PHYS 250 Test 5: Photo Upload

David Yang

TOTAL POINTS

92 / 100

QUESTION 1

1 10 / 10

✓ **- 0 pts** **Correct**

- 10 pts Not much here I'm afraid

- 1 pts Calculation error

- 5 pts Found omega but not T

- 3 pts Didn't answer b

QUESTION 2

2 10 / 10

✓ **- 0 pts** **Correct**

- 5 pts Motion of point A wil be downwards first

- 10 pts Not much here I'm afraid

QUESTION 3

3 25 / 25

✓ **+ 6 pts** **a) Correct**

✓ **+ 6 pts** **b) Corrrect**

✓ **+ 7 pts** **c) Correct**

✓ **+ 6 pts** **d) Correct**

+ 0 pts Not much here I'm afraid

QUESTION 4

4 14 / 15

+ 15 pts Correct

+ 0 pts Not much here I'm afraid

+ 7 pts a) Assumed fundamental was shown, when in fact 6th harmonic shown. (7/10)

✓ **+ 5 pts** **b) Correct**

+ 10 pts a) Correct

+ 8 pts a) Incorrect n used (n=5)

✓ **+ 9 pts** **a) Calculation error**

+ 4 pts b) incorrect n used

b) Correct given error in A

QUESTION 5

5 33 / 40

+ 40 pts Correct

+ 0 pts Not much here I'm afraid

✓ **+ 5 pts** **Shows element on diagram**

+ 5 pts Param. variable clearly defined

+ 10 pts Correct dm

✓ **+ 13 pts** **Correct dI**

✓ **+ 5 pts** **Correct integral setup**

✓ **+ 2 pts** **Correct integration**

+ 0 pts parameterizing variable not clearly defined

+ 9 pts dl correct except "x" term incorrectly written in terms of param variable

+ 8 **Point adjustment**

Show param variable on diagram (3/5). dm incorrect (5/10)

1 dx, not x

2 no x

1.

$K = 100 N/m$

$m = 2kg$

$w = \sqrt{50}$ rad/s

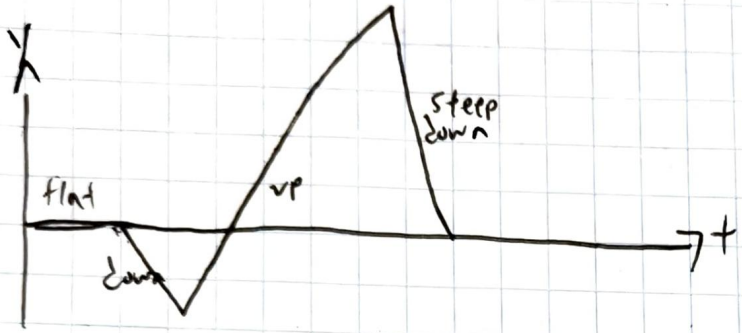
$f = \frac{w}{2\pi}$

$T = \frac{2\pi}{w}$

a. $\frac{2\pi}{\sqrt{50}}$ s

b. $\frac{2\pi}{\sqrt{50}}$ s

2.



3.

2.5 wavelengths for 30cm

12cm = λ → .12m

$k = \frac{2\pi}{\lambda} = \frac{2\pi}{.12m}$

a. wavelength is 0.12m

wave number $k = \frac{2\pi}{.12m}$

b. speed is 2.4m/s

c. $y(x,t) = 3 \sin\left(\frac{2\pi}{0.12}x - 40\pi t\right)$

$v = 20 \cdot .12 = 2.4 m/s$

$w = vk = \frac{2\pi}{.12} \cdot 20 \cdot .12 = 40\pi$

d. 1.2π m/s

sine wave

$A \sin(Kx \pm wt + \phi)$

3 $\quad \frac{2\pi}{.12} \quad 40\pi \quad 0$

$v_{max} = wA = 40\pi \cdot .03 = 1.2\pi$

1 **10 / 10**

✓ **- 0 pts** **Correct**

- 10 pts Not much here I'm afraid

- 1 pts Calculation error

- 5 pts Found omega but not T

- 3 pts Didn't answer b

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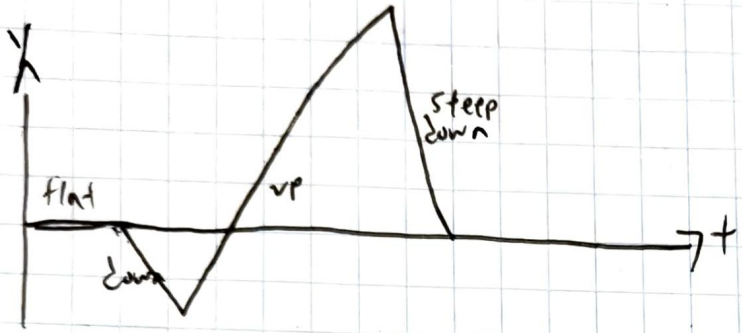

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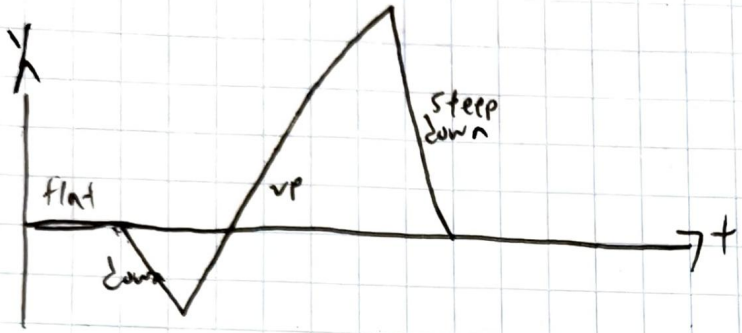

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3 25 / 25

- ✓ **+ 6 pts** a) Correct
- ✓ **+ 6 pts** b) Corrrect
- ✓ **+ 7 pts** c) Correct
- ✓ **+ 6 pts** d) Correct
- **+ 0 pts** Not much here I'm afraid

$m = .005\ kg$

$L = 4m$

$f_n = \frac{n}{2L} \cdot \sqrt{\frac{\text{Tension}}{\text{linear density}}}$ → m/L

$600_5 = \frac{5}{\frac{2L}{8}} \cdot \sqrt{\frac{x}{(.005/4)}} \Rightarrow 800 = \sqrt{\frac{x}{.00125}}$

$800^2 = \frac{x}{.00125}$

$x = .00125 \cdot 800^2$

~~$x = 800$~~ Tension $= 800N$

b.

Let $v = \sqrt{\frac{\text{Tension}}{\text{linear density}}}$

$f_5 = \frac{5}{2L} \cdot v$

$f_1 = \frac{1}{2L} \cdot v$

Therefore $\frac{f_5}{5} = f_1$

120 Hz

If we setup are equation

$x \cdot f_1 = f_5$

↓

$\frac{x}{2L} \cdot v = \frac{5}{2L} \cdot v$

$\frac{x}{2L} = \frac{5}{2L}$

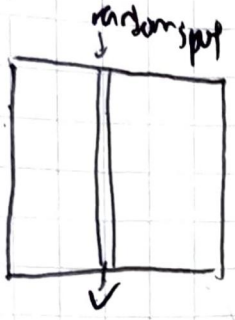
$x = 5$

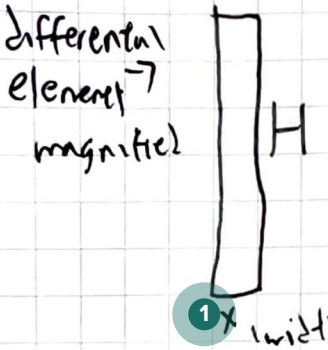
4 14 / 15

+ **15 pts** Correct
+ **0 pts** Not much here I'm afraid
+ **7 pts** a) Assumed fundamental was shown, when in fact 6th harmonic shown. (7/10)
✓ **+ 5 pts b) Correct**
+ **10 pts** a) Correct
+ **8 pts** a) Incorrect n used (n=5)
✓ **+ 9 pts a) Calculation error**
+ **4 pts** b) incorrect n used

b) Correct given error in A

Chop the refrigerator up into rods, and parameterize with differential width x.
x will range from L to $L+w$.





Step 1.

$dA = x\,H\,dx$

$dm = \sigma\,dA = \sigma x H\,dx$

$dI = dm\left(\frac{1}{12}H^2 + x^2\right) = \sigma H x\,dx \cdot \left(\frac{1}{12}H^2 + x^2\right)$

$= \left(\frac{\sigma H^3 x}{12} + \sigma H x^3\right) dx$

Distribute

x will range from:

L to $L+w$

Integrate

$$\int_L^{L+w} dI = I = \int_L^{L+w} \left(\frac{\sigma H^3 x}{12} + \sigma H x^3\right) dx$$

$$\sigma H \int_L^{L+w} \left(\frac{H^2 x}{12} + x^3\right) dx$$

$$\sigma H \left(\frac{H^2 x^2}{24} + \frac{x^4}{4}\right)\Bigg]_L^{L+w}$$

$$\sigma H\left(\frac{H^2(L+w)^2}{24} + \frac{(L+w)^4}{4}\right) - \sigma H\left(\frac{H^2 L^2}{24} + \frac{L^4}{4}\right)$$

5 **33 / 40**

+ **40 pts** Correct
+ **0 pts** Not much here I'm afraid
✓ **+ 5 pts** **Shows element on diagram**
+ **5 pts** Param. variable clearly defined
+ **10 pts** Correct dm
✓ **+ 13 pts** **Correct dl**
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