Birla Institute of Technology and Science - Pilani,
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First Sem.' 2017-18 Course No :- PHY F213, Course Title:- OPTICS

Assignment - III

MM = 50, Assignment date = 26/10/17, Due date 14/11/17; Time 10:00 am

Q1. Consider the interference pattern produced by three slits of very small widths. The positions of the slits are $S_1(0, d, 0)$, $S_2(0.0.0)$ and $S_3(0, -3d/2, 0)$. The light emitted from the three slits are all in the same phase and have equal amplitudes = A.

a) Determine at what value of $\theta = \theta_1$ measured from the origin, will the principal maxima be formed.

b) Calculate the Intensity distribution function $I(\theta)$

5+10 = 15

Q2. a) White light is incident normally on a thin film which has $n = 1.5$ and a thickness $t = 5000^o$A. For what wavelengths in the visible spectrum (4000 to 7000)^{o}A, will the intensity of reflected light be maximum.

b) It is required that the reflection (at near normal incidence) from a glass surface ($n_{\text{glass}} = 1.4$) is minimised by coating it with a thin film of transparent polymer of refractive index $n_{\text{film}} = 1.2$. Determine the minimum thickness t_{min} of the film for the reflection of light of wavelength $\lambda = 6000^o$A light from the glass surface to be minimized.

c) Although at a thickness $t = t_{\text{min}}$ of the film [Ref (**Q2.** b) above] there will be minimum reflection, the intensity of the reflected light is not exactly zero. If it is possible to change the refractive index of the film, what should be the refractive index of the film (at the same thickness) in order that the intensity for the reflected light is exactly zero. Again assume near normal incidence and $\lambda = 6000^o$A

5+5+5 = 15

Q3. Consider a very long parallel plate of glass (Refractive index $n = 1.6$) and of uniform thickness $t = 25000^o$A. If light of intensity $I_0 = 10^{-5}$W/m^2 is incident on the plate at an incident angle of 45^o, determine the intensity of the light in the

a) reflection zone

b) transmission zone

Note include the contribution of all the multiply reflected rays within the glass plate.

10+10 = 20