

Name \_\_\_\_\_ Section \_\_\_\_\_



Ho Ho Ho



**ES204**  
Examination I  
December 15, 2000

Problem	Score
1	/30
2	/30
3	/40
Total	/100

Show all work for credit  
AND  
Turn in your FE help sheet

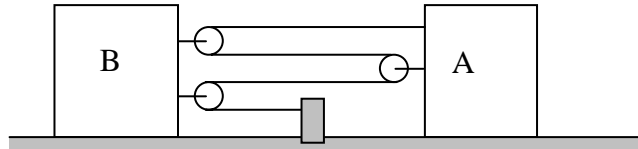


**Merry Christmas! Frohe Weihnachten!**



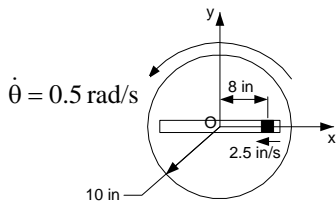
1.1) Block A has a velocity of 12 ft/s to the right. What is the velocity of block B at this instant?

- (a) 6 ft/s right    (b) 9 ft/s right    (c) 12 ft/s right    (d) 16 ft/s right    (e) none of these



1.2) The axis  $xy$  is attached to the rotating disk. The pin travels with respect to the disk at a constant 2.5 in/s in the direction shown. If the disk rotates with a constant angular velocity of 2 rad/s in a ccw direction, determine the speed of the pin in the position shown.

- (a) 4.7 in/s    (b) 3 in/s    (c) 6.5 in/s    (d) 4 in/s    (e) 2.5 in/s



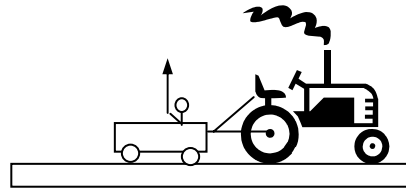
1.3) An object is found to have an angular acceleration,  $\alpha = -4\omega^2$ . What is an equation for the angular velocity as a function of time assuming that at  $t=0$  it has an angular velocity of  $\omega_0$ ?

Note: not all the algebra has been done to simplify the equations and solve for  $\omega$ .

- a)  $\omega - \omega_0 = -\frac{4}{3}\omega^3 t$     b)  $\omega - \omega_0 = -4\omega^2 t$     c)  $\frac{1}{\omega} - \frac{1}{\omega_0} = -4t$     d)  $\frac{1}{\omega} - \frac{1}{\omega_0} = 4t$     e) none of these

1.4) A child is tossing a ball up and down in a trailer being pulled by a tractor traveling at 15 mph (22 ft/s). If the child throws the ball up at 8 ft/s with respect to the trailer what is actual speed of the ball?

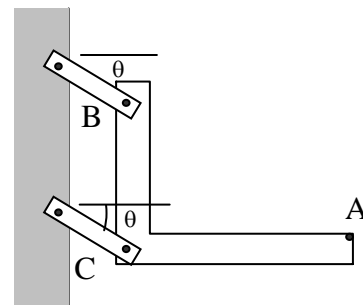
- a) 23.4 ft/s
- b) 17 ft/s
- c) 30 ft/s
- d) 20.5 ft/s



Problem 1.5 and 1.6 refer to the figure shown to the right:

1.5) The two short links (0.5 ft long) in the figure to the right have constant angular velocities of 2 rad/s counterclockwise. What is the angular velocity of the L shaped object?

- a) zero
- b) 1 rad/s
- c) 2 rad/s
- d) 3 rad/s
- e) 4 rad/s
- f) none of these



1.6) What is the magnitude of the acceleration of point A?

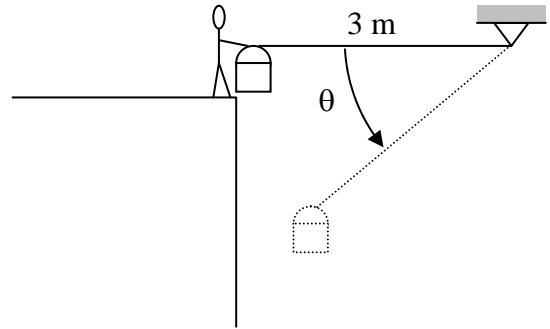
- a) not enough information given
- b)  $1 \text{ rad/s}^2$
- c)  $2 \text{ rad/s}^2$
- d)  $3 \text{ rad/s}^2$
- e)  $4 \text{ rad/s}^2$
- f) none of these

Name \_\_\_\_\_  
ES204 Examination I

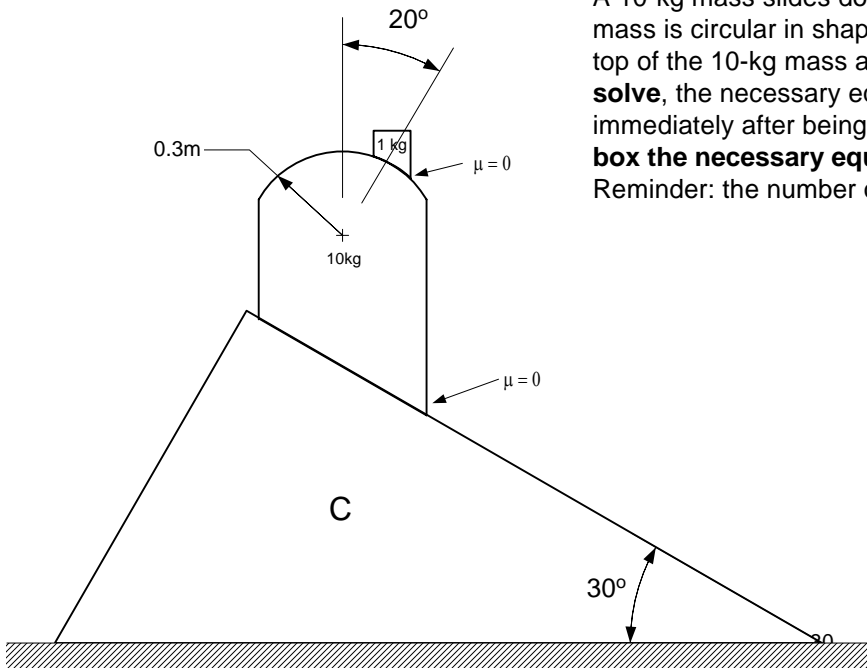
**Problem 2**

30 pts  
Dec. 15, 2000

A bucket is filled with sand and released from an angle of  $\theta = 0^\circ$ . The cable can support a maximum tension of 500 N. Determine the mass of the sand and the bucket if the cable breaks when  $\theta = 50^\circ$ .

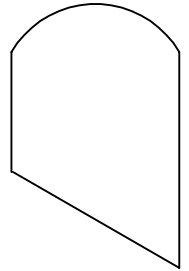
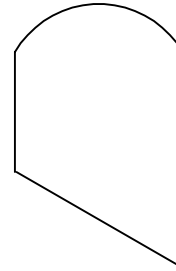
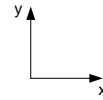


A 10-kg mass slides down the  $30^\circ$  stationary ramp C. The top of the 10-kg mass is circular in shape with radius 0.3m. A 1-kg block follows the circular top of the 10-kg mass and is positioned at an angle of  $20^\circ$ . Find, **but do not solve**, the necessary equations to determine the acceleration of each mass immediately after being released from rest. Neglect friction. **Show all work, box the necessary equations and make a list of the unknowns.** Reminder: the number of equations must equal the number of unknowns.



FBD's

KD's



Unknowns	Equation Number