Notre Dame University. Department of Mechanical Engineering
Final-MEN101 (Dynamics) *Closed book:2hr*
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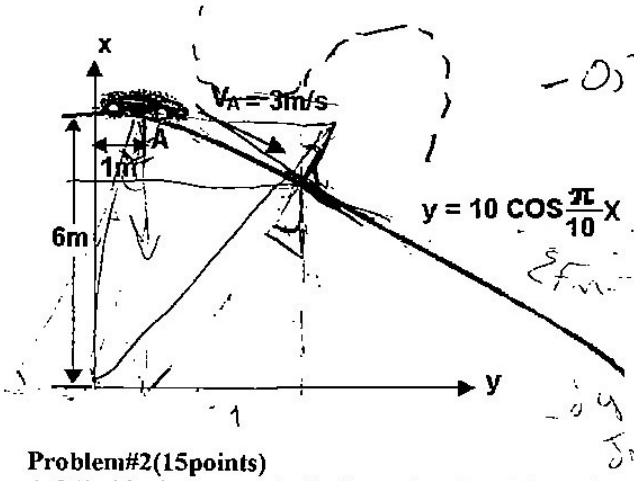
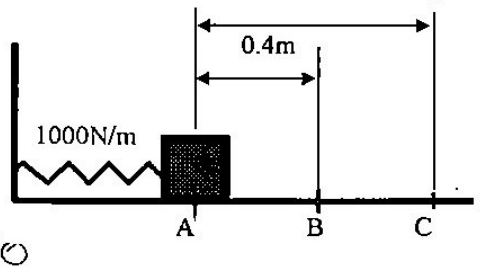
Instructions: You must explain your methodology carefully and in detail, including the specific assumptions you use. Steps should be clear.

Problem #1(10, 10points)
The car has a total weight of 950 kg.

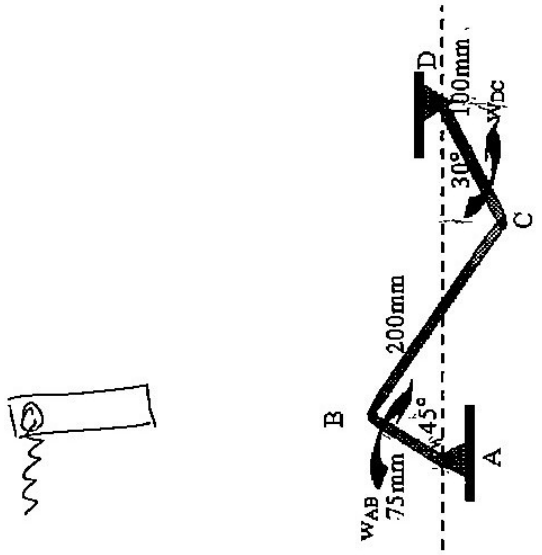
a) Find the resultant normal force acting on the car when it is at point A and freely going at 3m/s.
b) Compute the increase in the car speed at this point. Neglect air resistance and do not pay attention for the size of the car.



Problem#2(15points)
A 5 Kg block rests on the horizontal surface. The spring is initially compressed 0.4 m from B to A. After the block is released from rest at A, determine its velocity when it passes point C. $\mu_k = 0.25$.

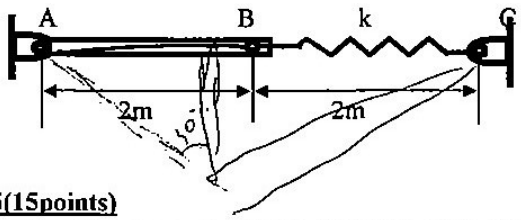


Problem#3(20points)
For the three bar linkage shown w_{DC} = 4rad/s; Find w_{AB} and w_{CB} at the instant shown.



Problem#4(15, 15points)
When the slender 20kg bar AB is horizontal; it is at rest and the spring is unstretched.

a) Find the stiffness k of the spring so that the motion of the bar is momentarily stopped when it has rotated downward 90°.
b) Find the angular velocity of the bar when θ = 60°.



Problem#5(15points)
Blocks A and B with mass m, find the largest horizontal force P which can be applied to A so that B will not move relative to A. All surfaces are smooth.