Submit hardcopy at end of class.

ME 274 – Quiz10
Spring 2026 - 11:30 class

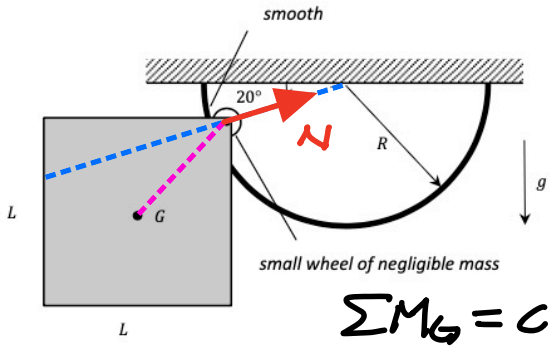
Name SOLUTION

Question 10.1

A homogeneous, square plate is released from rest in the orientation shown with the upper right corner of the plate being guided by a smooth, semi-circular guide. On release, the angular acceleration α of the plate is:

- α is counterclockwise
- $\alpha = 0$
- α is clockwise
- More information is needed in order to answer this question.

HINT: Start out with an FBD of the plate.



$\Sigma M_G = CW \Rightarrow$
$\alpha = CW$

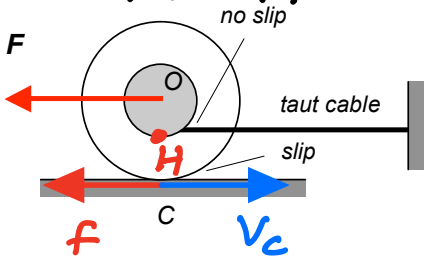
Question 10.2

A cable is wrapped around the inner radius of a stepped drum. A force F is applied to the center of the drum. Let μ_s and μ_k be the coefficients of static and kinetic friction, respectively, between the drum and ground. Circle the answer below that most accurately describes the friction force acting on the drum at the contact point C.

(a) $f = \mu_s mg$ (to the left)
(b) $f = \mu_k mg$ (to the left)
(c) $f = 0$
(d) $f = \mu_s mg$ (to the right)
(e) $f = \mu_k mg$ (to the right)

- Since H = IC, drum rotates about H
- F creates CCW moment about H ⇒ rotation of drum is CCW ⇒ C slides to right.
- From opposes motion of C

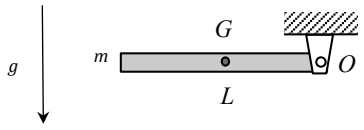
Sliding @ C ⇒ $f = \mu_k mg$

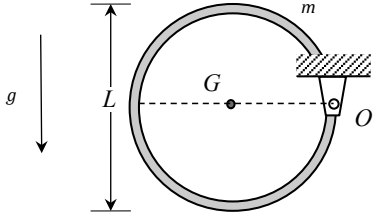


Question 10.3

A homogeneous thin bar and a homogeneous ring (each of mass m, with the length of the bar being L and the diameter of the ring being L) are supported by a pin joint at O. Each are released from rest when their centers of mass G are on the same horizontal level as O. Consider the speed of the center of mass G of each when G is at its bottom most position. At this position:

- The speed of the bar is greater than the speed of the ring.
- The speed of the bar is less than the speed of the ring.
- The speed of the bar is the same as the speed of the ring.
- More information is needed to answer this question.





homogeneous thin bar

$I_O = I_G + m\left(\frac{L}{2}\right)^2$
$= \frac{1}{12}mL^2 + \frac{1}{4}mL^2$
$= \frac{1}{3}mL^2$

homogeneous thin ring

$I_O = m\left(\frac{L}{2}\right)^2 + m\left(\frac{L}{2}\right)^2$
$= \frac{1}{2}mL^2$

⇒ bar larger velocity at G because its I_O is less