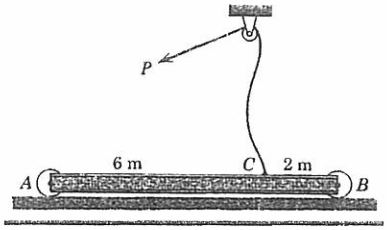
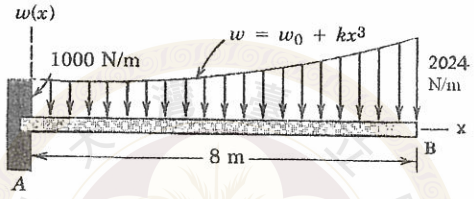
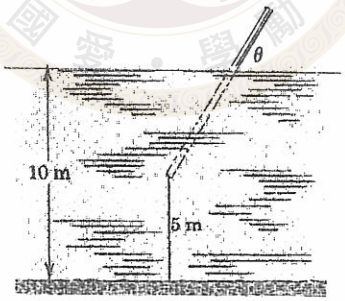
1. The uniform 100-kg I-beam is supported initially by its end rollers on the horizontal surface A and B. by means of the cable at C it is desired to elevate end B to a position 3m above end A. Determine the required tension P, the reaction A, and the angle θ made by the beam with the horizontal in the elevated position. (20 分)



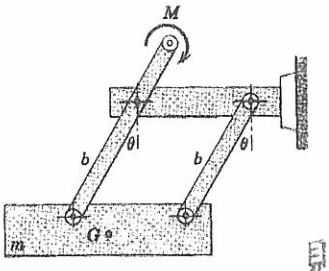
2. Determine the reaction at support A of the loaded cantilever beam. (20 分)



3. A buoy in the form of a uniform 8-m pole 0.2 m in diameter has a mass of 200 kg and is secured at its lower end to the bottom of a fresh-water lake with 5 m of cable. If the depth of the water is 10 m, calculate the angle θ made by the pole with the horizontal. (15 分)



4. The mass m is brought to an equilibrium position by the application of the couple M to the end of one of the two parallel links that are hinged as shown. The links have negligible mass, and all friction is assumed to be absent. Determine the expression for the equilibrium angle θ assumed by the links with vertical for a given value of M. Consider the alternative of a solution by force and moment equilibrium. (15 分)



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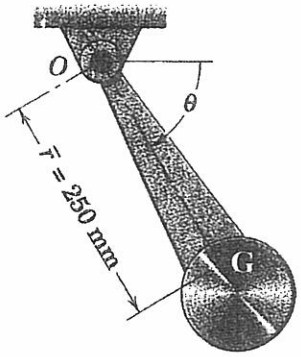
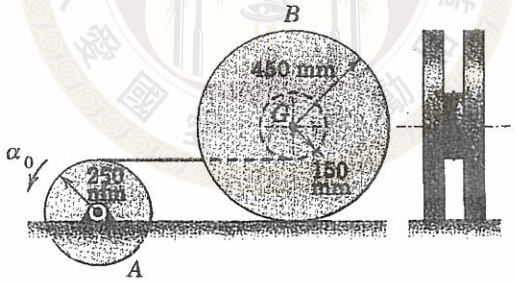
5. The pendulum has a mass of 7.5 kg with center of mass at G and has a radius of gyration about the pivot O of 295mm. If the pendulum is released from rest at $\theta = 0^\circ$, determine the total force supported by the bearing at the instant when $\theta = 60^\circ$. Friction in the bearing is negligible. (15 分)



6. The drum A is given a constant angular acceleration α_0 of 3 rad/s^2 and causes the 70-kg spool B to roll on the horizontal surface by means of the connecting cable, which wraps around the inner hub of the spool. The radius of gyration $\bar{k}$ of the spool about its mass center G is 250 mm, and the coefficient of static friction between the spool and horizontal surface is 0.25. Determine the tension T in the cable and the friction force F exerted by the horizontal surface on the spool. (15 分)



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