Physics 111
Exam 4
Autumn 1994
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32 PTS

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Name: _____

Social Security #: _____

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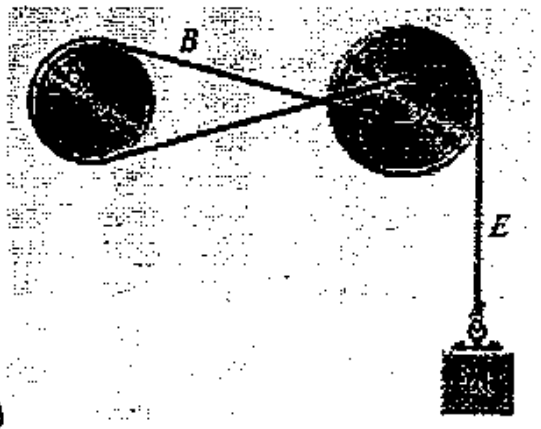
The pulley marked A on the figure shown has a diameter of 0.600 m. It is attached by a twisted belt, B, to the hub (D) of a second pulley (C). The outer diameter of the second pulley (C) is 0.800 m and attached to the rim of pulley C is a cord connected to a 2.00 kg object (E). The twisted belt does not slip. Starting from rest pulley A undergoes a uniform angular acceleration that takes its angular speed to 6.28 rad/s in 2.00 s.



A. (8PTS) What are the angular acceleration and the tangential acceleration of pulley A?

$\alpha_A = \frac{\Delta\omega}{\Delta t} = \frac{6.28\ rad/s}{2.00\ s} = \boxed{3.14\ rad/s^2}$

$a_T = R\alpha_A = (0.300\ m)(3.14\ rad/s^2)$

$\boxed{a_T = .942\ m/s^2}$

B. (8PTS) What are the angular acceleration and the tangential acceleration of the 0.200 m diameter hub D of the second pulley C? a_T IS SAME EVERYWHERE ALONG BELT.

$\boxed{a_T(HUB) = .942\ m/s^2}$

$\alpha_D = \alpha_C = \frac{a_T}{R_D} = \frac{0.942\ m/s^2}{0.100\ m} = \boxed{9.42\ rad/s^2}$

C. (8PTS) After 2.00 s, what are the angular speed of the hub D and the angular speed of pulley C?

$\omega_D = \omega_{0D} + \alpha_D t = 0 + (9.42\ rad/s^2)(2.00\ s)$

$= \boxed{18.8\ rad/s}$

$\omega_C = \omega_D = \boxed{18.8\ rad/s}$

D. (8PTS) Assuming pulley A turns in the correct way to lift object E in 2.00 s, how far has E risen and what is its speed?

$v_E = v_{TC} = R_C \omega_C = (0.400\ m)(18.8\ rad/s) = \boxed{7.54\ m/s}$

$DIST = \bar{v}_E t = \frac{v_E t}{2} = \frac{(7.54\ m/s)(2.00\ s)}{2}$

$\boxed{DIST = 7.54\ m}$