題號： 297　　國立臺灣大學 112 學年度碩士班招生考試試題

科目： 應用力學(B)

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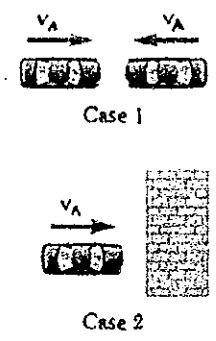
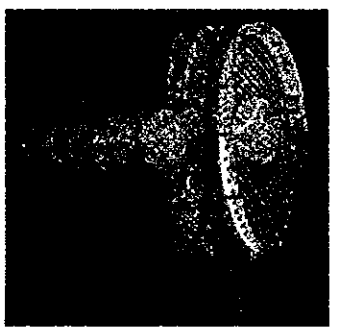
1. **[16 points]** Define and describe the following terms:
   (1) Conservative force. (2) Three-force body. (3) Angle of friction. (4) Rolling resistance.

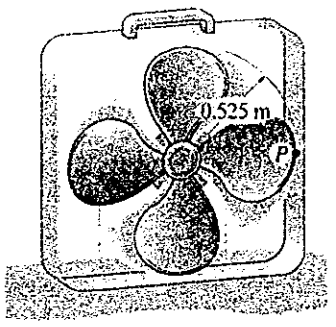
2. **[12 points]** Multiple-choice questions. Refer to the figures below.
   (1) The expected damages associated with two types of perfectly plastic collisions are to be compared. In the first case, two identical cars traveling at the same speed impact each other head on. In the second case, the car impacts a massive concrete wall. In which case would you expect the car to be more damaged? (a) Case 1 (b) Case 2 (c) The same damage in each case.
   (2) If an impulse-momentum analysis is considered during the very short time of interaction, as shown in the picture, weight is a/an _____. → (a) impulsive force (b) explosive force (c) non-impulsive force (d) internal force.
   (3) The fan blades suddenly experience an angular acceleration of 2 rad/s^2. If the blades are rotating with an initial angular velocity of 4 rad/s, determine the speed of point *P* when the blades have turned 2 revolutions (when $\omega = 8.14$ rad/s).
   (a) 4.27 m/s (b) 5.31 m/s (c) 6.93 m/s (d) 8 m/s (e) 0 m/s



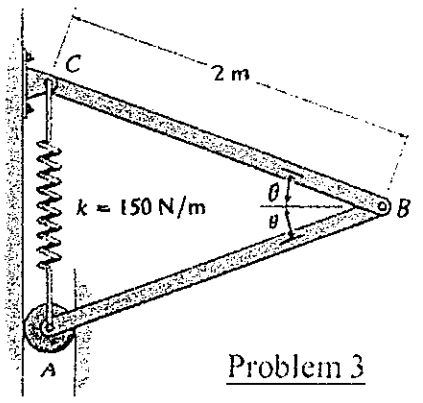
Problem 2(1)



Problem 2(2)



Problem 2(3)



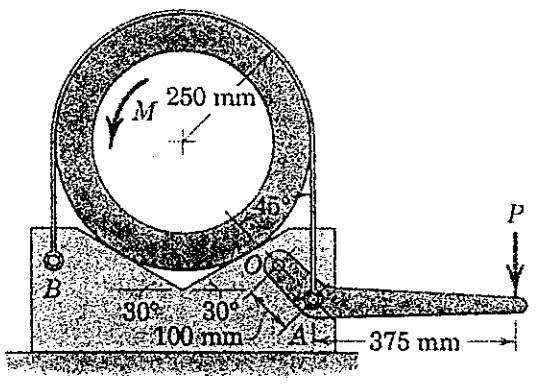
Problem 3

3. **[16 points]** The spring has an unstretched length of 0.3 m. (a) Plot the FBD of *AB* and *BC*. (b) Determine the angle θ for equilibrium if each uniform bar has a mass of 16 kg.

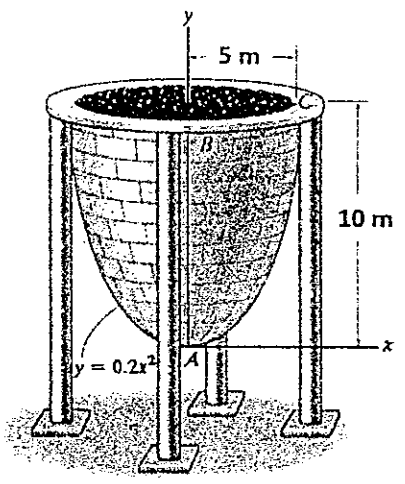
4. **[20 points]** Find the couple *M* required for the design of the band brake shown to turn the pipe in the V-block against the action of the flexible band. A force $P = 100$ N is applied to the lever, which is pivoted about *O*. The coefficient of friction between the band and the pipe is 0.3, and that between the pipe and the block is 0.4. The weights of the parts are negligible.

5. **[16 points]** The suspension bunker as a coal container is made from plates curved to the natural shape.
   (a) Calculate the surface area of the bunker. (b) Calculate the volume of the bunker.

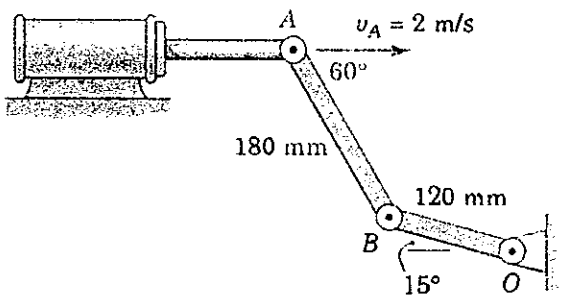
6. **[20 points]** At the instant under consideration, the rod of the hydraulic cylinder is extending at the rate $v_A = 2$ m/s. Determine the corresponding (a) angular velocity and (b) angular acceleration of link *OB*.



Problem 4



Problem 5



Problem 6

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