Université d'Ottawa
Faculté de génie

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MCG 2108 (A) Mechanics II (FALL 2014)

FINAL Examination **Dec 8th, 2014.** **Time allowed: 3 hrs**

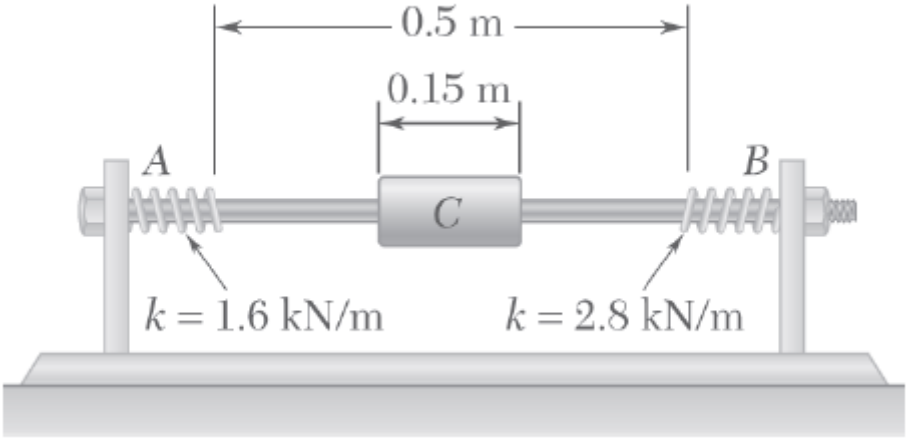
Total Points: 50

PLEASE READ INSTRUCTIONS CAREFULLY:

- *Attempt **All FIVE** questions.*
- *Write clearly and must draw sketches.*
- *Non-Programmable Calculators permitted.*
- ***Return the Question paper with the Answer booklet & FORMULA SHEET.***
- ***If you need additional data, make any Engineering assumption and proceed.***

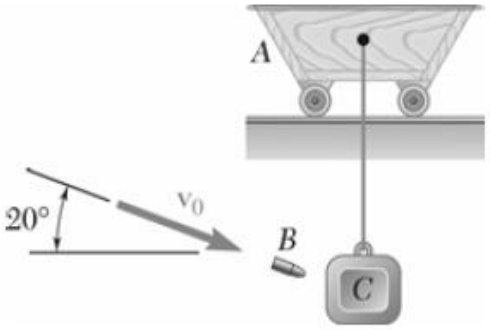
Total Pages: 3

Q1:
A collar *C* of mass *m* slides without friction on a horizontal rod between springs *A* and *B as shown below*. If the collar is pushed to the left until spring *A* is compressed 0.1 m and released, determine the distance through which the collar will travel and the maximum velocity it will reach if the *mass* changes from 1 kg to 2.5 kg. (**10 points**)

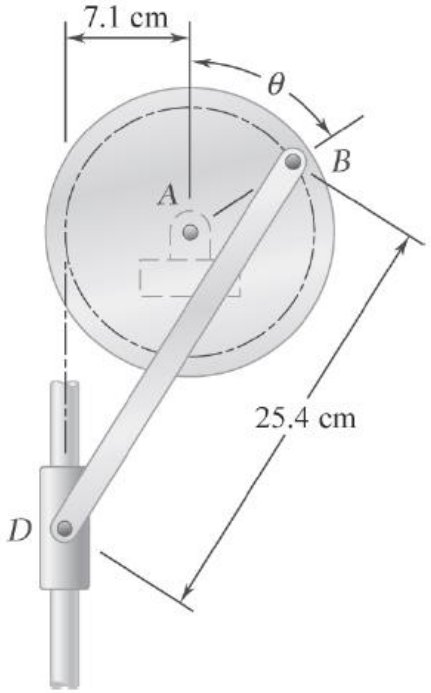


Q2:
Mass *C*, which has a mass of 4 kg, is suspended from a cord attached to cart *A*, which has a mass of 5 kg and can roll freely on a frictionless horizontal track *as shown below*. A 60-g bullet is fired with a speed V_O = 500 m/s and gets lodged in block *C*. Determine *(a)* the velocity of *C* as its reaches its maximum elevation, *(b*) the maximum vertical distance ***h*** through which *C* will rise.

(**10 points**)



Q3:
Collar *D* slides on a fixed vertical rod *as shown below*. Knowing that the disk has a constant angular velocity of 15 rad/sec clockwise, determine the angular acceleration of bar *BD* and the acceleration of collar D, when θ changes from 0^0 to 90^0. **(10 points)**



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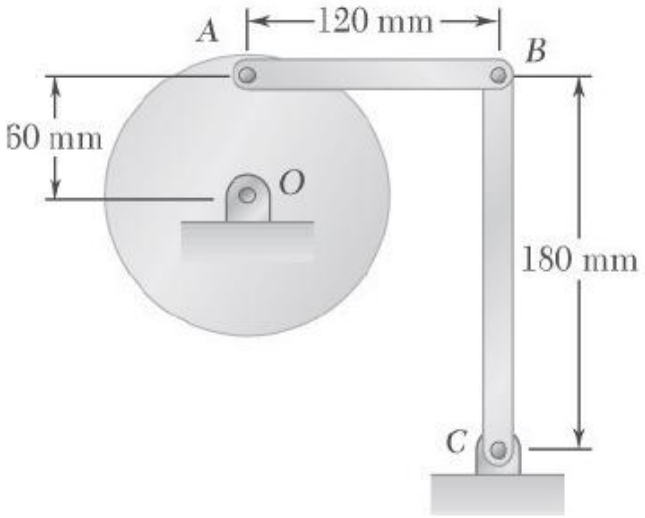
Q4:

The 2-kg rod *AB* and the 3-kg rod *BC* are connected as shown to a disk that is made to rotate in a vertical plane *as shown below*. Knowing that at the instant shown the disk has an angular acceleration of 18 rad/sec^2 clockwise and no angular velocity, determine the components of the forces exerted at *A* and *B* on rod *AB.* (**10 points**)



Q5:

Each of the double pulleys shown has a centroidal mass moment of inertia 0.25 kg-m^2, an inner radius of 100 mm and an outer radius of 150 mm as shown below. Neglecting bearing friction, determine *(a)* the velocity of the cylinder 3 seconds after the system is released from rest, *(b)* the tension in the cord connecting the pulleys. (**10 points**)