PHYS 250 Test 4: Photo Upload

David Yang

TOTAL POINTS

62 / 100

QUESTION 1

1 42 / 70

    + 70 pts Correct

    + 20 pts a and b) Correct FBD

    + 18 pts a and b) Correct FBD but pivot forces not shown

    ✓ **+ 10 pts a) Correct statement of torque equation**

    ✓ **+ 20 pts a) Correct solving of torque equation for T**

    + 20 pts b) Used Newton's 2nd to get Pivot forces. (Full credit for Fx=T, even if T is wrong)

    ✓ **- 4 pts a) Incorrect trig term in torque equation.**

    + 16 Point adjustment

    💬 a) Partial FBD, but forces not shown (6/20) b) OK half credit for Tx=T, but what you are doing with Ty is incorrect. (10/20)

    1 50

QUESTION 2

2 20 / 20

    ✓ **+ 20 pts Correct**

    - 1 pts the weights go to r=0, so don't factor into final moment of inertia

    + 0 pts Not much here I'm afraid.

    - 1 pts Calculation error

    - 2 pts Algebra error

QUESTION 3

3 0 / 10

    + 10 pts Correct

    + 5 pts a) Correct

    + 5 pts b) Correct

    ✓ **+ 0 pts Both incorrect**
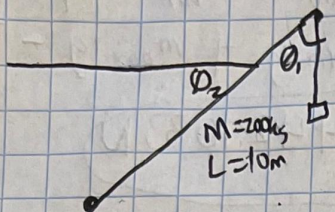
    + 2 pts a) opposite to correct

    + 2 pts b) opposite to correct

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Axis at pivot

1.
a.

F_{net} torque $= 0$

$T_{box} + T_{arm} + T_{wire} = 0$

$T_{box} = 10 \cdot Mg \cdot \sin(\theta_1) = 15014.47$

$T_{arm} = 5 \cdot Mg \cdot \sin(40) = 6299.318$

$T_{wire} = 8 \cdot T_{wire} \cdot \sin(\theta_2)$
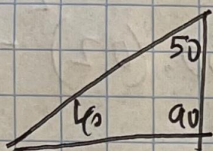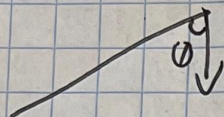
$T_{wire} - 6299.318 - 15014.47 = 0$

$8 \cdot T_{wire} \cdot \sin(\theta_2) = 21313.788$

$T_{wire} = \dfrac{21313.788}{8 \cdot \sin(40)} =$

$\boxed{4144.7959 \ N}$

b.

$F_{net} x$ and $F_{net} y = 0$
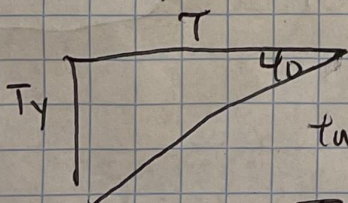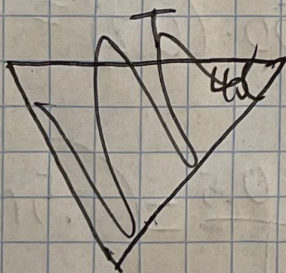
$\tan(40) = \frac{T_y}{T}$

$T_y = T \tan(40)$

$T_x = T$

b Cont.

$T_x = 4144.7959\ N$

$T_y = 3477.8967\ N$

$F_{net\ x} = 0$

$F_x - T_x = 0, \quad T_x = F_x = \boxed{4144.7959\ N}$

$F_{net\ y} = 0$

$\cancel{F_{net\ y}}^{0} = F_y + T_y - W_{arm} - W_{box}$

$F_y = W_{arm} + W_{box} - T_y$

$F_y = m_{arm} \cdot g + m_{box} \cdot g - T_y$

$\boxed{F_y = 442.1033\ N}$

2.

$L_f = L_i$

$I_f \cdot W_f = I_i \cdot W_i$

$W_f = \dfrac{I_i \cdot W_i}{I_f}$

$I_i = \frac{1}{2} \cdot 50 \cdot (0.2)^2 + 2 \cdot 1 \cdot (1)^2$

$I_i = 3$

$W_i = 0.5\ rad/s$

$I_f = \frac{1}{2} \cdot 50 \cdot (0.2)^2 = 1$

$W_f = \dfrac{3 \cdot 0.5}{1} = \boxed{1.5\ rad/s}$

3.

a. down

b. up

1 **42 / 70**

    + **70 pts** Correct

    + **20 pts** a and b) Correct FBD

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  ✓ + **10 pts** **a) Correct statement of torque equation**

  ✓ + **20 pts** **a) Correct solving of torque equation for T**

    + **20 pts** b) Used Newton's 2nd to get Pivot forces. (Full credit for Fx=T, even if T is wrong)

  ✓ - **4 pts** **a) Incorrect trig term in torque equation.**

  + **16** Point adjustment

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b cont.

$T_x = 4144.7959\ N$

$T_y = 3477.8967\ N$

$F_{net\,x} = 0$

$F_x - T_x = 0$, $\quad T_x = F_x = \boxed{4144.7959\ N}$

$F_{net\ y} = 0$

$0 = F_y + T_y - W_{arm} - W_{box}$

$F_y = W_{arm} + W_{box} - T_y$

$F_y = m_{arm} \cdot g + m_{box} \cdot g - T_y$

$\boxed{F_y = 442.1033\ N}$

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b cont.

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$T_y = 3477.8967\,N$

$F_{net\,x} = 0$

$\cancel{\sum F_x} \; F_x - T_x = 0, \quad T_x = F_x = \boxed{4144.7959\,N}$

$F_{net\,y} = 0$

$\cancel{F_{net\,y}} \; 0 = F_y + T_y - W_{arm} - W_{box}$

$F_y = W_{arm} + W_{box} - T_y$

$F_y = m_{arm} \cdot g + m_{box} \cdot g - T_y$

$\boxed{F_y = 442.1033\,N}$

2.

$L_f = L_i$

$I_f \cdot W_f = I_i \cdot W_i$

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