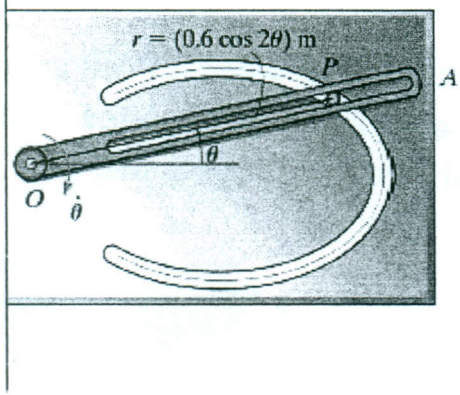
Mansoura University	Final Term Exam	12/1/2013	Mechanics
Faculty of Engineering	Dept.: Mechanical Eng.		Time: 3 hours

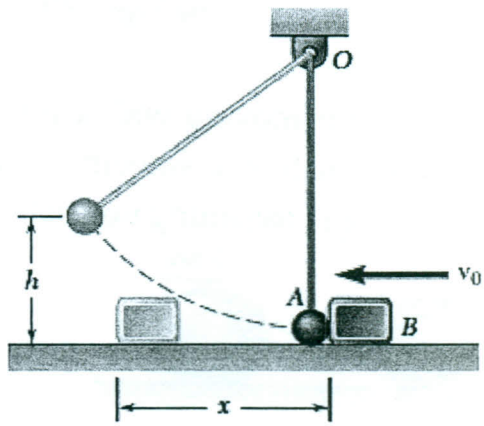
الامتحان 8 أسئلة فى صفحتين حديث و من الخارج

Solve as you can. **اقرأ ورقة الأسئلة جيداً و ابدأ بحل السؤال الأسهل.**

1- The 0.2-kg pin P is constrained to move in the smooth curved slot, which is defined by the lemniscates $r = (0.6 \cos 2\theta)$ m. Its motion is controlled by the rotation of the slotted arm OA, which has a constant clockwise angular velocity of $\dot{\theta} = -3$ rad/s. Determine the force arm OA exerts on the pin P when $\theta = 0°$. Motion is in: (a) horizontal plane, and (b) vertical plane.

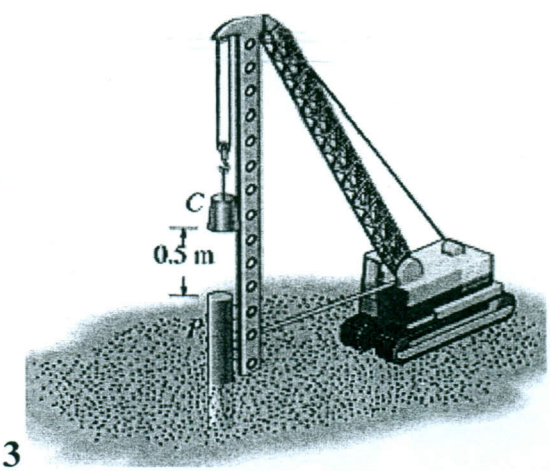


Prob. 1



Prob. 2

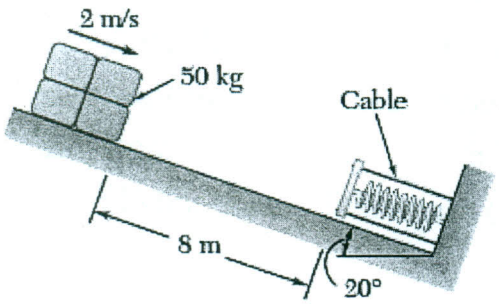
2- A 1-kg block B is moving with a velocity $v_0 = 2$ m/s as it hits the 0.5-kg sphere A, which is at rest and hanging from a cord attached at O. Knowing that $\mu_k = 0.6$ between the block and the horizontal surface and $e = 0.8$ between the block and the sphere, determine after impact (a) the maximum height h reached by the sphere, (b) the distance x traveled by the block.



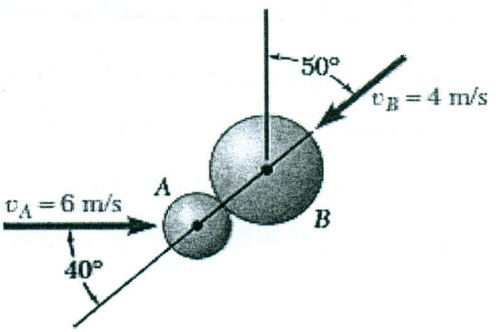
Prob. 3

3- The pile P has a mass of 800 kg and is being driven into loose send using the 300-kg hammer C which is dropped a distance of 0.5 m from the top of the pile. Determine the speed of the pile just after it is struck by the hammer. The coefficient of restitution between the hammer and the pile is $e = 0.1$.

4- A spring is used to stop a 50-kg package which is moving down a 20° incline. The spring has a constant $k = 30$ kN/m and is held by cables so that it is initially compressed 50 mm. Knowing that the velocity of the package is 2 m/s when it is 8 m from the spring, and the kinetic coefficient of friction between the package and the incline is 0.2. Determine the maximum additional deformation of the spring in bringing the package to rest.

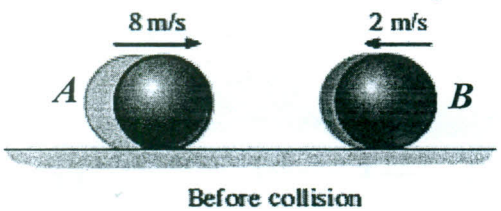


Prob. 4

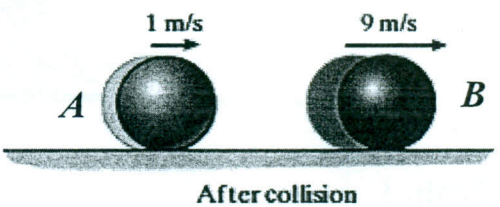


Prob. 5

5- A 600-g ball A is moving with a velocity of magnitude 6 m/s when it is hit as shown by a 1-kg ball B which has a velocity of magnitude 4 m/s. Knowing that the coefficient of restitution is 0.8 and assuming no friction, determine the velocity of each ball after impact.



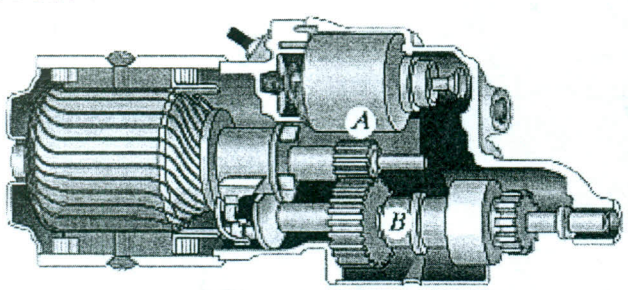
Prob. 6

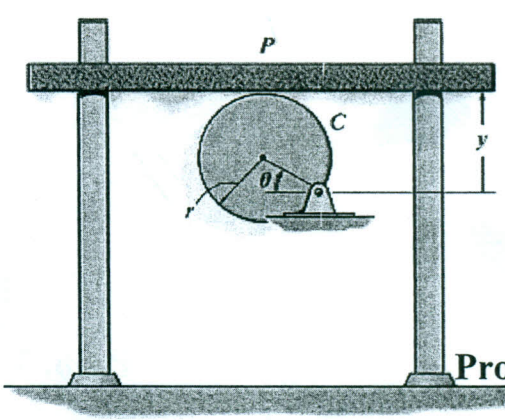


6- Determine the coefficient of restitution e between ball A and B. The velocities of A and B before and after the collision are shown.

7- For a short time, gear A of the automobile starter rotates with an angular acceleration of $\alpha_A = (450\ t^2 + 60)$ rad/s^2, where t is in seconds. Determine the angular velocity and angular displacement of gear B when $t = 2$ s, starting from rest. The radii of gears A and B are 10 mm and 25 mm, respectively.

Prob. 7





Prob. 8

8- Determine the velocity and acceleration of platform P as a function of the angle θ of cam C if the cam rotates with a constant angular velocity ω. The pin connection does not cause interference with the motion of P on C. The platform is constrained to move vertically by the smooth vertical guides.