



National University
of computer and emerging sciences

Foundation of Advancement
of Science and Technology



ASSIGNMENT # 06

PRESENTED BY:

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STUDENT OF COMPUTER SCIENCE

COURSE NAME: APPLIED PHYSICS

COURSE INSTRUCTOR: MADAM RABIA

ASSIGNMENT #6
18K-0131

QNO: 1

Data

$$V = 50 \text{ m/s}$$

$$L = 5 \text{ m}$$

$$m = 0.060$$

$$T = 1$$

$$S = \sqrt{\frac{\tau}{N U}}$$

$$U = \frac{m}{L} \Rightarrow \frac{0.06}{5}$$

$$U = 0.012 \text{ kg/m}$$

$$50 = \sqrt{\frac{\tau}{N \cdot 0.012}}$$

$$\tau = 2500 \times 0.012$$

$$\boxed{T = 30 \text{ N}}$$

Q No::: 2

$$v_1 = 20 \text{ m/s}$$

$$L_1 = 6 \text{ N}$$

$$L_2 = ?$$

$$v_2 = 30$$

$$\frac{v_1}{v_2} = \frac{\sqrt{L_1}}{\sqrt{L_2}}$$

$$\frac{20}{30} = \frac{\sqrt{6}}{\sqrt{L_2}}$$

$$\frac{4}{9} = \frac{6}{L_2}$$

$$L_2 = 13.2 \text{ N}$$

Q No: 3 (10 Marks)

(a)

$$A = 8 \text{ cm}$$

$$\lambda = 80 \text{ cm}$$

$$f = 3 \text{ Hz}$$

$$\Rightarrow \omega = 2\pi f$$

$$k = \frac{2\pi}{\lambda}$$

$$\omega = 2\pi(3)$$

$$k = \frac{2\pi}{0.8}$$

$$\boxed{\omega = 6\pi}$$

$$\boxed{k = \frac{5}{2}\pi}$$

$$y(x, t) = 0.03 \sin\left(\frac{5}{2}\pi x + 6\pi t\right)$$

(b)

$$\Rightarrow y(x, t) = 0.08 \sin(10\pi x + 6\pi t)$$

Qno. 4

$$y = 0.25 \sin(0.30\pi x - 40t)$$

- a) amplitude $\Rightarrow 0.25 \text{ m}$
- b) angular frequency $= 40$
- c) angular wave number $= 0.30$
- d) wavelength

$$k = \frac{2\pi}{\lambda} \Rightarrow \lambda = \frac{2\pi}{0.3}$$

$$\boxed{\lambda = 20.4 \text{ m}}$$

e) Wave speed $= f\lambda$
 $\Rightarrow 6.4 \times 20.4$
 $\Rightarrow 133.3 \text{ m/s}$

- f) positive x-axis

QNO: 5

$$y = 0.51 \text{ cm} \sin(Kx - \omega t)$$

$$K = 3.10 \text{ rad/cm} \quad \omega = 9.30 \text{ rad/s} \quad t = 1$$

$$y = 0.51 \sin(3.1 - 9.3(1.0))$$

$$y = -0.48 \text{ cm} \text{ (+ve x direction)}$$

$$\Rightarrow y = 2 \text{ cm} \sin(Kx - \omega t)$$

$$K = 2.11 \text{ rad/m}, \quad \omega = 3.6 \text{ rad/s}$$

$$\text{amplitude} = 0.02 \text{ m}$$

$$\text{Wavelength} \Rightarrow K = \frac{2\pi}{\lambda}$$

$$\lambda = 2.98 \text{ m}$$

$$\text{frequency} \rightarrow \omega = 2\pi f$$

$$3.62 = 2\pi f$$

$$f = \frac{3.62}{2\pi}$$

$$f = 0.57 \text{ Hz}$$

$$\text{Speed} = \lambda f$$

$$\Rightarrow 2.98 \times 0.57$$

$$v \Rightarrow 1.72 \text{ m/s}$$

QNO:6

$$y = 0.15 \sin(0.80x - 50t), \quad U = 12.0 \text{ g/cm}$$

a) $S = \lambda f$
 $S = \frac{5}{2} \times 7.96$
 $\Rightarrow 62.5 \text{ m/s}$

b) $K = \frac{2\pi}{\lambda}$
 $\lambda = \frac{2\pi}{0.8}$

$$\lambda = \frac{5}{2} \pi \text{ m}$$

c) $\omega = 2\pi f$

$$50 = 2\pi f$$

$$f = \frac{50}{2\pi}$$

$$f = 7.96 \text{ Hz}$$

d) $P = \frac{1}{2} \mu \omega^2 A^2 v$

$$= \frac{1}{2} \times 12 \times 50^2 \times 0.15^2 \times 12$$

$$P = 21094 \text{ Watt}$$

Q#7

$$L = 30 \text{ m}$$

$$\mu = 9 \times 10^{-3} \text{ Kg/m}$$

$$T = 20 \text{ N}$$

$$f_1 = ? \quad f_2 = ? \quad f_3 = ? \quad f_4 = ?$$

$$\therefore V = \sqrt{\frac{T}{\mu}}$$

$$V = \sqrt{\frac{20}{9 \times 10^{-3}}}$$

$$V = 47.14 \text{ m/s}$$

$$f_1 = \frac{V}{2L}$$

$$f_1 = \frac{47.14}{2 \times 30}$$

$$f_1 = 0.78 \text{ Hz}$$

$$f_2 = 2f_1$$

$$f_2 = 2(0.785)$$

$$f_2 = 1.57 \text{ Hz}$$

$$f_3 = 3f_1$$

$$= 3(0.785)$$

$$f_3 = 2.35 \text{ Hz}$$

$$f_4 = 4f_1$$

$$f_4 = 4 \times 0.78$$

$$f_4 = 3.14 \text{ Hz}$$

Q NO: 8

(a)

$$L = 120 \text{ cm}$$

$$L = 1.2 \text{ m}$$

$$f_4 = 120 \text{ Hz}$$

$$a) \lambda = ?$$

$$n = 4$$

$$b) f_1 = ?$$

$$\therefore f_4 = 4f_1$$

$$\Rightarrow f_1 = \frac{120}{4}$$

$$\boxed{f_1 = 30 \text{ Hz}}$$

$$\therefore \lambda = \frac{2L}{n}$$

$$\lambda = \frac{2 \times 1.2}{4}$$

$$\boxed{\lambda = 0.6 \text{ m}}$$

Q# 8(b)

$$f_1 = 220 \text{ Hz}$$

$$L = 70 \text{ cm} = 0.7 \text{ m}$$

$$m = 1.2 \text{ gm}$$

$$m = 1.2 \times 10^{-3} \text{ kg}$$

a) $T = ?$

b) $f_3 = ?$

$$\therefore N = \frac{m}{L} = \frac{1.2 \times 10^{-3}}{0.7}$$

$$N = 1.7 \times 10^{-3} \text{ kg/m}$$

$$f_1 = \frac{v}{2L}$$

$$v = 220 \times 2 \times 0.7$$

$$v = 308 \text{ m/s}$$

a) $v = \sqrt{\frac{T}{\mu}}$

$$v^2 = \frac{T}{\mu} = T = 308 \times 308 (1.7 \times 10^{-3})$$

$$T = 161.2 \text{ N}$$

b) $f_3 = 3f_1$

$$f_3 = 3 \times 220$$

$$f_3 = 660 \text{ Hz}$$