

# NCERT 11.15. Q10

EE23BTECH11010 - Venkatesh Bandawar\*

**Question:** For the travelling harmonic wave  $y(x, t) = 2.0 \cos 2\pi (10t - 0.0080 x + 0.35)$  where  $x$  and  $y$  are in cm and  $t$  in s. Calculate the phase difference between oscillatory motion of two points separated by a distance of

- (a) 4 m,
- (b) 0.5 m,
- (c)  $\lambda/2$ ,
- (d)  $3\lambda/4$

**Solution:**  $K = 2\pi(0.008)$

$$\therefore K = \frac{2\pi}{\lambda}$$

$$\lambda = \frac{2\pi}{K}$$

$$\lambda = \frac{2\pi}{2\pi \times 0.008}$$

$$\lambda = 125$$

$$\therefore \text{phase difference (in radians)} = \frac{\text{distance between two points}}{\lambda} \times 2\pi$$

$$\begin{aligned} \text{(a) phase difference} &= \frac{4}{125} \times 2\pi \\ &= \frac{8\pi}{125} \text{ radians} \end{aligned}$$

$$\begin{aligned} \text{(b) phase difference} &= \frac{0.5}{125} \times 2\pi \\ &= \frac{\pi}{125} \text{ radians} \end{aligned}$$

$$\begin{aligned} \text{(c) phase difference} &= \frac{125/2}{125} \times 2\pi \\ &= \pi \text{ radians} \end{aligned}$$

$$\begin{aligned} \text{(d) phase difference} &= \frac{3 \times 125/4}{125} \times 2\pi \\ &= 3\pi/2 \text{ radians} \end{aligned}$$