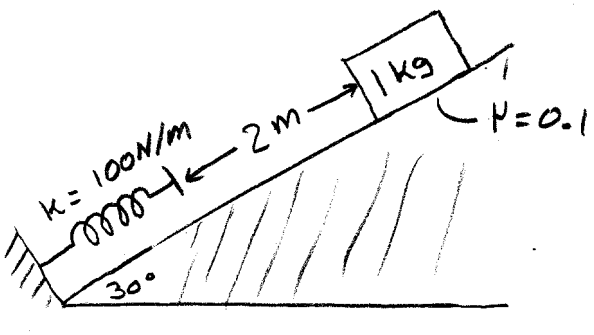
ELEC 435
Problem Set 1
Due: September 5, 2014

Homework Problems.

H1.1 The hook of a spring balance moves 10 mm when a load is hung on it. What will be its natural frequency of vibration?

H1.2 A block of mass 1kg is released from rest and travels down a 30° incline for a distance of 2m before striking a spring of stiffness 100N/m. The coefficient of friction between the block and the ramp is 0.1. Determine the maximum deflection of the spring.



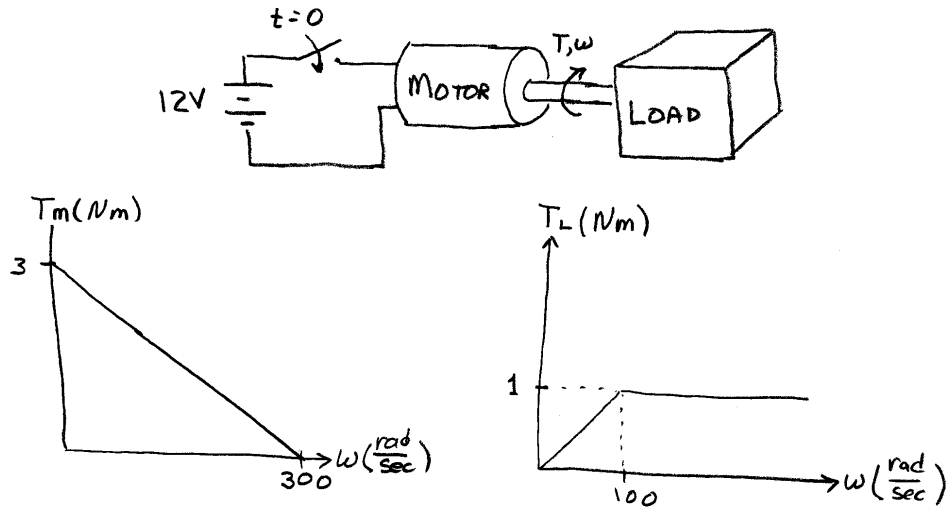
H1.3 In the sport of curling, a stone of mass 7kg is projected along an ice surface with the aim that it should travel to a mark some 20 m from the point of projection. If the coefficient of friction between the ice and the stone is 0.1, with what velocity should the stone be projected so that it reaches the mark without overshooting it?

H1.4 A DC motor is used to drive a load as shown in the figure below. When connected to a 12 V battery, the motor has the steady-state speed/torque relationship shown in the left-hand graph. The steady-state speed/torque relationship for the load is given in the right-hand graph. The combined moment of inertia of the rotating components of the motor and the load is $J = 2.5 \times 10^{-3} \mathrm{kg} \cdot \mathrm{m}^2$.

(a) Assuming the system is at rest when the switch is closed at $t = 0$, sketch ω vs. t.

(b) At what value of t does the speed reach 1500 rpm?

(c) What is the steady state speed of the motor/load combination?



Quiz Problems.
None this week.