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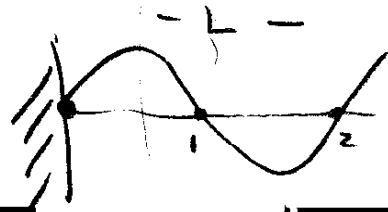
[5]

$v = 145 \text{ m/s}$

$L = 200 \text{ cm}$

$A = 2 \text{ cm}$

a)



[5] b)

Fundamentals

$L = \lambda/4$

$f = \frac{v}{\lambda} = \frac{v}{4L}$

1st overtone

$L = \frac{3\lambda}{4}$
 $= 3 \frac{v}{4L}$

2nd overtone (this wave)

$L = \frac{5\lambda}{4}$

$= \frac{5v}{4L}$

5th Harmonic

[10] c)

$f = \frac{5}{4} \frac{v}{L} = (1.25) \frac{145 \text{ m/s}}{2 \text{ m}}$
 $= 90.6 \text{ Hz}$

$\lambda = \frac{4}{5} L = \frac{4}{5} (2 \text{ m}) = 1.6 \text{ m}$

[5] d)

$\text{Sin } A + \text{Sin } B = 2 \text{ Sin } \frac{1}{2}(A+B) \text{ Cos } \frac{1}{2}(A-B)$

so

$2 \text{ Sin}(kx) \text{ Cos } \omega t = \text{Sin}(kx - \omega t) + \text{Sin}(kx + \omega t)$

$k = 2\pi/\lambda = \frac{2\pi}{(\frac{4}{5}L)} = \frac{10\pi}{4L} = \frac{5\pi}{2L} = \frac{5\pi}{2(1.2\text{m})} = 39.3/\text{m} = \frac{2\pi}{.16\text{m}}$

$\omega = 2\pi f = 2\pi \left(\frac{5v}{4L}\right) = \frac{(10\pi)(145 \text{ m/s})}{4(1.2 \text{ m})} = 5694/\text{s} = 2\pi(906) = \frac{2\pi}{.00110}$

$y = \text{Sin}(39.3x - 5694t) + \text{Sin}(39.3x + 5694t)$

$= \text{Sin } 2\pi(x/.16 - t/.00110) + \text{Sin } 2\pi(x/.16 + t/.00110)$