Tawhidul Islam Phy105 5

Sub: 011192118 Section A

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(Q)

Qsn 2 (b)

$$\frac{a_{max}}{V_{max}} = \frac{\omega^2 A}{\omega A}$$

$$\frac{1.57}{1} = \omega$$

$\omega = 1.57$ rad/se.

$$T = \frac{2\pi}{\omega} = \frac{2 \times 3.1416}{1.57} = 4 \text{ Sec}$$

ii) time period of oscillation 4 Sec

$A\omega = 1$

$A(1.57) = 1$

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$A = 0.637\ m$

(i)

amplitude $A = 0.637\ m$

Ans

Qn 2 (c)

$y = 10 \sin \pi (10t - \frac{\pi}{6} x)$

$y = 10 \sin \frac{\pi}{6} \times \pi \left(\frac{10}{\frac{\pi}{6}} t - x \right)$

$= 10 \sin \frac{\pi^2}{6} (19.1t - x)$

(i)

$A = 10\ m$

(iii)

$\frac{\pi^2}{6} = \frac{2\pi}{\lambda}$

$\lambda \pi^2 = 2\pi 6$

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$$\lambda = \frac{2\pi 6}{\pi^2}$$

$$= 3.812 m$$

(iv)

$v = f\lambda$

$19.1 = f \times 3.82$

$$\frac{19.1}{3.82} = f$$

$f = 5 \text{ Hz}$.

(ii)

$v = 19.1 \text{ ms}^{-1}$

Ans 2

(a)

minimum velocity can be found at amplitude of a motion

maximum velocity can be found at equilibrium of a motion

$T = 4 \times t = 4 \times 0.25 = 1s$ Ans

(ii)

Frequency $= \frac{1}{T} = 1$ Hz

iii

amplitude of motion $A = 36$ cm
$= 0.36$ m

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(iv)

$x = 18cm$

$= 0.18m$

$\omega = 2\pi f$

$= 2 \times 3.1416 \times 1 = 6.2832 \text{ rad s}^{-1}$

$v = \omega\sqrt{A^2 - x^2}$

$= 6.2832\sqrt{(0.36)^2 - (0.18)^2}$

$= 1.958908 \text{ ms}^{-1}$

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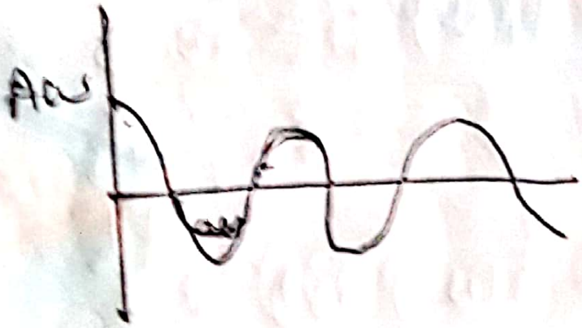
Ans to the qsn No: (a)

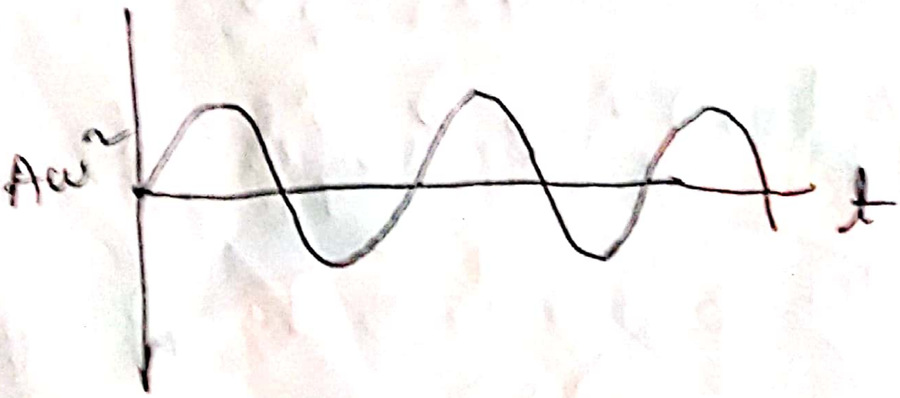
$$y = A\,\omega\cos\left(-\omega t - \delta - \frac{\pi}{2}\right)$$

$$v = \frac{dy}{dt} = A\omega^2 \sin\left(-\omega t - \delta - \frac{\pi}{2}\right)$$

displacement graph



velocity graph



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Ans 1 (b)

$$x = x_m e^{-\delta t} \cos(\omega_d t + \phi)$$

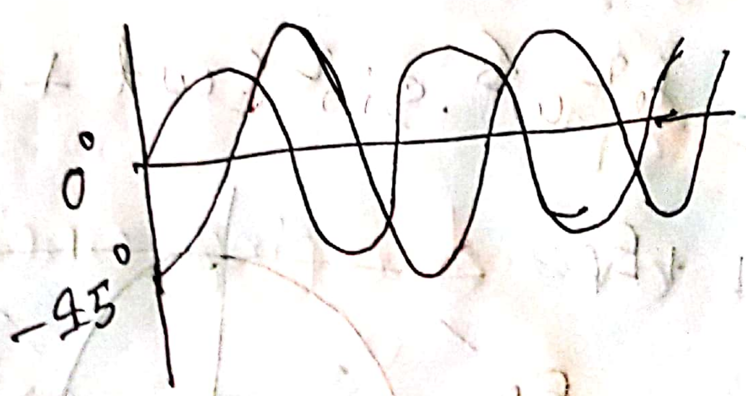
i) damping amplitude $= x_m e^{-\delta t}$.

ii) Damping frequency $= \omega_d$

iii) Damping energy $= k x_m^2 e^{-\delta t}$

Ans 1 (c)

$$\delta = -\frac{\pi}{4} = -45^\circ$$



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Ans. to the qsn No: 4.

$x(t) = a\omega^3 \sin(\omega t + 6.5^\circ)$

$E_k = \frac{mv^2}{2}$

$E_p = \frac{kx^2}{2}$

$x(t) = a\omega^3 \sin(\omega t + 65^\circ)$

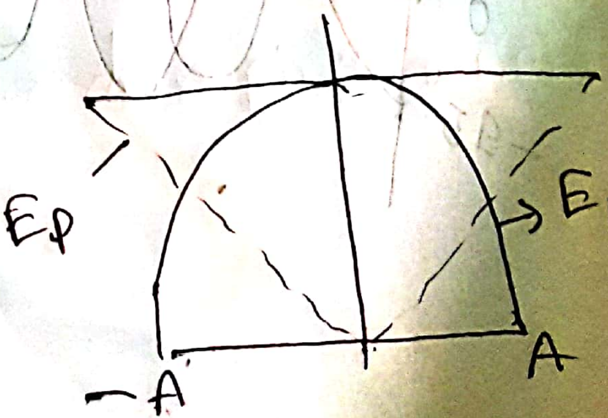
$v(t) = \frac{dx}{dt}$

$= a\omega^4 \cos(\omega t + 65^\circ)$

$E_k = \frac{m}{2} a^2\omega^8 \cos^2(\omega t + 65^\circ)$

$E_p = \frac{k}{2} a^2\omega^6 . \sin^2(\omega t + 65^\circ)$

$E_T = E_k + E_p$



$E_T = \frac{1}{2} m\omega^2 a^2$

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Ans 2 (b)

(iii)

$m = 25\ gm$

$= 0.025.$

$\omega^2 = \frac{k}{m}$

$k = \omega^2 \times m = (1.57)^2 \times 0.025$

$= 0.0616$

$\therefore$ Total Energy $E = \frac{1}{2} k A^2$

$= \frac{1}{2} \times 0.616225 \times (0.637)^2$

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Ans 3 (a)

$C = 10 \times 10^{-6} F$

$L = 0.2 \times 10^{-3} h$

$R = 600 \Omega$.

$$\frac{1}{LC} = \frac{1}{0.2 \times 10^{-3} \times 10 \times 10^{-6}}$$

$$= 5 \times 10^{8}$$

$$\frac{R^2}{4L^2} = \frac{(600)^2}{4 \times (0.2 \times 10^{-3})^2}$$

$$= 2.25 \times 10^{-2}$$

$$\frac{1}{LC} < \frac{R^2}{4L^2}$$

It is a over damping oscillation

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(iii)

$L = 2 \times 10^{-9}$ H

$R = 600 \Omega$

$C = 10 \times 10^{-6}$ F

Resonant Freq $= \frac{1}{2\pi}\sqrt{\frac{1}{LC}}$

$= \frac{1}{2\pi}\sqrt{\frac{1}{(2\times10^{-4})\times(2\times10^{-4})}}$

$= 3558.80$ H

ii) It has no damping oscillation

$\omega = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}}$

$= \sqrt{\frac{1}{(0.2\times10^{-3})} - \frac{(600)^2}{4\times(0.2\times10^{-3})^2}}$

= undefiend.

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(iv)

$$T = 2\pi\sqrt{LC}$$

$$= 2\pi\sqrt{0.2\times10^{-3}\times10\times10^{-6}}$$

$$= 2.81\,S$$

Ans:

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