but $4m\lambda R = (D^2_{m+n} - D^2_n)_{air}$

∴ Equation (5) can be written as

$$\mu = \frac{(D^2_{m+n} - D^2_n)_{air}}{(D^2_{m+n} - D^2_n)_{medium}}$$

Thus just by knowing diameters of nth & (n+m)th dark ring with air film & then with liquid film we can calculate RI of the liquid using above formula

Important formulae

1.) In case of parallel films

Path difference $\delta = 2\mu t \cos r - \frac{\lambda}{2}$

For constructive interference

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

For destructive interference

$2\mu t \cos r = n\lambda$

2) Wedge shaped films.

Fringe width.

$$\beta = \frac{\lambda}{2\mu\theta}$$

3) Newtons rings.

For only 1 ring

$D_n = 2\sqrt{n\lambda R}$

$D_n^2 = 4n\lambda R$

$R = \frac{D_n^2}{4n\lambda}$ or $\lambda = \frac{D_n^2}{4nR}$

For a liquid film

$D_n^2 =$

$$D_n^2 = \frac{4n\lambda R}{\mu}$$

$$\mu = \frac{4n\lambda R}{4 D_n^2}$$

4) For 2 rings

$$\mu = \frac{(D^2_{m+n} - D_n^2)\ \text{air}}{(D^2_{m+n} - D_n^2)\ \text{liquid}}$$

2Q

5) $$R = \frac{D^2_{m+n} - D_n^2}{4m\lambda}$$

6) $$\mu = \frac{4m\lambda R}{(D^2_{m+n} - D_n^2)\ \text{liquid}}$$

Numericals:-

1Q Fringes of equal thickness are observed in a thin glass wedge of refractive index 1.52. The fringe spacing is 0.1 cm. wavelength of light is 589.3 nm calculate wedge angle.

→ Given

$\mu = 1.52$

$\lambda = 589.3 \times 10^{-9}$

$\beta = 0.1 \times 10^{-2}$

Q.3