

Worshop Handout 2

$$1. \quad n = 4 : \quad k_4 = 14.4 \text{ m}^{-1} = \frac{2\pi}{\lambda_4} = \frac{2\pi}{\frac{\lambda_1}{4}}$$

$$\Rightarrow 14.4 \text{ m}^{-1} = \frac{8\pi}{\lambda_1} \Rightarrow \lambda_1 = \frac{8\pi}{14.4 \text{ m}^{-1}}$$

$$\omega_4 = 2\pi f_4 = 2\pi \cdot 4 f_1 = 8\pi f_1$$

$$\Rightarrow f_1 = \frac{\omega_4}{8\pi} = \frac{166 \text{ rad/s}}{8\pi}$$

$$2. \quad n = 3 ; \quad v = \lambda_3 f_3 = \frac{2L}{3} \cdot 690 \text{ Hz}$$

$$= 2 \cdot (60 \text{ cm}) (230 \text{ s}^{-1})$$

$$3. \quad n = 6 ; \quad v = \lambda_6 f_6 \Rightarrow f_6 = \frac{v}{\lambda_6}$$

$$= \frac{v}{\frac{2L}{6}} = 3 \frac{v}{L} = 3 \cdot \frac{78 \text{ m/s}}{2 \text{ m}}$$

$$4. \quad v = 48 \text{ m/s} ; \quad L = 1.5 \text{ m}$$

$$\lambda_n = \frac{2L}{n} = \frac{2 \cdot 1.5 \text{ m}}{n} = \frac{3 \text{ m}}{n}$$

- a) $n = 1$
- b) $n = 3$
- c) $n = 4$

$$A_n = \frac{v}{\lambda_n} = \frac{v n}{3 \text{ m}} = \frac{(48 \text{ m/s}) n}{3 \text{ m}}$$

$$5. \quad y(x, t) = A_{sw} \sin kx \sin \omega t = 0$$

$$\Rightarrow \sin kx = 0 \Rightarrow kx = n\pi \Rightarrow x = \frac{n\pi}{k}$$

$$= \frac{n\pi}{0.750\pi \text{ rad/m}}$$

$$= \frac{n}{0.750} \text{ m} \quad \text{NEW}$$

$$6. \quad A \sin(kx + \omega t) + A \sin(kx - \omega t)$$

$$= A \left[\sin kx \cos \omega t + \cos kx \sin \omega t \right.$$

$$\left. + \sin kx \cos \omega t - \cos kx \sin \omega t \right]$$

$$= 2A \sin kx \cos \omega t$$