NAME KEY **Table** _____

Honor Code: *I have neither given nor received unauthorized aid on this test*

Signature: _____

ME 201 Test #3

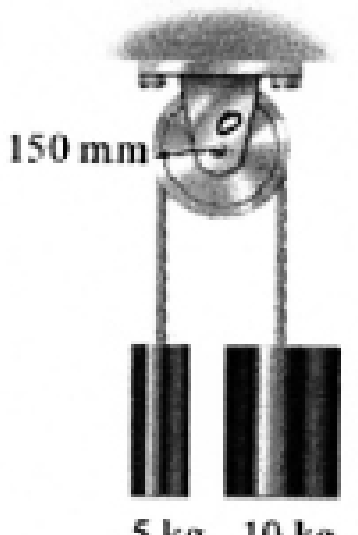
April 18, 2008

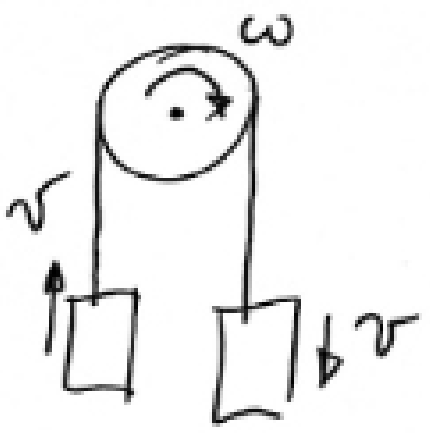
NOTES:

1. ***Sign and provide identifying info on every sheet.***
2. *Use proper **vector notation** in all cases where vectors are used.*
3. *In cases involving Newton's Laws, you are **REQUIRED to draw** complete and correct **FBDs** and when the problem is dynamics, you must also draw complete and correct **KDs**. Then use these to develop your governing equations.*
4. *If you use you **calculator to perform any calculus** that might involve trig or similar functions, set your calculator to the **radian mode** first.*
5. *In all cases, remember to show results with **magnitude, direction, units** and put your **answer in a box**.*

NAME _____ Table _____

1. (25 pts) The moment of inertia of the pulley is 0.2 kg-m^2. The system is released from rest. Determine the velocity of the 10-kg cylinder 3 sec after the system is released. The pin is frictionless and the cable is massless and inextensible and does not slip on the pulley.





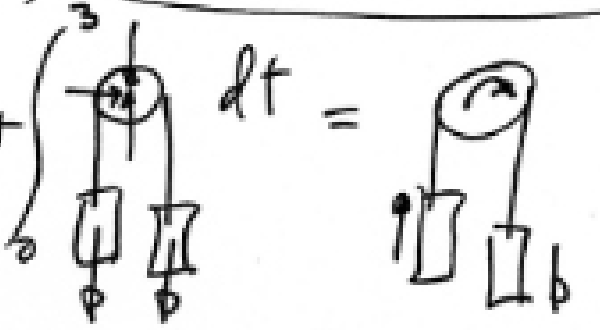
Kinematics:

$v = \omega r$

$v = .15\omega$

Kinetics: (Time & Speed ∴ I-M) Angular I-M System

$\bar{H}_{o_1} + \int_0^3 \Sigma \bar{M}_o \, dt = \bar{H}_{o_2}$



$0 + \int_0^3 dt =$

$\circlearrowleft + \quad 0 + (10(.15) - 5(.15))(9.81)(3)$

$= 0.2\,\omega_2 + .15(10)(v_2) + .15(5)(v_2)$

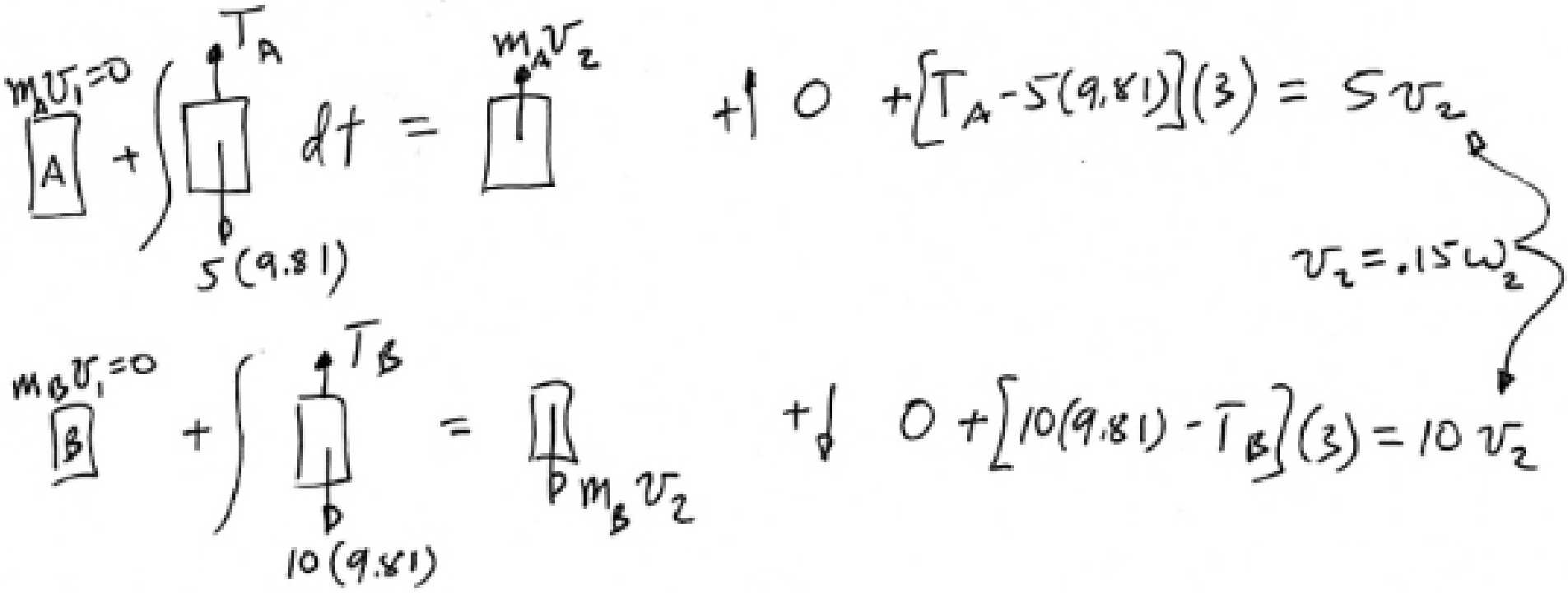
$(v_2 = .15\omega_2)$

$22.07 \text{ N-m-sec} = (0.5375 \text{ kg-m}^2)\,\omega_2$

$\omega_2 = 41.06 \text{ rad/sec}$

$v_2 = 6.159 \text{ m/sec}$ ↓ b

Alternative #1: We could still use I-M but apply to each of 3 masses separately.



Solve: 3 eqns, T_A, T_B ω_2

$T_A = 59.32$ N

$T_B = 77.57$ N

$\omega_2 = 41.06$ rad/sec

$\therefore \quad v_2 = .15\omega_2 = 6.159 \frac{m}{sec}$

Clearly this involves more arithmetic, but it gives more info (about T_A & T_B).