Write your NAME :	Exam 1 March 7th, 2016	MEE 241 (Spring 2016) *Dynamics*

Problem 1 (30 pts)

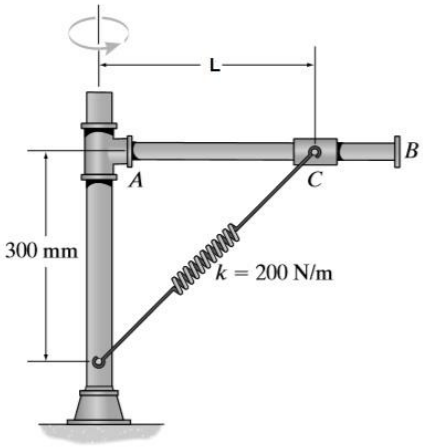

Fig. 1

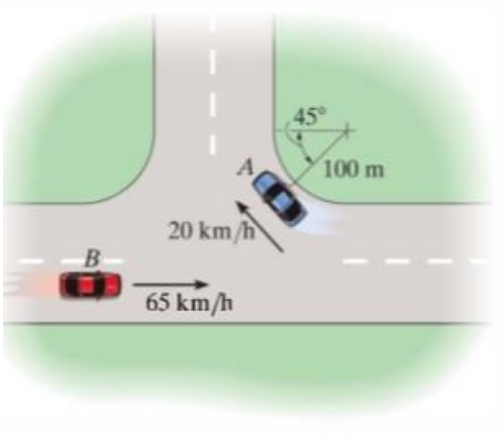

Fig. 2

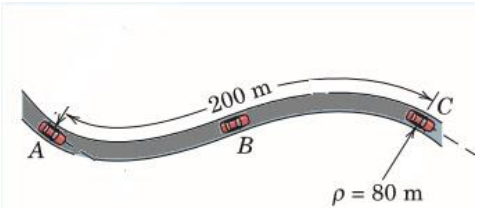

Fig. 3

The mechanism in Fig. 1 is rotating about the vertical axis with a constant angular velocity ω. If rod AB is smooth, determine the value of ω that will keep the 3-kg collar C at a constant position 800mm away from the axis of rotation. The spring has an unstretched length of 400 mm.

Problem 2 (30 pts)

At the instant shown in Fig. 2, cars A and B are traveling at the speeds shown. If B is accelerating at $1200\ km/h^2$ while A maintains a constant speed, determine the velocity and acceleration of A with respect to B.

Problem 3 (20 pts)

A 1200-kg car enters a section of curved road in the horizontal plane and speeds up at a uniform rate from a speed of 40 km/h at A to a speed of 90 km/h as it passes C. Determine the total horizontal force exerted by the road on the tires at position C where the radius of curvature of the road is 80 m.

Problem 4 (20 pts)

The weight of a particle varies with altitude such that $W = mgr_e^2/y^2$, where r_e is the radius of the earth and y is the distance from the particle to the earth's center. A particle is fired vertically upwards from the earth's surface with a velocity v_0:

a) determine its velocity as a function of position y
b) find the maximum y reached.
c) (bonus, 5 pts) What v_0 will allow the particle to escape the earth's gravitational field and keep going towards outer space?