

- 06** A parallel beam of light of wavelength 500 nm falls on a narrow slit and the resulting diffraction pattern is observed on a screen 1 m away. It is observed that the first minimum is at a distance of 2.5 mm from the centre of the screen. Find the width of the slit.

Sol. Given, $D = 1$ m, $n = 1$

$$x = 2.5 \text{ mm} = 2.5 \times 10^{-3} \text{ m}$$

$$\lambda = 500 \text{ nm} = 500 \times 10^{-9} \text{ m} = 5 \times 10^{-7} \text{ m}$$

Using formula, $x = n \frac{\lambda D}{d}$

$$\Rightarrow d = \frac{n\lambda D}{x}$$

$$\text{or } d = \frac{1 \times 5 \times 10^{-7} \times 1}{2.5 \times 10^{-3}} = 2 \times 10^{-4} \text{ m} = 0.2 \text{ mm}$$