

**Q4.** The visible spectrum ranges from  $4000\text{\AA}$  to  $7000\text{\AA}$ . Find the angular breadth of the first order visible spectrum produced by a plane grating having 6000 lines/cm when light is incident normally on the grating.

**Given:-**  $\lambda_1 = 4000\text{\AA} = 4 \times 10^{-5} \text{ cm}$      $\lambda_2 = 7000\text{\AA} = 7 \times 10^{-5} \text{ cm}$      $n=1$   
 $a+b = 1/6000 \text{ lines per cm}$

**Formula:-**  $(a + b) \sin \theta = n \lambda$

**Solution:-**  $(a + b) \sin \theta_1 = \lambda_1$

$$\theta_1 = \sin^{-1} \frac{\lambda_1}{a+b} = \sin^{-1}(4 \times 10^{-5} \times 6000) = 13.88^\circ$$

$$(a + b) \sin \theta_2 = \lambda_2$$

$$\theta_2 = \sin^{-1} \frac{\lambda_2}{a+b} = \sin^{-1}(7 \times 10^{-5} \times 6000) = 24.83^\circ$$

$$\theta_2 - \theta_1 = 24.83 - 13.88 = 10.95^\circ$$

**Ans :- The Angular separation =  $10.95^\circ$**