ASSIGNMENT No 9 ***Chapter 9***

Problem 1)

A rotating blade of a blender turns with constant angular acceleration of 1.50 rad/s^2.

a) How long does it take to reach an angular velocity of 36 rad/s starting from rest.

b) Through how many revolutions does the blade run in this time interval

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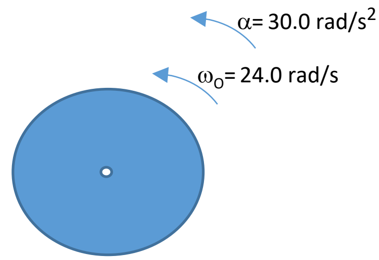
Problem 2) 9.16 Sec. 9.3

At t = 0 a griding wheel has an angular velocity of 24.0 rad/s. It has a constant angular acceleration of 30.0 rad/s^2 until a circuit breaker trips at t= 2.0 s. From then on, it turns through 432 rad as it coasts to a stop at constant angular acceleration.

a) Through what total angle did the wheel run between t = 0 and the time it stopped?

b) At what time did it stop?

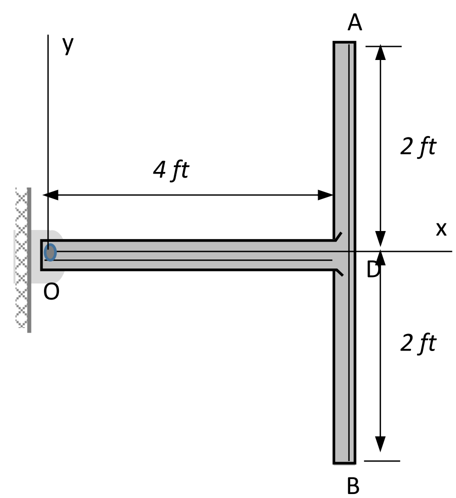
c) What was its acceleration as it slowed down?



Problem 3)

Two homogeneous uniform selender rods each weighing 32.2 lb, are rigidly connected to form a single body. Determine:

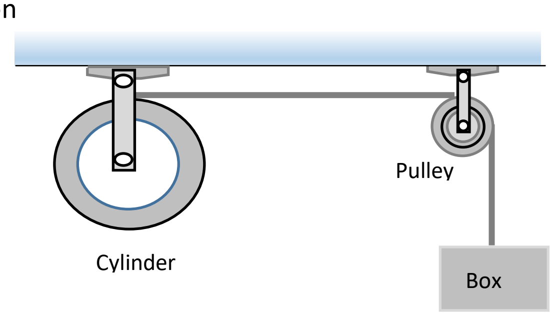
the coordinates of the center of mass without using the tables.



Problem 4)

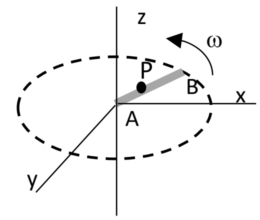
The hollow cylinder and the pulley, as shown, turn without friction about stationary horizontal axles that pass through their centers. A light rope is wrapped around the cylinder, passes over the pulley, and has a 3.00-kg box suspended from its free end. There is no slipping between the rope and the pulley surface. The cylinder has a mass 4.00 kg and radius 40.0 cm. The pulley is a uniform disk with mass 2.00 kg and radius 20.0 cm. The box is released from rest and descends as the rope unwraps from the cylinder.

Find the speed of the box when it has fallen 3.0 m.



Problem 5)

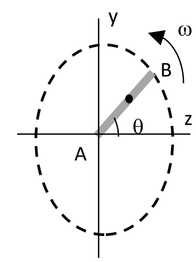
The 2-m long bar AB with a mass of 2 kg, and of small cross section rotates in a horizontal plane (x-y) about a vertical axis (z) which passes through A. It accelerates uniformly from 20 rev/min to 30 rev/min in 5.0 s. after which the angular velocity remains constant.



a) What is the linear velocity of its mid point at the beginning and at t = 5.0 sec.

b) Find the normal and tangential components of the acceleration of the mid-point of the bar after 3 s acceleration begins.

c) What is the magnititude and direction of angular acceleration of the bar after 5 seconds has passed.



d) What is the total energy of the system at t > 5 s.

e) If the bar rotates in a vertical plane perpendicular to x-axis, find the total energy of the system if at t = 5 s, AB makes an angle of 30^{O} with z-axis and when the angle is 120^{O}. What is the maximun and minimum energy and location of B for these energies

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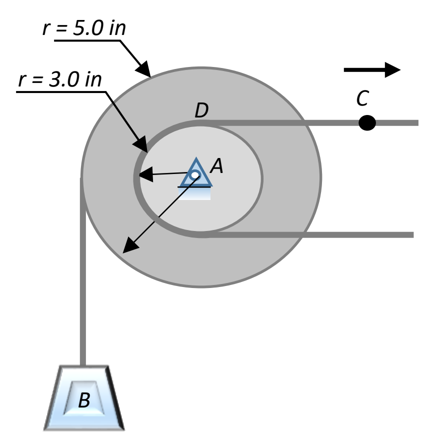
Problem 6)

Load B is connected to a double pulley by one of the two inextensible cables. The motion of the pulley is controlled by cable C, which has a constant acceleration of 9.0 in/s^2, and an initial velocity of 12.0 in/s, both directed to the righr. Determine



a) the number of revolutions executed the by pulley in 2.0 s.

b) the velocity and change in position of the load B after 2.0 s.

c) the acceleration of point D on the rim of the inner pulley at t = 0

Example 7)

A baseball of mass 0.15 kg is initially traveling horizontally at 50 m/s. It is struck by a bat, after which the baseball is still travelling horizontally but in exactly the opposite direction from its initial motion at a speed of 40 m/s. Consider the collision of the bat and the ball. Assume that before the collision, the bat is moving in a hoizontal circle at an angular velocity of ω rad/s. Assume that the player holding the bat exerts no torque. The bat has a moment of inertia of 0.3 kg.m2 about the pivot and the ball hits at a point that is 80 cm away from the pivot. After the collision the bat is still swinging in the same direction around the same pivot but with a reduced angular velocity of 0.35ω. Find the numerical value of ω.