

EC5103
Quiz#6
Name:

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What is the angular separation in second order between light of wavelengths 400 nm and 600 nm when diffracted by a grating of 5000 grooves/cm?

$$\text{Sol)} \quad m\lambda = a \sin \theta, \quad a = \frac{1}{5000} \text{ (cm)} = 2 \text{ (mm)}$$

for $m=2$,

$$\theta_1 = \sin^{-1} \left(\frac{m\lambda_1}{a} \right) = \sin^{-1} \left(\frac{2 \cdot 4 \times 10^{-7}}{2 \cdot 10^{-6}} \right)$$

$$= 23.58^\circ$$

$$\theta_2 = \sin^{-1} \left(\frac{m\lambda_2}{a} \right) = \sin^{-1} \left(\frac{2 \cdot 6 \times 10^{-7}}{2 \cdot 10^{-6}} \right)$$

$$= 36.87^\circ$$

\therefore The angular separation is

$$\Delta \theta = \theta_2 - \theta_1 = \underline{\underline{13.29^\circ}}$$