

春一周2

1.  $x(t) = A \sin(\omega t + \varphi)$

$$v(t) = \dot{x}(t) = A\omega \cos(\omega t + \varphi)$$

$$a(t) = \ddot{x}(t) = -A\omega^2 \sin(\omega t + \varphi)$$

$$\omega = 80\pi \text{ rad/s}$$

$$a_{\max} = A\omega^2 = 5g = 5 \times 9.8 \Rightarrow A = 7.76 \times 10^{-4}$$

$$x_{\max} = A = 7.76 \times 10^{-4} \text{ m}$$

$$v_{\max} = A\omega = 0.195 \text{ m/s}$$

2.  $x = 0.5 \sin \omega t + 0.3 \cos \omega t$

$$v = \dot{x} = 0.5\omega \cos \omega t - 0.3\omega \sin \omega t$$

$$a = \ddot{x} = -0.5\omega^2 \sin \omega t - 0.3\omega^2 \cos \omega t$$

$$= -\omega^2 (0.5 \sin \omega t + 0.3 \cos \omega t)$$

$$= -\omega^2 x$$

∴ 此振动为简谐振动

$$\omega = 10\pi \text{ rad/s} \Rightarrow f = 5 \text{ Hz} \quad T = 0.2 \text{ s}$$

$$A = \sqrt{0.5^2 + 0.3^2} = \frac{\sqrt{34}}{10}$$

$$\varphi = \arctan \frac{0.3}{0.5} = 0.54 \text{ rad/s}$$

$$\therefore x = \frac{\sqrt{34}}{10} \sin(10\pi t + 0.54) \quad (\text{cm})$$

$$v = \dot{x} = \sqrt{34}\pi \cos(10\pi t + 0.54) \quad (\text{cm/s})$$

$$a = \ddot{x} = -10\sqrt{34}\pi^2 \sin(10\pi t + 0.54) \quad (\text{cm/s}^2)$$





