Solutions of Homework at Week 12

May 16th, 2020

Chapter 17

P17-15 The rotational inertia is

$$I = \frac{1}{2}MR^2 + Md^2 = M\left(\frac{1}{2}(0.144\,\text{m})^2 + (0.102\,\text{m})^2\right) = (2.08\times10^{-2}\text{m}^2)M.$$

The period of oscillation is

$$T = 2\pi\sqrt{\frac{I}{Mgd}} = 2\pi\sqrt{\frac{(2.08\times10^{-2}\text{m}^2)M}{M(9.81\,\text{m/s}^2)(0.102\,\text{m})}} = 0.906\,\text{s}.$$

Chapter 18

P18-2 $\omega = (2\pi\text{ rad})(548\text{ Hz}) = 3440\text{ rad/s}$; $\lambda = v/f$ and then

$$k = (2\pi\text{ rad})/[(326\text{ m/s})/(548\text{ Hz})] = 10.6\text{ rad/m}.$$

Finally, $y = (1.12\times10^{-2}\text{m})\cos[(10.6\text{ rad/m})x + (3440\text{ rad/s})t]$.

#I have noticed that many students still write this as cos(10.6x+3440t), which is incorrect for dimension.

Chapter 19

P19-16 (a) $f_1 = (442\text{ Hz})(343\text{ m/s})/(343\text{ m/s} - 31.3\text{ m/s}) = 486\text{ Hz}$, while

$$f_2 = (442\text{ Hz})(343\,\text{m/s})/(343\,\text{m/s} + 31.3\,\text{m/s}) = 405\text{ Hz},$$

so $\Delta f = 81$ Hz.

(b) $f_1 = (442\text{ Hz})(343\,\text{m/s} - 31.3\,\text{m/s})/(343\,\text{m/s}) = 402\text{ Hz}$, while

$$f_2 = (442\text{ Hz})(343\,\text{m/s} + 31.3\,\text{m/s})/(343\,\text{m/s}) = 482\text{ Hz},$$

so $\Delta f = 80$ Hz.