UNIVERSITY of ARKANSAS
1871 ®

**MEEG 2013** **Name:** _____

(Underline your **last name**.)

**Test III** ( ) **ID#:** _____

**1.** (30%) A section of pipe weighing 96.6 lb rolls without slipping with a clockwise angular velocity $\omega_1$ before it crosses a 16-in. gap as shown. It is known that the impact between the pipe and the gap is perfectly plastic and that the new angular velocity of the pipe after it has crossed the gap to the other side is $\omega_2 = 2$ rad/s ↻. Determine the angular velocity $\omega_1$.

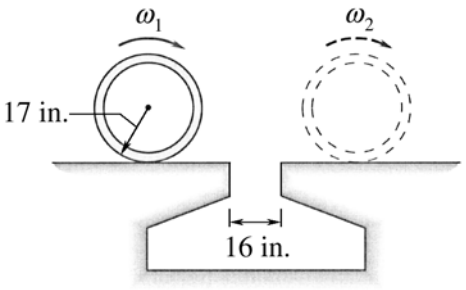


Fig. P1

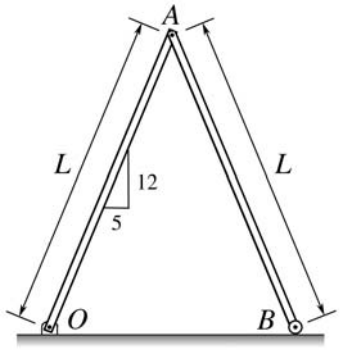


Fig. P2

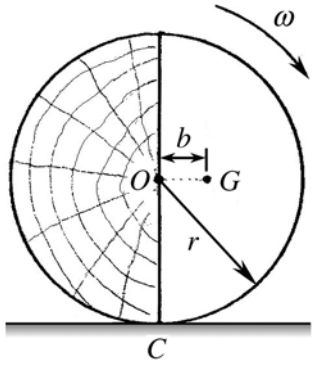


Fig. P3

**2.** (30%) The two slender bars *OA* and *AB*, each of length $L = 2.6$ m and mass $m = 6$ kg, are released from rest in the position shown. Using the *principle of virtual work in kinetics*, determine the angular acceleration $\alpha_{OA}$ of the bar *OA* immediately after release.

**3.** A 10-kg eccentric disk has a radius of gyration of 140 mm about its mass center *G* and rolls without slipping as shown, where $b = 100$ mm and $r = 300$ mm. It is known that, at the instant shown, its angular velocity is $\omega = 2$ rad/s ↻. For this instant, *circle on this test sheet* the nearest item for each of the following:

*A.* (7%) The magnitude of the angular acceleration $\alpha$ of disk is
(*a*) 9.42 rad/s$^2$. (*b*) 9.21 rad/s$^2$. (*c*) 8.99 rad/s$^2$. (*d* ) 8.77 rad/s$^2$. (*e*) 8.54 rad/s$^2$. ( *f* ) 8.32 rad/s$^2$.

*B.* (7%) The magnitude of the horizontal component $\mathbf{C}_x$ of the reaction at *C* is
(*a*) 23.6 N. (*b*) 23.0 N. (*c*) 22.3 N. (*d* ) 21.6 N. (*e*) 20.9 N. ( *f* ) 20.3 N.

*C.* (6%) The magnitude of the vertical component $\mathbf{C}_y$ of the reaction at *C* is
(*a*) 90.0 N. (*b*) 89.8 N. (*c*) 89.6 N. (*d* ) 89.3 N. (*e*) 89.1 N. ( *f* ) 88.9 N.

**4.** (20%) Non-numerical problem.

*A.* Describe the *principle of work and energy* for rigid bodies and the type of problems to which it is usually applicable.

*B.* Describe the *principle of impulse and momentum* for rigid bodies and the type of problems to which it is usually applicable.