Name _____ Section _____

ES204
Examination II
January 19, 2001

Problem	Score
1	/25
2	/40
3	/35
Total	/100

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

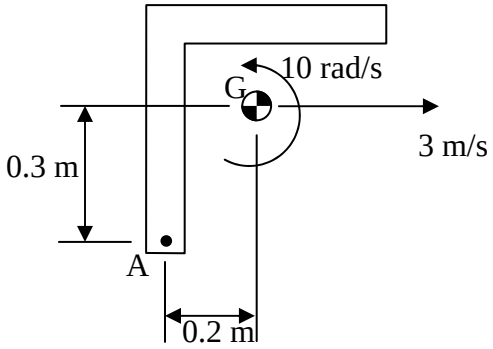
Name _____ 25 pts

ES204 Examination II **Problem 1** Jan. 19, 2001

1.1) A 10 pound, irregularly shaped object is found to have a mass moment of inertia about its center of gravity equal to 5 lbf-s^2-ft. Determine the radius of gyration about the center of gravity. (4 pts)

For problems 1.2 to 1.4 use the following information:

An L-shaped object is flying through the air as shown below. At the instant shown the object has an angular velocity of 10 rad/s (counter-clockwise) and a velocity of its center of gravity, G, of 3 m/s. The mass of the object is 5 kg and the mass moment of inertia is 0.2 kg-m^2.

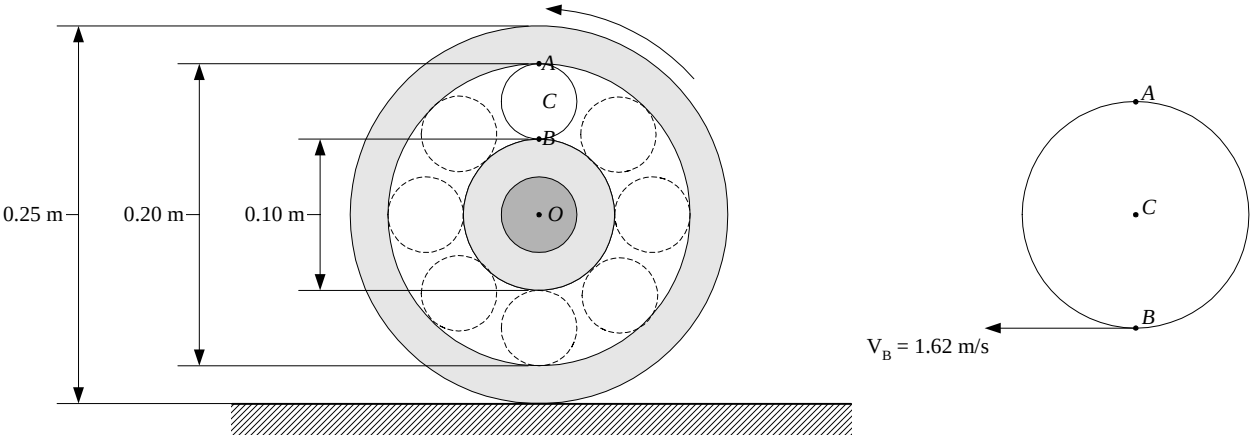


1.2) Determine the kinetic energy of the object. (4 pts)

1.3) Determine the linear momentum of the system. (3 pts)

1.4) Determine the angular momentum of the system about point A. (4 pts)

1.5-1.6) The large roller bearing rolls to the left on its outer race and its center O has a velocity of 0.9m/s. At the same time the central shaft and inner race rotate counterclockwise and point *B* has a velocity of 1.62 m/s to the left. There are no contacting surfaces that slip.



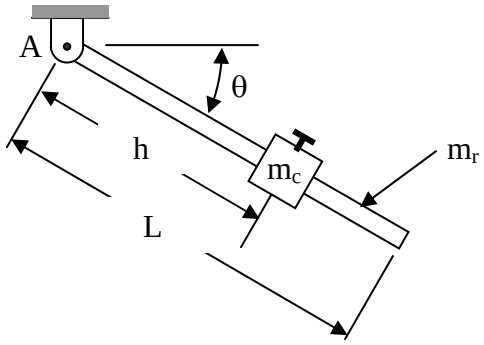
1.5) Determine the velocity of point *A* (the top inner side of the outer race). (5 pts)

1.6) Locate (approximately to scale) the instantaneous center of zero velocity (IC) for roller *C* on the enlarged view of roller *C*. (5 pts)

Name _____ 40 pts

ES204 Examination II **Problem 2** Jan. 19, 2001

A collar of mass m_c is attached to a rod of mass m_r as shown below. Assuming the rod is released from rest at $\theta = 0$ determine the equations necessary to find the reactions at point A when $\theta = 60°$. DO NOT SOLVE THE EQUATIONS. Your answer should consist of a list of unknowns and clearly labeled equations. Be sure to show all your work.



Name _____ 35 pts

ES204 Examination II **Problem 3** Jan. 19, 2001

A thin ring having a mass of 15 kg strikes the 20-mm-high step. The mass moment of inertia of a ring is mr^2. Determine the smallest angular velocity ω the ring can have so that it will make it over the step. Assume the ring does not slip or rebound from the step.