

## Problem-3: Answer

Given,

$$y = 3 \cos(\pi/4 - 2\omega t) \quad (1)$$

Velocity,

$$v = \frac{dy}{dt} \quad (2)$$

$$= 3 \times 2\omega \sin(\pi/4 - 2\omega t) \quad (3)$$

Acceleration,

$$a = \frac{dv}{dt} \quad (4)$$

$$= -4\omega^2 \times 3 \cos(\pi/4 - 2\omega t) \quad (5)$$

$$= -4\omega^2 y \quad (6)$$

As  $a \propto y$  and the negative sign shows that it is directed towards equilibrium (or mean position), hence the particle will execute SHM.

Comparing Eqn. (1) with the equation

$$y = r \cos(\phi - \omega t) \quad (7)$$

we have,

$$\omega^2 = 2\omega \quad (8)$$

or,

$$\frac{2\pi}{T^2} = 2\omega \quad (9)$$

$$T^2 = \frac{\pi}{\omega}. \quad (10)$$