interference will be observed that is in case of white light then there is no thick film, the condition of constructive interference at a given point is satisfied by a large number of colours and at the same point the condition is destructive interference is also satisfied. And hence as a result the intensity at a given point is almost equal to zero (0), that is why in case of a thick film eliminated by white light, then the colours are not observed in the reflected light.

## Numerical

(1) The light of wavelength 5893 Å is reflected from a soap film of refractive index 1.42. Then calculated the thickness of the film in the case of black and bright when it is eliminated by reflected light.

Soln. Given :-

$\lambda = 5893$ Å

$\mu = 1.42$

Case-I For Maximum Intensity :-

$$2\mu t\cos r = (2n+1)\frac{\lambda}{2} \quad \text{——— (1.)}$$

Here, $\mu = 1.42$

Angle of inclination is very small

$\therefore r = 0^\circ$

$n = 1$

$$2\mu t = \frac{3\lambda}{2}$$

$$t = \frac{3\lambda}{4\mu}$$

or,

$$t = \frac{3 \times 5893}{4 \times 1.42} = \frac{17679}{5.63}$$

$\therefore t = 3140.14\ \text{Å}$ Ans

Case II. For Minimum Intensity :-

$$2\mu t\cos r = n\lambda \quad \text{— (2.)}$$

Here,

$\mu = 1.42$

Angle of inclination is very small

$\therefore r = 0^\circ$

$n = 1$

$$2\mu t = \lambda$$

$$t = \frac{\lambda}{2\mu} = \frac{5893}{2 \times 1.42} = \frac{5893}{2.84}$$

$\therefore t = 2075\ \text{Å}$ Ans

Qus: What do you mean by fringes of equal thickness and the fringes of equal inclination?

Ans:- We know that the fringes in the film changes due to the change in the path difference ($2\mu t\cos\gamma$) between the interfering rays. It means that for a given film the path difference changes

1. With the change of thickness
2. With the change of angle reflection '$\gamma$' inside the film.

When the thickness of the film rapidly changes then the rays from various positions of the film reaching the eye placed at some distance have almost the same inclination. Therefore the path difference ($2\mu t\cos r$) between the coherent rays changes mainly due to the change of thickness and such like fringes are called fringes of equal thickness such as Newton's rings.

On the other hand, if the film is of uniform thickness then the path difference ($2\mu t\cos r$) between the coherent rays can changes only with the inclination and such like fringes are called fringes of equal inclination such as fabri-perot interferometer.