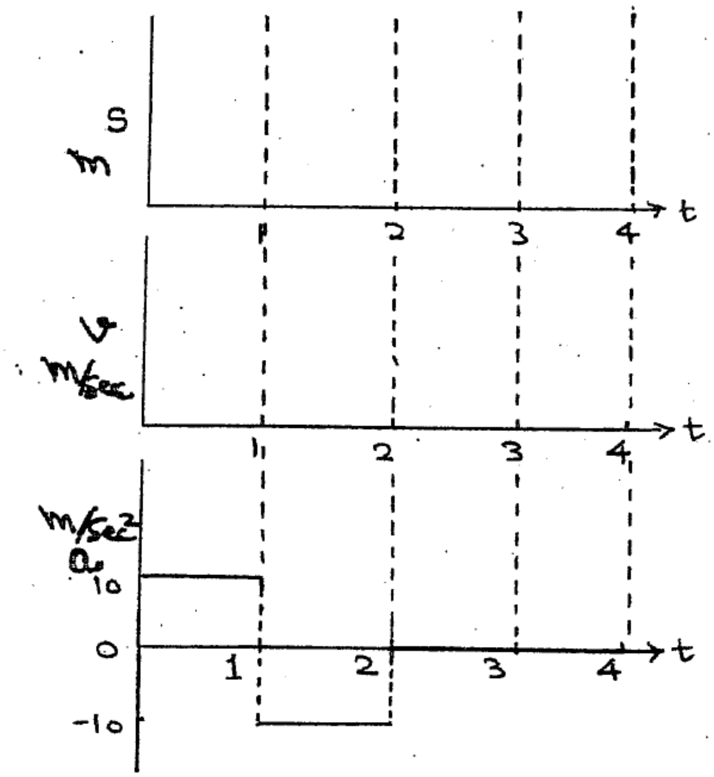
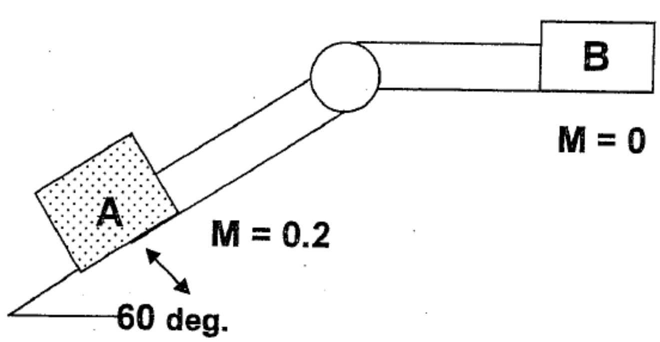
1. A particle moves in rectilinear translation as shown by the a-t diagram Sketch the velocity and displacement diagrams if the initial velocity and displacement are zero. Show all calculations. 0 – 4 SEC. 10 points

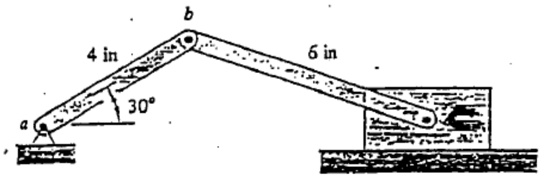


2. Block A and B are connected by a cable. A weighs 200 lb and B weighs 100 lb. The coefficient of friction between block A and the inclined plane is 0.2. The horizontal surface is frictionless. Find the acceleration of the blocks when they are released from a stationary position. (10 points)



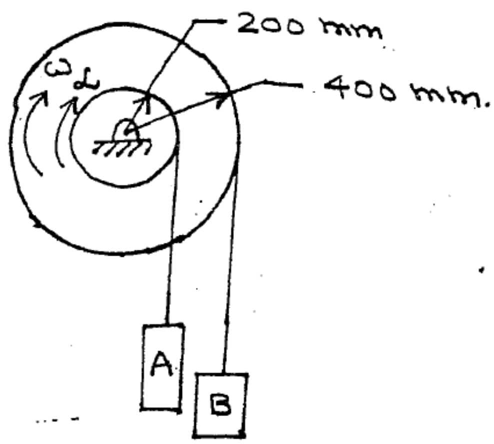
1. The crank arm ab shown in the figure rotates clockwise at 600 rev/min. Find the angular velocity of the link bc.

10 points



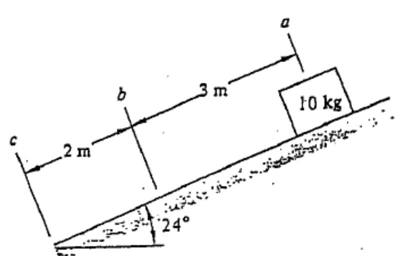
2. At the instant shown in the figure, the stepped pulley rotates clockwise at 25 rad/sec, with a clockwise angular acceleration of 6 rad/sec^2. The masses of the two blocks are m_A=0Kg, m_B=5Kg, and the cables are inextensible. Find the mass moment of inertia of the pulley.

10 points



1. The block in the figure below is released from rest at the position shown in the figure. The coefficient of kinetic friction over length *ab* is 0.22; and over length *bc*, this quantity has the value 0.16. Find the velocity with which the block passes position *c*.

10 points



2. A slender rod of length L and mass m is supported as shown. After the cable is cut the rod swings freely. Determine the angular velocity of the rod as it first passes through a vertical position. m=3kg and L=720 mm.

10 points

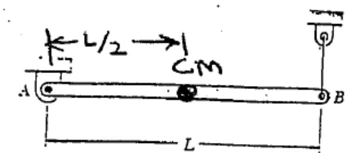


Fig. P17.17

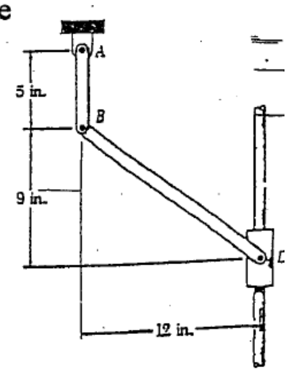
$I_o = \frac{1}{12} m l^2$

I = ⅓ ml² FOR A ROD ROTATING AT ITS END AXIS

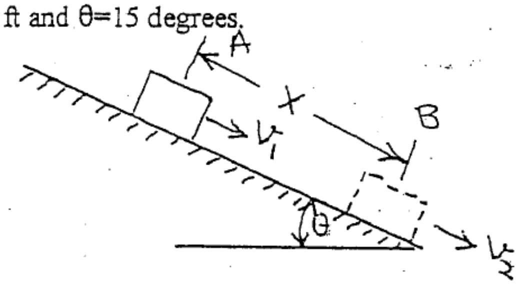
Solve any five of the following six problems. No additional points for working the sixth problem.
Draw free body diagrams and show coordinate system.

1. An archer shoots an arrow vertically upward. If the arrow ascends to a maximum height of 100 ft.
   a. Find the value of the initial velocity of the arrow.
   b. Find the time for the arrow to attain the maximum height.
   c. Find the total time the arrow is in flight.

2. At the instant shown the velocity of collar D is 60 in/s. Upward, determine
   a. The instantaneous center of zero velocity of link BD.
   b. The angular velocity of crank AB and link BD.
   c. The velocity of the mid point of link BD.



3. The block shown is observed to have a velocity $v_1 = 20$ ft/sec as it passes point A and a velocity $v_2 = 10$ ft/sec. As it passes point B on the incline. Calculate the coefficient of friction μ between the block and the incline if $x = 30$ ft and $\theta = 15$ degrees.

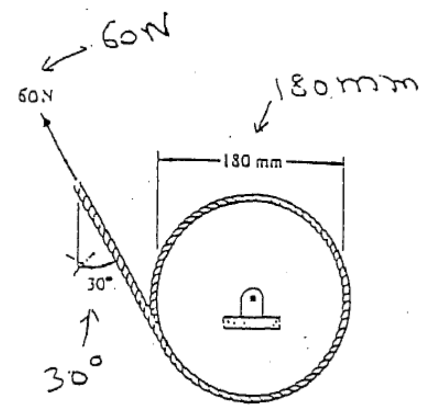


4. The 4-kg disk shown in the figure is initially at rest at time $t = 0$. A force of 60 N is applied to the thin, inextensible cable wrapped around the disk.

(a) Find the angular acceleration of the disk.

(b) Find the angular velocity, and the total angular displacement of the disk 4 s after the force has been applied.

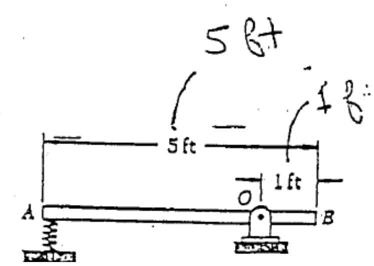
(c) Find the angular velocity of the disk after this element has completed four revolutions.



(note :you can leave this no 5 question)

5. A 30-lb slender rod AB is 5 ft long and is pivoted about a point O which is 1 ft from end B. The other end is pressed against a spring of constant $k = 1800$ lb/in. until the spring is compressed 1 in. The rod is then in a horizontal position. If the rod is released from this position, determine its angular velocity as the rod passes through a vertical position.

(SOLVE BY ENERGY METHOD)



6. The simple pendulum in the figure is released from rest at position θ. Mass A moves down, and there is an inelastic impact with mass B. All friction effects may be neglected, and the mass of the string is negligible.

(a) Find the general expression for the velocity of mass B after impact.

(b) Find the numerical value of the results in part a, if $m = 150$ g, $\ell = 800$ mm, $e = 0.90$, and $\theta = 20^\circ$.