yohandi - assignment 14

15a) $y(x,0) = y_m \sin(kx+\phi)$

when $x=0$, $y=0 \Rightarrow \phi = 0$

$\therefore$ positive sine function

b) $y_m = y_s = 4{,}0$ cm

c) $k = \frac{2\pi}{\lambda} = \frac{\pi}{9}$ cm^{-1}

d) $\omega = \frac{2\pi}{T} = \frac{\pi}{5}$ rad.s^{-1}

e) answered on a) (i.e. $\phi = 0$)

f) negative

g) $v = \frac{\omega}{k} = \frac{9}{5}$ cm/s

h) $y(0,t) = y_m \sin(-\omega t)$

$\frac{d(y(0,t))}{dt} = -\omega y_m \cdot \cos(\omega t)$

when $t = 5{,}0$ s $\frac{d(y(0,t))}{dt}(5{,}0) = 0{,}8\pi$ cm/s

27) $v = \frac{\omega}{k} = \frac{8{,}00}{15{,}0}$ m/s $= \frac{8}{15}$ m/s

28a) $v = \sqrt{\frac{T}{\mu}}$, $T = mg$, $v = \lambda f$ $\Rightarrow$ $\frac{\lambda^2 f^2 \cdot \mu}{g} = m$

$m = 634{,}8$ gram

b) $\lambda = \sqrt{\frac{mg}{\mu}} \cdot \frac{1}{f} = 0{,}753$ m

since $\lambda = 0{,}753$m doesn't divide $L = 1{,}2$m

there won't be any standing wave

29a) $y_m = \frac{2y_m}{2} = \frac{H}{2} = 3{,}00$ mm

b) $k = \frac{2\pi}{\lambda} = 0{,}05\pi$ cm^{-1}

c) $\omega = vk = \frac{d.k}{\Delta t} = 100\pi$ rad.s^{-1}

d) negative

48a) $f = \frac{\omega}{2\pi} = \frac{2}{\pi}$ Hz

b) $\lambda = \frac{2\pi}{\omega} \cdot v = \frac{2\pi \cdot 40}{4}$ cm $= 20\pi$ cm

c) $y_m = 4{,}0$ cm

d) $k = \frac{2\pi}{\lambda} = 10$ rad.m^{-1}

e) $\omega = 4{,}0$ rad.s^{-1}

f) negative

g) $T = v^2 \cdot \mu$

$= (40 \cdot 10^{-2})^2 (4 \cdot 10^{-3} \cdot 10^2)$ N

$= 0{,}064$ N

52) $P_{avg} = \frac{1}{2} \mu v A^2 \omega^2$

$= \frac{1}{2} \cdot \sqrt{T\mu} \cdot A^2 \cdot 4\pi^2 \cdot f^2$

$f = \frac{1}{2\pi A} \sqrt{\frac{2P_{avg}}{\sqrt{T\mu}}}$

$= 332{,}16$ Hz

60 a) $y_m = \frac{H}{4} = 0{,}30$cm

b) $k = \frac{2\pi}{\lambda} = \frac{2\pi}{60}$ cm^{-1} $= \frac{\pi}{30}$ cm^{-1}

c) $\omega = \frac{2\pi}{T} = \frac{500}{3}\pi$ rad.s^{-1}

d) negative