First Name: _____ Last Name: _____ Section: _____

3 December, 2009 Physics 207

EXAM 3

Please print your name and section number (or TA's name) clearly on the first page. Show all your work in the space immediately below each problem. **Your final answer must be placed in the boxes, when provided**. Problems will be graded on reasoning and intermediate steps as well as on the final answer. Be sure to include units wherever necessary, the direction of vectors, and the correct number of significant figures. Check your answers to see that they have the correct dimensions (units) and are the right order of magnitude. You are allowed 1 side of 1 sheet of notes (8.5" x 11", 1 side), a calculator, and the constants in this exam booklet. **Each part is worth 20 points**. Try to be neat! The exam lasts 1.25 hours.

Constants and Conversion Factors:

Acceleration due to gravity at Earth's surface: $g = 9.81$ m/s^2

1.0 km = 0.62 miles

1 atm =101,000 Pa

1 hp = 746 W

moment of inertial, I, for a solid disk of mass M and radius R $= MR^2/2$

SCORE:

Problem 1: _____

Problem 2: _____

Problem 3: _____

Problem 4: _____

Problem 5: _____

TOTAL: _____

Please don't open the exam until you are instructed to start.

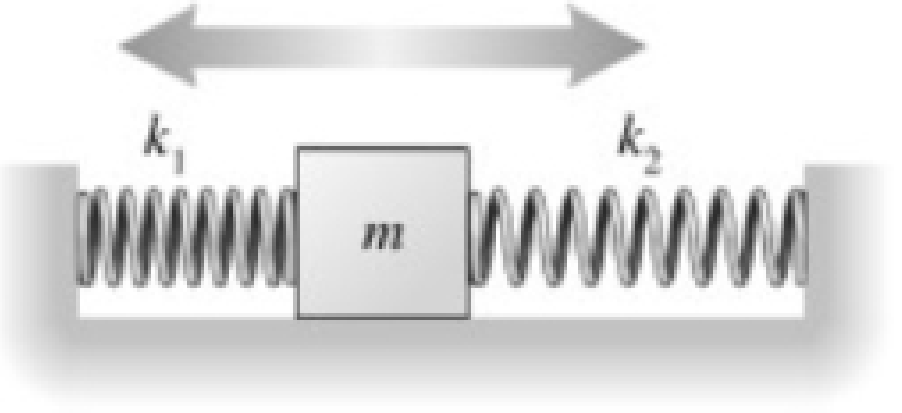
Part 1

A. A particular motor can provide a maximum of 110 N•m of torque. Assuming that all of this torque is used to accelerate a solid, uniform flywheel of mass 10.0 kg and radius 3.0 m, how long will it take for the flywheel to accelerate from rest to 6.0 rad/s? (Note - the moment of inertial for a solid disk of mass M and radius R is $I = MR^2/2$.) (10 pts)

B. An irregularly shaped object 10 m long is placed with each end on a scale. If the scale on the right reads 74 N and the scale on the left reads 93 N how far from the left is the center of gravity? (10 pts)

Part 2

A. A 2.0 kg block on a frictionless table is connected to two springs with spring constants k_1 and k_2 whose opposite ends are fixed to walls, as show in the figure. What is the oscillation angular frequency if k_1= 7.6 N/m and k_2 = 5.0 N/m? (10 pts)



B. A mass on a spring has an angular oscillation frequency of 2.8 rad/s. The mass has a maximum displacement (when t = 0 s) of 0.23 m. If the spring constant is 46 N/m, what is the potential energy stored in the mass-spring system when t = 1.4 s? (10 pts)