題號： 351 國立臺灣大學 106 學年度碩士班招生考試試題

科目： 應用力學(B)

節次： 4

Note: refer to the figures on bottom for the corresponding problems

1. [15 points] A hydraulic-lift table is used to raise a 1000-kg crate. It consists of a platform and two identical linkages on which hydraulic cylinders exert equal forces. (Only one linkage and one cylinder are shown here.) Member *EDB* and *CG* are each of length $2a$ and *AD* is pinned to the midpoint of *EDB*. If the crate is placed on the table, so that half of its weight is supported by the system shown, determine the force exerted by the cylinder in raising the crate for $\theta = 60°$, $a = 0.5$ m, and $L = 3$ m.

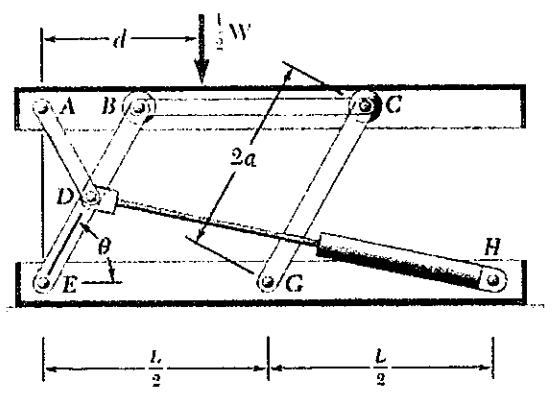
2. [15 points] The concrete dam is held in place by its own weight. If the density of concrete is $\rho_c = 2.5$ Mg/m^3, and water has a density of $\rho_w = 1.0$ Mg/m^3, determine the smallest dimension d that will prevent the dam from overturning about its end A.

3. [15 points] A counterclockwise moment $M = 150$ N·m is applied to the flywheel. If the coefficient of friction between the band and the wheel is 0.2, compute the minimum force *P* necessary to prevent the wheel from rotating.

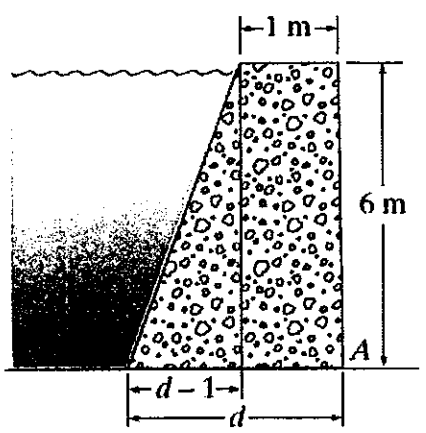
4. [15 points] The pendulum is released from the 60° position and then strikes the initially stationary cylinder of mass m_2 when *OA* is vertical. Determine the maximum spring compression δ. Use the values $m_1 = 3$ kg, $m_2 = 2$ kg, $\overline{OA} = 0.8$ m, coefficient of restitution $e = 0.7$, and $k = 6$ kN/m. Assume that the bar of the pendulum is light so that the mass m_1 is effectively concentrated at point *A*. The rubber cushion *S* stops the pendulum just after the collision is over. Neglect all friction.

5. [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*.

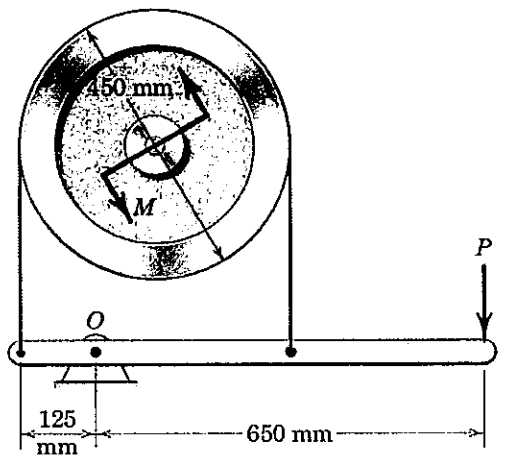
6. [20 points] A uniform slender rod of length $L = 1000$ mm and mass $m = 4$ kg is suspended from a hinge at *C*. A horizontal force **P** of magnitude 100 N is applied at end *B*. Knowing that $\bar{r} = 250\ mm$, determine (*a*) the angular acceleration of the rod (10 points), (*b*) the *x* and *y* components of the reaction at *C* (10 points). (Hint: for a slender rod, moment of inertia $\bar{I} = \frac{1}{12}mL^2$)



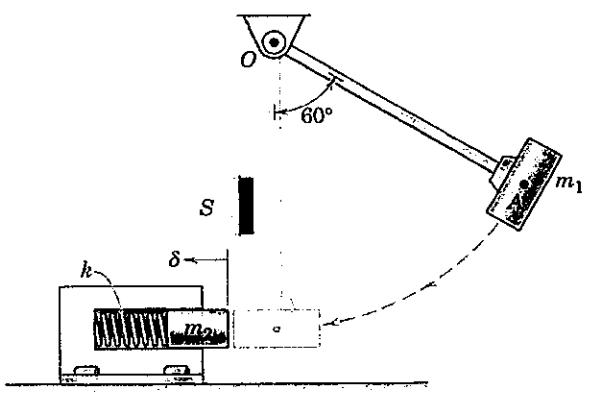
Problem 1



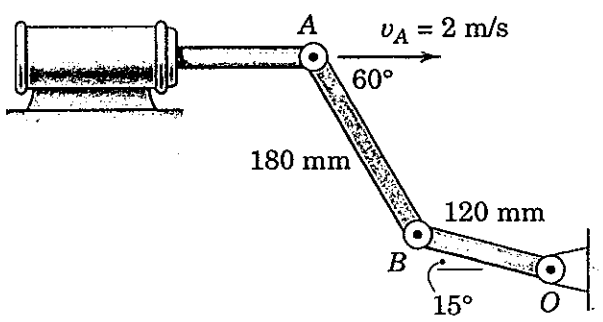
Problem 2



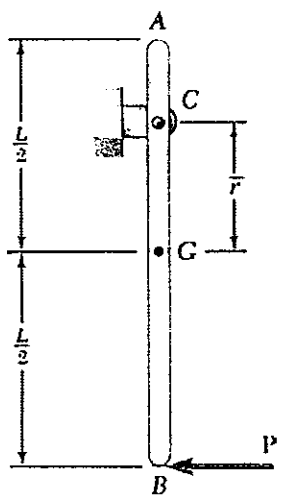
Problem 3



Problem 4



Problem 5



Problem 6

試題隨卷繳回