a thin glass wedge, which is kept in air having inclination angle 0.5' (0.5 minute of arc). The spacing between two successive bright fringes is 1.5 mm, calculate the vacuum wavelength of the light source used.