(1)

$$y = 4\sin\left[2\pi\left(\frac{t}{0.04} - \frac{x}{150}\right)\right]$$

given $x = 50\text{ cm}$

$t = 0.1\text{ s}$

$$y = 4\sin\left[2\pi\left(\frac{0.1}{0.04} - \frac{50}{150}\right)\right]$$

$$y = 4\sin\left[2\times 180\left(2.5 - \frac{1}{3}\right)\right]$$

$$y = 4\sin\left[360 \times \frac{13}{6}\right]$$

$$y = 4\sin[780]$$

$$y = 4\sin(60)$$

$$y = 4 \times \frac{\sqrt{3}}{2} = 2\sqrt{3}$$

$$y = 2 \times 1.732$$

$$= 3.464\text{ cm}$$

particle velocity $= \frac{dy}{dt}$

$$y = 4 \times \frac{2\pi}{0.04}\cos\left[2\pi\left(\frac{t}{0.04} - \frac{x}{150}\right)\right]$$

$$y = \frac{2\pi}{0.01}\cos(60)$$

$$y = \frac{\pi}{0.01} = 100\pi$$

$$y = 100 \times 3.142$$

$$y = 314.2\text{ cm/s}$$

$$= 3.14\text{ m/s}$$

(2) Data

$n = 256\text{ Hz}$

$v = 350\text{ m/s}$

Solution

$v = n\lambda$

$\lambda = \frac{v}{n} = \frac{350}{256}\text{ m}$

1 vib. $\equiv \frac{350}{256}\text{ m}$

$\therefore$ 16 -"- $\equiv$?

$$\therefore 16 \times \frac{350}{256}$$

$$= 21.875\text{ m}$$

(3) Data :

$\lambda_1 = 87\text{ cm}$

$\lambda_2 = 88.5\text{ cm}$

$n_1 - n_2 = 10$

Solution :

$n_1 - n_2 = 10$

$$\frac{v}{\lambda_1} - \frac{v}{\lambda_2} = 10$$

$$\frac{v}{0.87} - \frac{v}{0.885} = 10$$

$$v\left[\frac{0.885-0.87}{0.87 \times 0.885}\right] = 10$$

$$v = \frac{10 \times 0.87 \times 0.885}{0.015}$$

$$v = 513.3 \text{ m/s}$$

(4) Data

$|n_C - n_D| = 8$

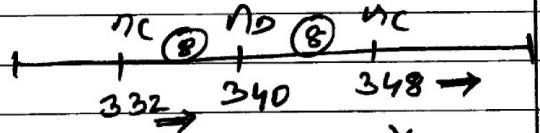
$n_D = 340$ Hz

$n_C' > n_C$ (filling)

$|n_C' - n_D| = 4$

$n_C = ?$

Solution :



$n_D = 340$ Hz

$|n_C - n_D| = 8$

$\therefore n_C = n_D + 8$; $n_C = n_D - 8$

$n_C = 348$; $n_C = 332$ Hz

$|n_C' - n_D| = 4$

$n_C' = n_D + 4$; $n_C' = n_D - 4$

$n_C' = 344$ Hz ; $n_C' = 336$ Hz

But $n_C' > n_C$ due to filing

$\therefore n_C' = 336$ Hz

$n_C = 332$ Hz

(5) Data :

$n = 350$ Hz

$n' = 370$ Hz ⇒ ☎

a) $v_0 = ?$

b) $n' = ?$ ⇐ ☎

$v = 340$ m/s

(a) $n' = n\left(\frac{v+v_0}{v}\right)$

$370 = 350\left(\frac{340+v_0}{340}\right)$

$v_0 = 19.43$ m/s

(b) $n' = n\left(\frac{v-v_0}{v}\right)$

$= 350\left(\frac{340-19.43}{340}\right)$

$= 329.99$ Hz