# Exam 3 Samples

Here are the sample exams for the last exam in the semester.

Please note the following:

1. The exam will take place on Thursday May 10 at 7:30 am in room ME 208.
2. The exam duration will be 75 minutes same as the first two exams.
3. Book and notes are allowed.
4. Only a calculator can be used.
5. No computers, tablets or other electronic devices allowed.

# ME-306 Exam # 3

May 13, 2010

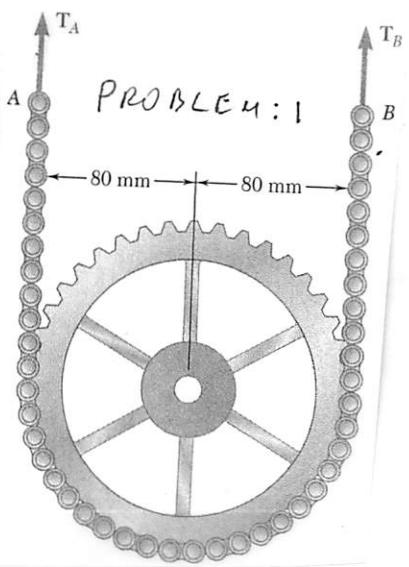
( Time 75 minutes ) NAME:_____

1. A 3-kg wheel has a centroidal radius of gyration of 70 mm and is suspended from a chain as shown. Determine the acceleration of points A and B of the chain, knowing that $T_A = 14\,N$ and $T_B = 18\,N$ (25 points) $\vec{a}_A = -0.885\,\hat{\jmath}$ $\vec{a}_B = 2.6\,\hat{\jmath}$

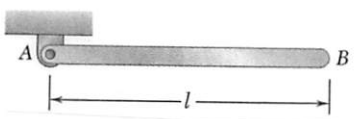
2. A slender rod of length $\ell = 3\,ft$ and weight $W = 1.8\,lb$ is pivoted at one end as shown. It is released from rest in a horizontal position and swings freely.
   a) Determine the angular velocity of the rod as it passes through the vertical position (15 points). $\omega = -5.67$ rad/s
   b) Determine the reactions at the pivot as it passes through the vertical position (10 points). $F_y = 4.5$ lb

3. A 50-lb uniform wheel of 1 ft radius rolls downhill.
   a) Determine the wheel's linear acceleration (15 points) $a = 10.73$ ft/s$^2$
   b) Determine the minimum value of $\mu_S$ that is sufficient to prevent slipping (10 points) $\mu = 0.192$

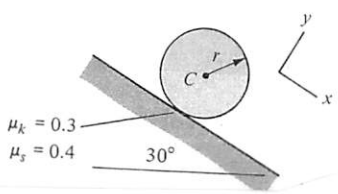
4. The Pendulum consists of a $20\,lb$ sphere and an $8\,lb$ rod. If it is released from rest when $\theta = 90^\circ$, determine the angular velocity $\omega$ right after the sphere strikes the floor . Take $e = 0.8$ (25 points). $\omega = 4.36$ rad/s



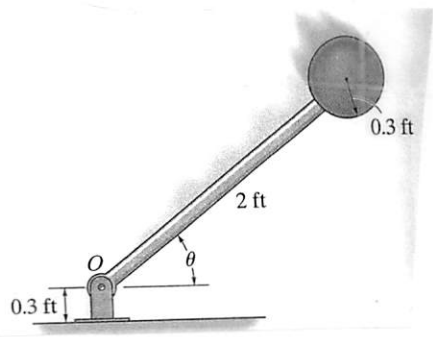
PROBLEM: 1



PROBLEM: 2



PROBLEM: 3



PROBLEM: 4

**ME-306: Exam #3** **December 17, 2009**

(Open book, time 75 minutes)

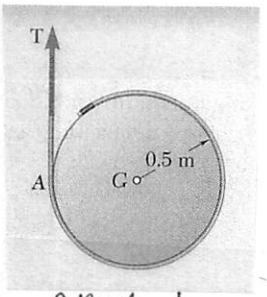
NAME:_____

1. A cord is wrapped around a homogeneous disk of radius r = 0.5 m and mass m = 15 kg. If the cord is pulled upward with a force **T** of magnitude 180 N, determine
   a) The acceleration of the center of the disk (10 points) $a_y = 2.19\ m/s^2$
   b) The angular acceleration of the disk (10 points) $\alpha = -48\ rad/s^2$
   c) The acceleration of the cord (5 points) $\vec{a}_A = 26.2\ \downarrow\ m/s^2$

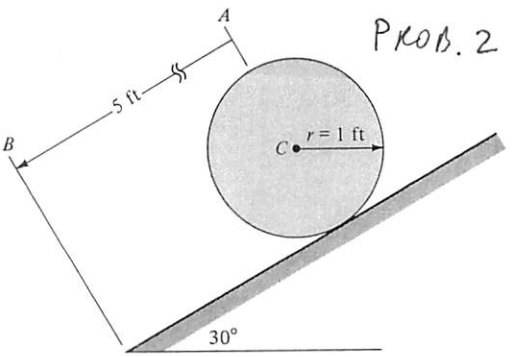
2. A 30-lb uniform disk is released from rest and rolls without slipping down the incline. **Using energy** calculate the velocity of the center C at position B. (25 points) $\omega = 10.36\ rad/s$

3. The scaffolding in the figure can be modeled as a uniform slender bar. If the support cable A breaks, calculate the tension in cable B and the angular acceleration of the scaffolding immediately after the failure of cable A. (25 points) $\alpha = 1.61\ rad/s^2$ $T = 200\ lb$

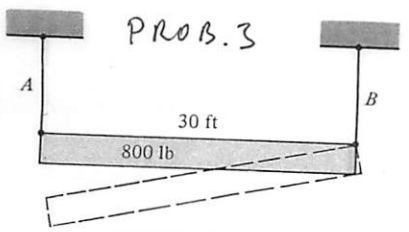
4. A 75-kg man stands on the turntable A and rotates a 6-kg slender rod over his head. If the angular velocity of the rod is ω = 5 rad/sec relative to the man and the turntable is observed to be rotating in the opposite direction with an angular velocity ω' = 3 rad/s, determine the radius of gyration of the man about the z-axis. Consider the turntable as a thin circular disk of 300-mm radius and 5-kg mass. (25 points) $k_a = 0.122$



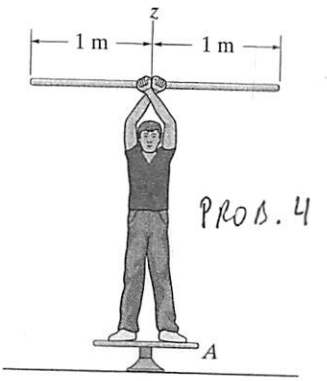
PROB. 1



PROB. 2



PROB. 3



PROB. 4