

## Previous Year JEE Questions

**Q2: A single slit of width  $b$  is illuminated by coherent monochromatic light of wavelength  $\lambda$ . If the second and fourth minima in the diffraction pattern at a distance 1 m from the slit are at 3 cm and 6 cm, respectively from the central maximum, what is the width of the central maximum? (i.e. the distance between the first minimum on either side of the central maximum)**

- (a) 6.0 cm
- (b) 1.5 cm
- (c) 4.5 cm
- (d) 3.0 cm

### **Solution**

For single slit diffraction,  $\sin \theta = n\lambda/b$  ( $n = 1, 2, 3 \dots$ )

$$\sin \theta \approx \theta \approx \tan \theta$$

$$b \tan \theta = n\lambda$$

$$b \tan \theta_1 = 2\lambda$$

$$b (y_1/d) = 2\lambda$$

$$b \tan \theta_2 = 4\lambda$$

$$b (y_2/d) = 4\lambda$$

$$(y_2 - y_1) b/D = 2\lambda$$

$$(6 - 3) b/D = 2\lambda$$

$$3b/D = 2\lambda$$

$$\lambda D/b = 3/2 = 1.5 \text{ cm}$$

**Answer: (b) 1.5 cm**