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

1. [20 points] Determine (*a*) the force in members *ED*, *DC*, *HC*, *EH*, *GH*, and *HI* of the truss, and state if the members are in tension or compression; (*b*) how many zero-force members are existing in this truss.

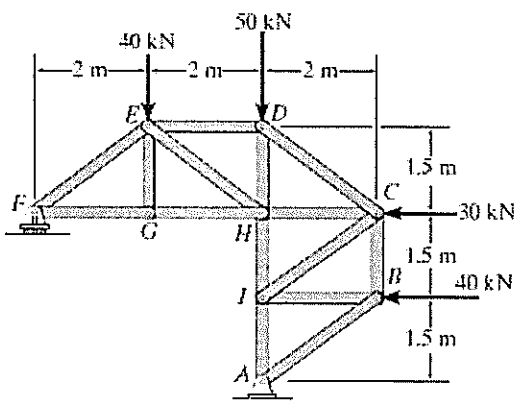
2. [12 points] The rectangular gate shown in section is 3 m long (perpendicular to the paper) and is hinged about its upper edge *B*. The gate divides a channel leading to a fresh-water lake on the left and a saltwater tidal basin on the right. Calculate the torque *M* on the shaft of the gate at *B* required to prevent the gate from opening when the salt-water level drops to 1 m. (The densities of fresh water and salt water are 1.000 g/cm^3 and 1.030 g/cm^3, respectively.)

3. [16 points] A 6.5-m ladder *AB* leans against a wall as shown. Determine the smallest value of μ_s at *A* for which equilibrium is maintained under the following two conditions: (*a*) the coefficient of static friction μ_s is zero at *B*; (*b*) the coefficient of static friction μ_s is the same at *A* and *B*.

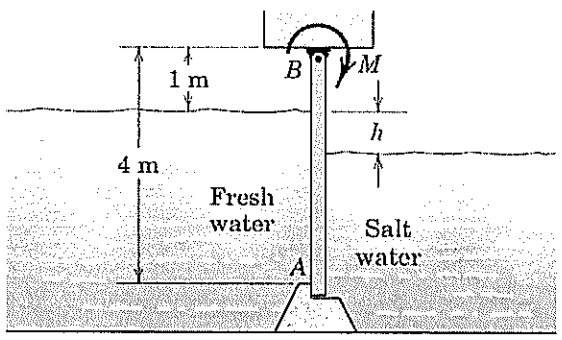
4. [20 points] A 2-kg block *A* is pushed up against a spring compressing it a distance $x = 0.1$ m. The block is then released from rest and slides down the 20° incline until it strikes a 1-kg sphere *B* which is suspended from a 1 m inextensible rope. The spring constant $k = 800$ N/m, the coefficient of friction between *A* and the ground is 0.2, the distance *A* slides from the unstretched length of the spring $d = 1.5$ m and the coefficient of restitution between *A* and *B* is 0.8. When $\alpha = 40°$, determine (*a*) the speed of *B* and (*b*) the tension in the rope.

5. [16 points] The mechanism is presented here and the angular velocity ω_0 of the disk is constant. Determine (*a*) the angular velocity ω_{AB} and the angular acceleration α_{AB} of link *AB*; (*b*) the velocity v_B and the acceleration of a_B of collar *B* for the instant represented. Assume the quantities ω_0 and *r* to be known. (Each answer for 4 pt)

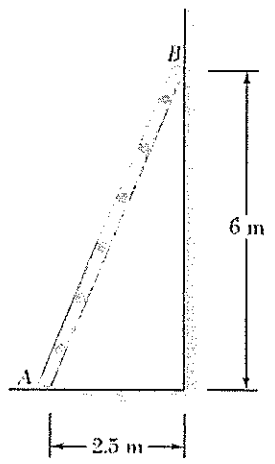
6. [16 points] Collar *B* moves to the left with a speed of 5 m/s, which is increasing at a constant rate of 1.5 m/s^2, relative to the hoop, while the hoop rotates with the angular velocity and angular acceleration shown. Determine the magnitudes of the velocity and acceleration of the collar at this instant.



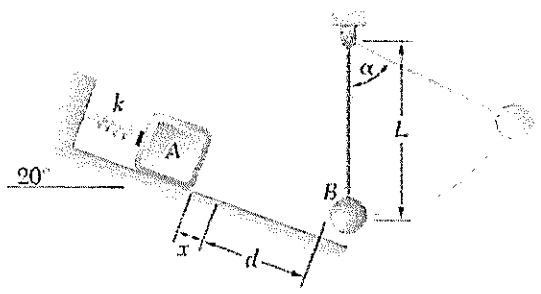
Problem 1



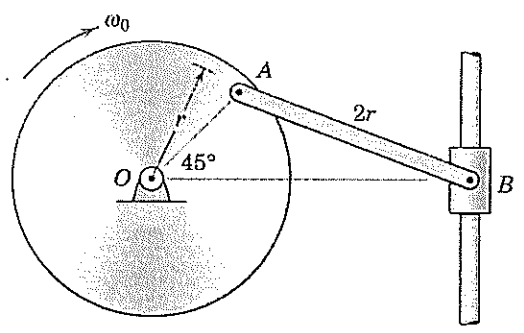
Problem 2



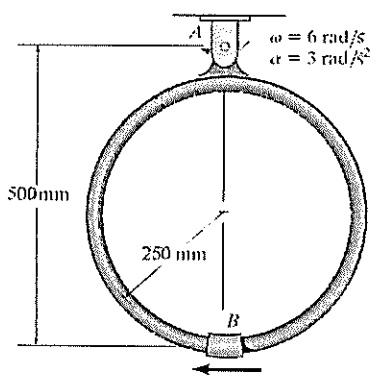
Problem 3



Problem 4



Problem 5



Problem 6

試題隨卷繳回