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তারিখ : .....

Qn : 2

$$y_{1,2} = A\cos\left(\frac{2}{3}kx \pm \omega t\right)$$

$$y_1 = A\cos\left(\frac{2}{3}kx - \omega t\right) \quad \text{——} (1)$$

$$y_2 = A\cos\left(\frac{2}{3}kx + \omega t\right) \quad \text{——} (2)$$

$k \rightarrow$ wave number

$\omega \rightarrow$ angular frequency.

$$y = y_1 + y_2$$

$$= A\cos\left(\frac{2}{3}kx - \omega t\right) + A\cos\left(\frac{2}{3}kx + \omega t\right)$$

$$= A\left[\cos\underbrace{\left(\frac{2}{3}kx - \omega t\right)}_{A} + \cos\underbrace{\left(\frac{2}{3}kx + \omega t\right)}_{B}\right] \quad \text{——} (3)$$

Again

$$\cos A + \cos B = 2\cos\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)$$

From eqn 3

তারিখ : .....

$$y = A \cdot 2\cos\left(\frac{\frac{2}{3}kx - \omega t + \frac{2}{3}kx + \omega t}{2}\right)$$

$$\cos\left(\frac{\frac{2}{3}kx - \omega t - \frac{2}{3}kx + \omega t}{2}\right)$$

$$= 2A\cos\frac{\frac{4}{3}kx}{2}\cos\left(\frac{-2\omega t}{2}\right)$$

$$= 2A\cos\frac{2}{3}kx\cos\omega t$$

$$y = A_0\cos\omega t$$

$A_0 \rightarrow$ resultant amplitude

$$A_0 = 2A\cos\frac{2}{3}kx.$$

P.T.O

তারিখ : .....

Node point: (for minimum amplitude/ displacement:)

$$\cos\frac{2}{3}kx = 0$$

$$\frac{2}{3}\cos kx = \cos(0)$$

$$\frac{2}{3}kx = 1$$

$$kx = \frac{3}{2}$$

$$x = \frac{3}{2k}$$

$$x = \frac{3}{2\left(\frac{2\pi}{\lambda}\right)}$$

Nodes are separated by $\frac{\lambda}{2\pi}$

তারিখ : .....

Antinode point:

$$\cos\frac{2}{3}kx = \pm 1$$

$$\frac{2}{3}\cos\left(\frac{kx}{2}\right) = \cos\left(\frac{\pi}{2}\right)$$

$$\therefore \frac{2}{3}\left(\frac{kx}{2}\right) = \frac{\pi}{2}$$

$$kx = \frac{3\pi}{4}$$

$$= (2n+1)\frac{3\pi}{4}$$

$$x = \frac{(2n+1)\frac{3\pi}{4}}{k}$$

$$= \frac{(2n+1)\frac{3\pi}{4}}{\frac{2\pi}{\lambda}}$$

$$= 2n+1 \cdot \frac{3\pi}{4} \times \frac{\lambda}{2\pi}$$

$$= (2n+1)\frac{\lambda}{8}$$

Ans.

Sub :

Day

Time : Date : / /

$x = \frac{2n+1}{4} \times$ ..

$x = \frac{2n+1}{4} \times \frac{\lambda}{2}$

$\therefore x = \left(n + \frac{1}{2}\right) \times \frac{\lambda}{2}$

Antinodes are separated by

$\frac{\lambda}{2}$

Ans:

তারিখ : .....

Qn 4

$R = 20\Omega$

$L = 10mH = 10 \times 10^{-3} = 0.01\ H$

voltage amplitude $V = 169.7\ V$.

1) ~~Resonant frequency~~

Resonance.

$$I = \frac{V_m}{R}$$

$$= \frac{169.7}{20}$$

$$= 8.485\ A.$$

$\omega_0 = 15\ kHz$

$= 15000\ Hz$

ii) The bandwidth:

$$B = \frac{R}{L}$$

$$= \frac{20}{1}$$

$$= 20 \text{ krad/S}$$

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

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

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

$$C = \frac{\sqrt{\frac{1}{\omega_0}}}{L}$$

$$= 8.165 \times 10^{-3}$$

The quality factor

$$Q = \frac{\omega_0}{B}$$

$$= \frac{15000}{20} = 750$$

iii) $$\omega_1 = -\frac{R}{2L} + \sqrt{\left(\frac{R}{2L}\right)^2 + \frac{1}{LC}}$$

$$= -\frac{20}{2} + \sqrt{\left(\frac{20}{2}\right)^2 + \frac{1}{8.165 \times 10^{-3}}}$$

$$= -10 + \sqrt{100 + 1.225 \times 10^{-4}}$$

$$= 6.125 \times 10^{-6} \text{ krad/S}$$

তারিখ : .....

$$\omega_2 = 10 + \sqrt{100 + 1.225 \times 10^{-4}}$$

$$= 20 \text{ krad/s}$$

Ans

(iv) $\omega = \omega_0$

$$I = \frac{V_m}{R} = \frac{169.7}{20}$$

$$= 8.485 \text{ A}$$

At. $\omega = \omega_1, \omega_2$

$$I = \frac{V_m}{\sqrt{2}\, R}$$

$$= \frac{169.7}{\sqrt{2} \cdot 20}$$

$$= 11.999 \text{ A}$$

Ans

তারিখ : .....

Qm 3

$$y = 10 \sin 0.79 \frac{\pi}{3}(36000t + 18x)$$

$$y = A \sin \frac{2\pi}{\lambda}(\omega t + x)$$

$$y = 10 \sin 0.79 \frac{\pi}{3} \times 18\left(\frac{3600}{18}t + x\right)$$

$$y = 10 \sin \frac{19}{100} \times \frac{\pi}{3} \times 18(2000t + x)$$

$$= 10 \sin \frac{2\pi}{0.422}(-2000t + x)$$

i) $A = 10\ m$

ii) $V = 2000\ ms^{-1}$

iii) $\frac{2\pi}{\lambda} = 14.9$

$\lambda = 0.422\ m$

তারিখ : .....

iv) $V = \lambda f$

$$\frac{V}{\lambda} = f$$

$$f = \frac{2000}{0.422}$$

$$f = 4739.34 \text{ Hz}$$

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

$$= \frac{1}{4739.34}$$

$$= 2.11 \times 10^{-4} \text{ S}$$

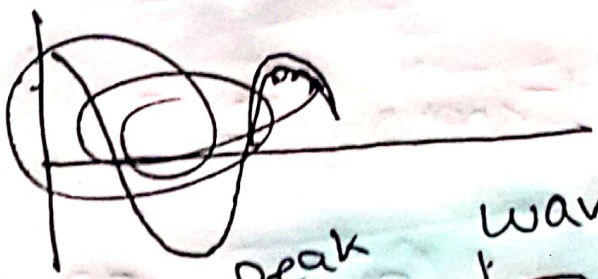
তারিখ : .....

Ans: 1

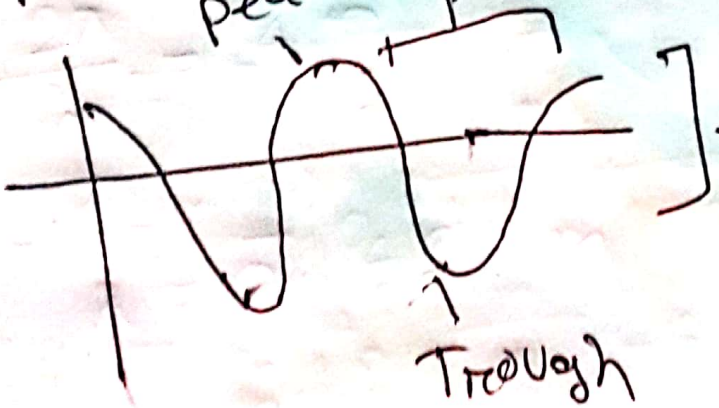
A wave which generally travels continuously in a medium of the same direction without the change in its amplitude is known as progressive wave

$$y = A \cos(\omega t - kx)$$

i)



ii



তারিখ : .....

iii)