

Name _____ Section _____

ES204
Examination II
January 22, 1999

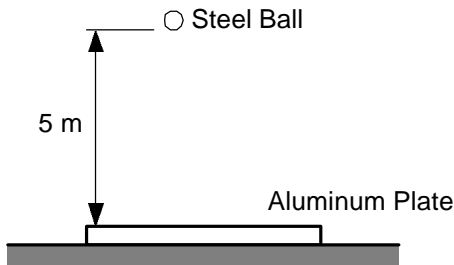
Problem	Score
1	/20
2	/40
3	/40
Total	/100

Show all work for credit
AND
Turn in your signed help sheet
AND
Stay in your seat until the end of class

1.1 A punch press flywheel operates at 30 rad/s with a mass moment of inertia of 15 slug-ft². Find the speed in rad/s to which the wheel will be reduced after a sudden punching requiring 4500 ft-lb of work.

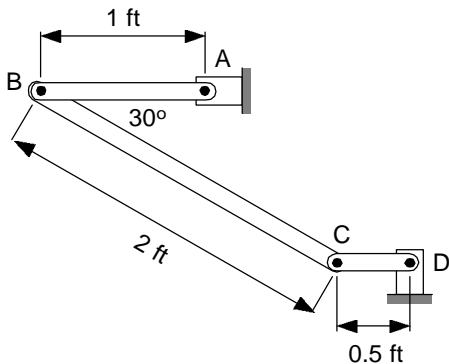
1.2 An experiment is performed to determine the coefficient of restitution for a 10 N steel ball and a heavy flat aluminum plate resting on the ground. The ball is dropped from a distance of 5 m above the plate and is measured to have a vertical speed of 4.8 m/s just after impact. Determine the coefficient of restitution.

- (a) 0.04 (b) 0.34 (c) 0.92 (d) 0.96 (e) none of these

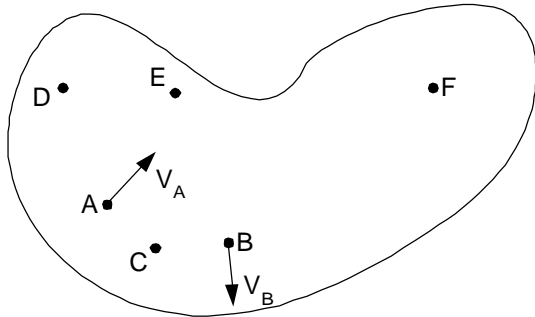


1.3 The angular velocity of rod AB is 5 rad/s clockwise. What is the angular velocity of rod BC at this instant?

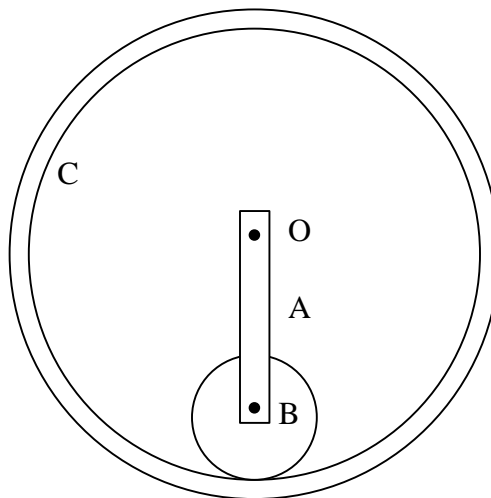
- (a) zero (b) 2.5 rad/s ccw (c) 5 rad/s ccw (d) undefined ω (e) none of these



1.4 A rigid body has velocities V_A and V_B as shown. Which labeled point on the body will have the greatest velocity?



1.5 Wheel B rolls without slipping inside ring C and is pinned to link A as shown. Link A is pinned to a fixed pivot at O. If the angular velocity of B is 10 rad/s, what is the angular velocity of link A. The distance for O to B is 8 inches and the radius of B is 2 inches.

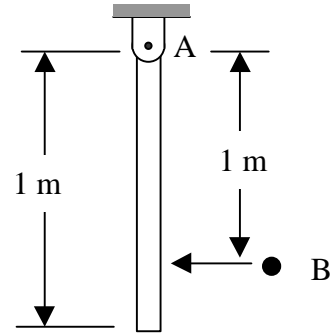


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ES204 Examination II

Problem 2

40 pts
Jan. 22, 1999

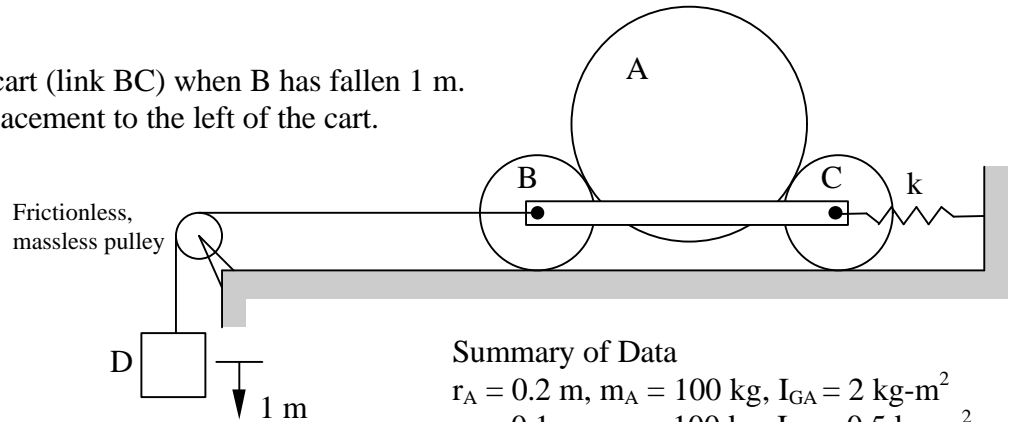
A 50 gram bullet travelling at 500 m/s strikes the homogeneous, long slender link with mass 1 kg, at a distance, h , below the pin joint O. Find the distance h so that the pin reaction in the x -direction will be zero at the instant of impact.



Cylinder A rolls without slipping on cylinders B and C as shown. The system is released from rest and cylinders B and C roll without slipping on the floor. The spring is initially undeflected and has a spring constant of 1000 N/m. Cylinders A, B and C and block D all have masses of 100 kg. Neglect the mass of link BC.

Determine:

- The velocity of the cart (link BC) when B has fallen 1 m.
- The maximum displacement to the left of the cart.



Summary of Data

$$r_A = 0.2 \text{ m}, m_A = 100 \text{ kg}, I_{GA} = 2 \text{ kg}\cdot\text{m}^2$$

$$r_B = 0.1 \text{ m}, m_B = 100 \text{ kg}, I_{GB} = 0.5 \text{ kg}\cdot\text{m}^2$$

$$r_C = 0.1 \text{ m}, m_C = 100 \text{ kg}, I_{GC} = 0.5 \text{ kg}\cdot\text{m}^2$$

$$m_D = 100 \text{ kg}, k = 1000 \text{ N/m}$$