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Qnn 4

$m = 250\,g$

$= .25\,kg$

$k = 83\ N/m$

$b = 70\,g/s$

$= 0.07\,kg/s$

$C = 0.03\,F$

$L = 0.1\,H$

i

$$T = 2\pi\sqrt{\frac{m}{k}}$$

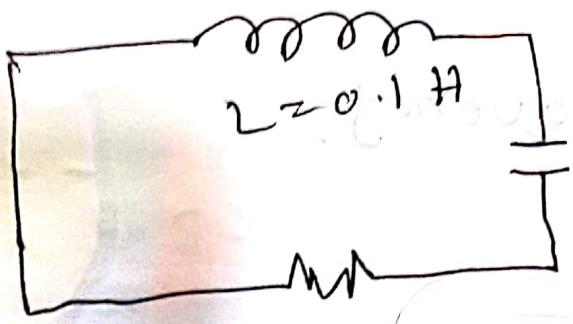
$$= 2\pi\sqrt{\frac{.25}{83}}$$

$= 3.4485$

$= 0.3498\,S$ Ans

তারিখ : .....

ii



$$R_{max} = \sqrt{\frac{4L^2}{LC}}$$

$$= \sqrt{\frac{4\times(0.1)^2}{0.1\times 0.03}}$$

$$= 13.333\ \Omega$$

So that R_{max} in 13.333 Ω or smaller value to become oscillatory.

তারিখ : .....

iii

Resonant Frequency.

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

$$= \frac{1}{\sqrt{0.1 \times 0.03}}$$

$$= \frac{1}{0.055}$$

$$= 18.182 \text{ rad/sec}$$

iv

$$\text{life time} = \frac{1}{\gamma}$$

$$= \frac{1}{\frac{b}{m}}$$

$$= \frac{m}{b} = \frac{.25}{0.07} = 3.571 \, s^{-1}$$

V

$$t = \frac{-m \ln \frac{1}{2}}{b}$$

$$= \frac{-25 \ln \frac{1}{2}}{0.07}$$

$$= 247.553\ S \quad 2.476\ S$$

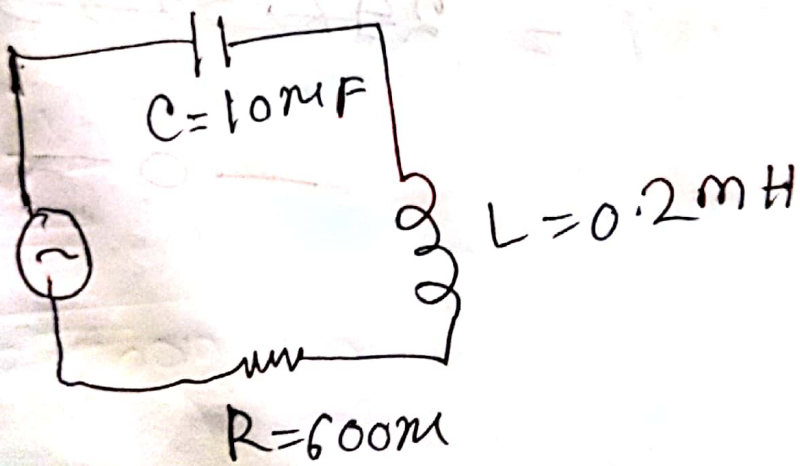
— 0 —

Qn 3

$C = 10\mu F$

$L = 0.2\,mH = 0.2 \times 10^{-3}\,H$

$R = 600\,\Omega$



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

$$= \frac{}{} = 0.0225$$

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

$$= \frac{1}{2 \times 10^{-6}}$$

তারিখ : .....

$= 5 \times 10^{-10}$ $\quad 9 \times 10^{-8}$

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

The circuit is overdamped DHM.

(ii)

damping frequency.

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

$$= \sqrt{\frac{1}{10 \times (1 \times 10^{-6})} - \frac{(600)^2}{4 \times (0.2 \times 10^{-3})^2}}$$

$$= \sqrt{100000 - 9 \times 10^{-4}}$$

$$= 3.16.228$$

Ans

iii

Resonant Frequency

$$f_0 = \frac{1}{2\pi\sqrt{LC}}$$

$$= \frac{1}{2\pi\sqrt{(0.2\times10^{-3}) \times (10\times(1\times10^{-6}))}}$$

$$= \frac{1}{2.8099\times10^{-4}}$$

$$= 3558.896$$

A

Qn 5

$y = -4\cos(\omega t + \delta)$

$\lambda = 27\text{cm} = 27 \times 10^{-2}$

$A = 4 \quad \omega = ?$ (ii)

$\omega = 2\pi f$

$= \frac{2\pi}{T}$

$T = 2\pi\sqrt{\frac{L}{g}} = 2\pi\sqrt{\frac{27 \times 10^{-2}}{9.8}}$

$= 1.042$

(i)

$\omega = \frac{2 \times 3.1416}{1.042}$

$= 6.029 \text{ rad/s}$

iii

$$\omega = 6.029 \text{ rad/s}$$

$$2\pi T = 6.029$$

$$T = \frac{6.029}{2\pi}$$

$$= 1.042$$

iv

$$f = \frac{1}{T}$$

$$= \frac{1}{1.042} = 0.95 \text{ Hz}$$

(v)

$$a_{max} = A\left(\frac{2\pi}{T}\right)^2$$

$$= A\omega^2$$

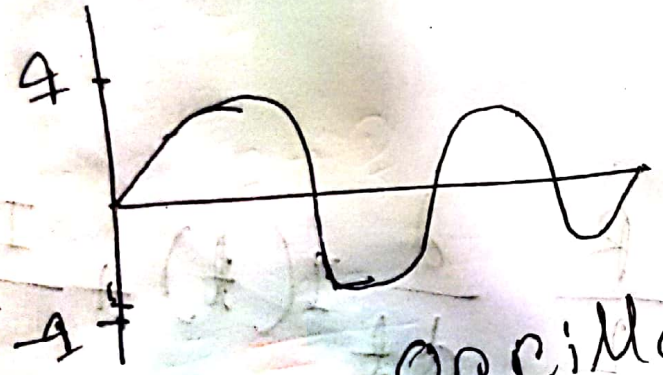
$$= 4 \times (1.042)^2$$

$= 4.34 \, ms^{-1}$

Ans.

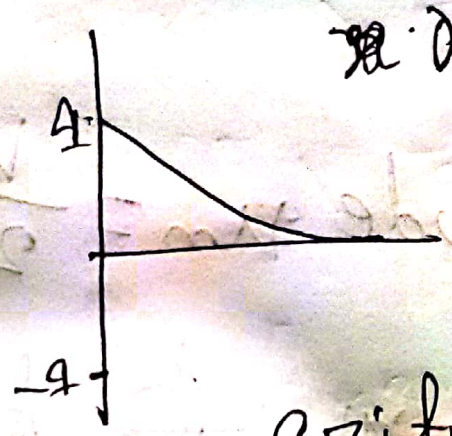
Qsn 2

$w/\gamma = 2$



Oscillatory.

$w/\gamma = 0.25$



critical damping

Qm 1

(i)

$$\omega_0 = \frac{2\pi}{T} \qquad \alpha = \frac{k}{2m}$$

(ii)

$$\frac{d^2 I(t)}{dt^2} + \frac{R}{L} \frac{d}{dt} I(t) + \frac{I(t)}{LC} = 0$$

(iii)

damping amplitude $= \frac{k}{2m} t$

damping energy = $\frac{}{2m} t$