HW #1 ERICH KRONEBERGER

(6) $M = 1.00\times10^{-20}$ kg period $= 1.00\times10^{-5}$

$v_{max} = 1.00\times10^{3}$ m/s

(a) $\omega = \frac{2\pi}{T} = 2.0\times10^{5}\,\pi$

(b) $f = \frac{v_{max}}{\omega} = 1.591\times10^{-3}$

(9.) $x = 6\cos\left[3t + \frac{\pi}{3}\right]$ so @ $t = 2$

(a) Displacement = 4.33 m $(f(2))$

(b) velocity $= A[\omega] \Rightarrow 6[3] = 18$ m/s

(c) acceleration $= -\omega^2 A\cos\left(3t + \frac{\pi}{3}\right)$

$-9[6]\cos[7.0471] = -38.99$ m/s^2

(d) Phase of motion $= \left[3t + \frac{\pi}{3}\right]$ @ $t=0 = [7.0471]$ radians

(e) frequency $= \omega/2\pi = 3/2\pi$ Hz

(f) period of motion $= \frac{1}{\text{frequency}} = 2\pi/3$

(11.) $k = 7580$ N/m $M = 0.245$ kg ← two springs

$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} = \frac{1}{2\pi}\sqrt{\frac{7500(2)}{.245}} = 39.38$ Hz

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(22.) for $x = \frac{1}{2}x_m$ (a) 75% of energy = kinetic

(b) while 25% = potential (c) at $\frac{\sqrt{2}}{2}$ or $\sin\left(\frac{\pi}{4}\right)$ $U = K_e$

(31.) $m = 5$ kg $k = 1000$ N/m $x = 0.5$ m $v_0 = 10$ m/s

(a) $f = \frac{1}{2\pi}\sqrt{\frac{k}{m}} = 2.25$ Hz (b) $U = \frac{1}{2}kx^2 = 125$ Joules

(d) $E_0 = \frac{1}{2}mv_0^2 + \frac{1}{2}kx_0^2 = 375$ Joules energy $- 125\text{ J} =$ **250 J** K_e

(c) $E = 375\text{J} = \frac{1}{2}kA^2 \Rightarrow \sqrt{1.75} = A$ or **86 cm.**

(33.) Block = 5.4 kg Bullet = .0095 kg $k = 6000$

(a) $v = 630$

$V = \frac{\text{Bullet}(v)}{\text{bullet + block}} = \frac{0.0095(630)}{0.0095 + 5.4} =$ **1.11 m/s** bullet + block system

(b) $A^2 = \frac{(\text{bullet} + \text{block})\,v^2}{k} \Rightarrow \frac{896900(5.4095)}{6000} = \sqrt{357.83} = A$

$A = 18.91$

(45) $t = 8.85\text{s}$ $x = 0.35\text{m}$ ← trapeze artist is 35cm tall?

$8.85 = 2\pi\sqrt{\frac{I}{MgL}} \Rightarrow 1.983(L) = \left[\frac{I}{Mg}\right]$ factor .08

$\boxed{t = 8.77\text{s}}$

(55) (a) $I = m\left(\frac{L^2}{12} + d^2\right)$ $T = 2\pi\sqrt{\frac{\frac{L^2}{12} + \left(\frac{L}{\sqrt{12}}\right)^2}{gd}}$

$T = 2\pi\sqrt{\frac{2L}{\sqrt{12}\,g}} = 2\pi\sqrt{\frac{2(2.2)}{\sqrt{12}(9.8)}}$

$\boxed{2.26\text{s}}$

(b)

(58) $m = 250\text{g}$ $k = 85\text{N/m}$ $b = 70\text{g/s}$ ratio after 20 cycle

$x = Ae^{-bt/2m}\cos(\omega t + \phi)$ $f = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$

$\omega = \sqrt{340}$ $f = \frac{\sqrt{85}}{\pi}$ or 2.93Hz

$t = \frac{\sqrt{85\pi}}{85}$

$x = Ae^{(-0.477054)}\cos(\omega t + \phi)$ $\Rightarrow$ $x = Ae^{(-0.477054)}$

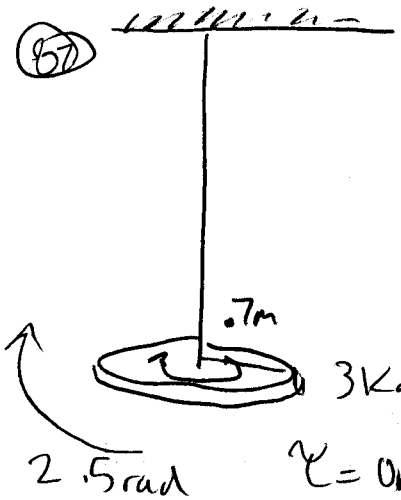
$\cos(2\pi + \phi)$

-1

$\boxed{12\%}$

$e^{-0.477054} = 0.620599 \times 20 = 12.41$

(87)



(a) $\tau = I\alpha$ $0.06 = I\frac{d^2\theta}{dt^2} = -(MgL)\theta$

$0.06 = 3(9.8)(\quad)L\sin(2.9)$

$L = 3.41 \times 10^{-3}$

$\tau = -k\theta$ $\boxed{k = -.024}$

$\frac{\tau}{L} = 17.59 = I$