If two SHMs are represented by equations $y_1 = 10 \sin\left(3\pi t + \frac{\pi}{4}\right)$ and $y_2 = 5\left[\sin(3\pi t) + \sqrt{3}\cos(3\pi t)\right]$, the ratio of their amplitudes is: (A) 2 : 1 (B) 1 : 1 (C) 10 : 3 (D) 4 : 1

Solution

$$y_{2} = 5 \left[\sin(3\pi t) + \sqrt{3}\cos(3\pi t) \right] = 10 \left[\sin(3\pi t) \frac{1}{2} + \frac{\sqrt{3}}{2}\cos(3\pi t) \right]$$

$$\therefore y_{2} = 10 \sin\left(3\pi t + \frac{\pi}{3}\right)$$

It can be seen that amplitudes are same for both $y_1 \& y_2$. So, the ratio of amplitudes = 1 : 1. Hence, (B)