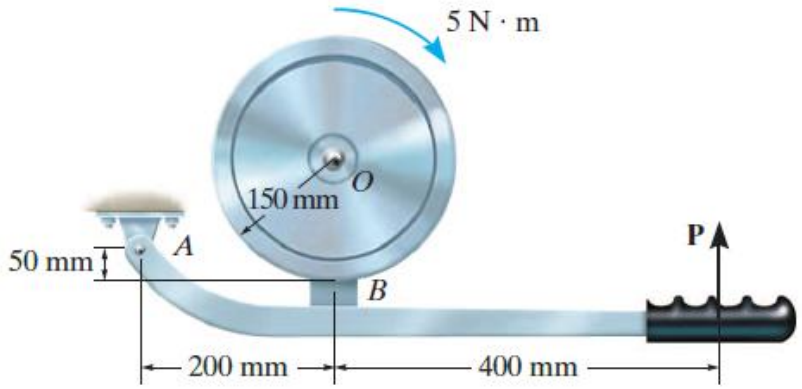
CHAPTER VII FRICTION

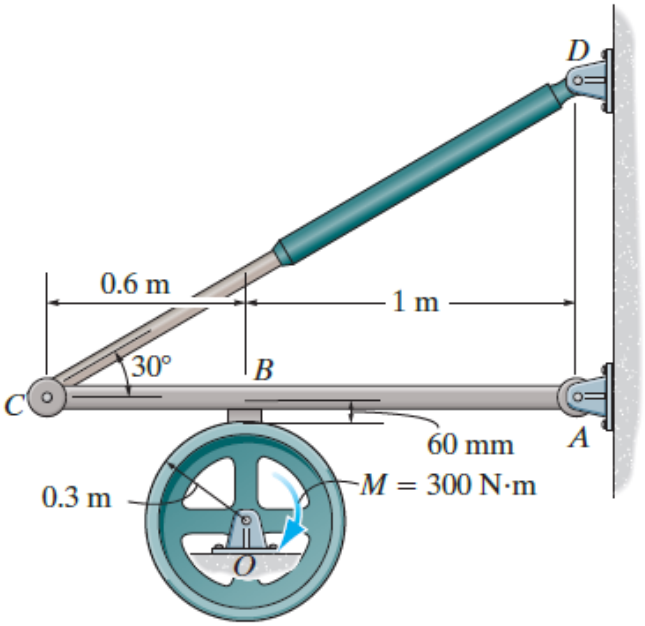
1- The block brake consists of a pin-connected lever and friction block at *B*. The coefficient of static friction between the wheel and the lever is and a torque of is applied to the wheel. Determine if the brake can hold the wheel stationary when the force applied to the lever is (a) P = 30 N, (b) P = 70 N.

((a) P = 30 N < 39.8 No, b) P = 70 N > 39.8 N Yes)

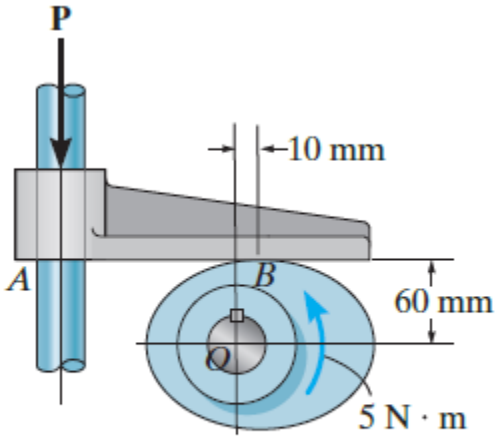


2- If a torque of M=300 N.m is applied to the flywheel, determine the force that must be developed in the hydraulic cylinder *CD* to prevent the flywheel from rotating. The coefficient of static friction between the friction pad at *B* and the flywheel μ_s =0.4.

(FCD = 3050 N = 3.05 kN)

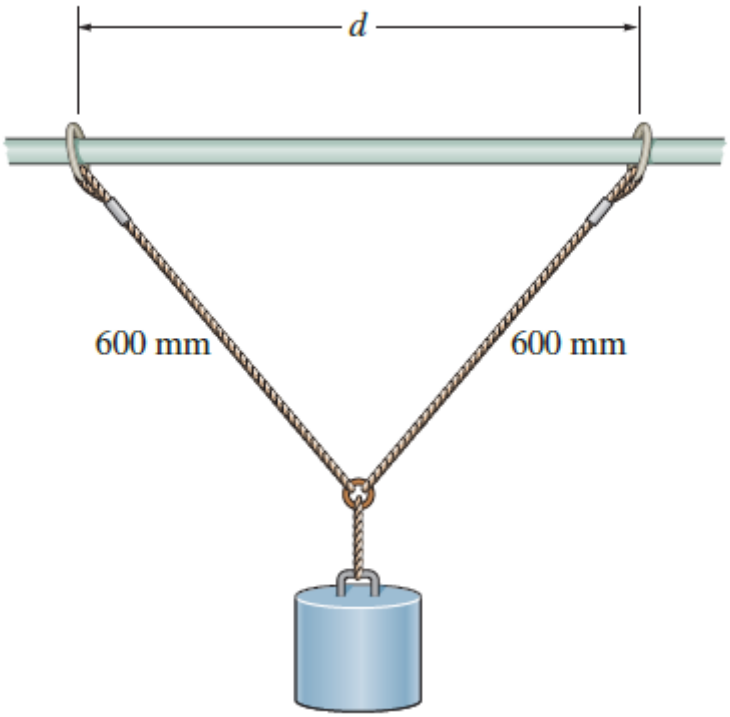


3- The cam is subjected to a couple moment of 5 N.m Determine the minimum force *P* that should be applied to the follower in order to hold the cam in the position shown. The coefficient of static friction between the cam and the follower is $\mu_s = 0.4$. The guide at *A* is smooth.



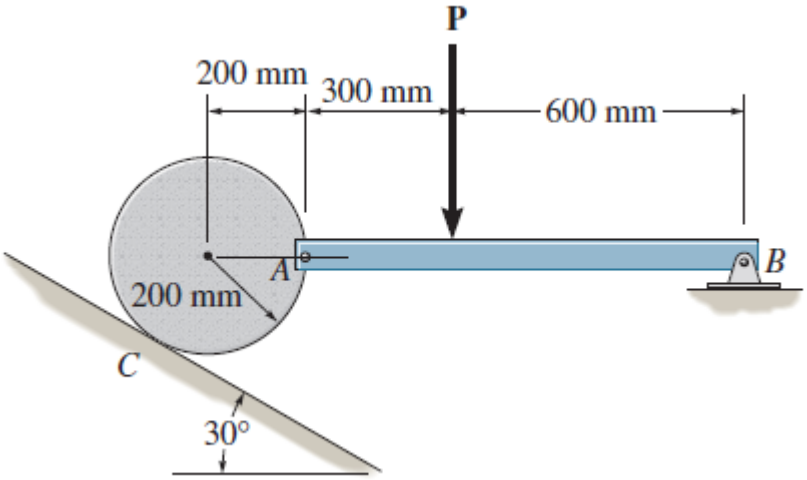
4- The 5-kg cylinder is suspended from two equal-length cords. The end of each cord is attached to a ring of negligible mass that passes along a horizontal shaft. If the rings can be separated by the greatest distance d=400 mm and still support the cylinder, determine the coefficient of static friction between each ring and the shaft.

(0.354)



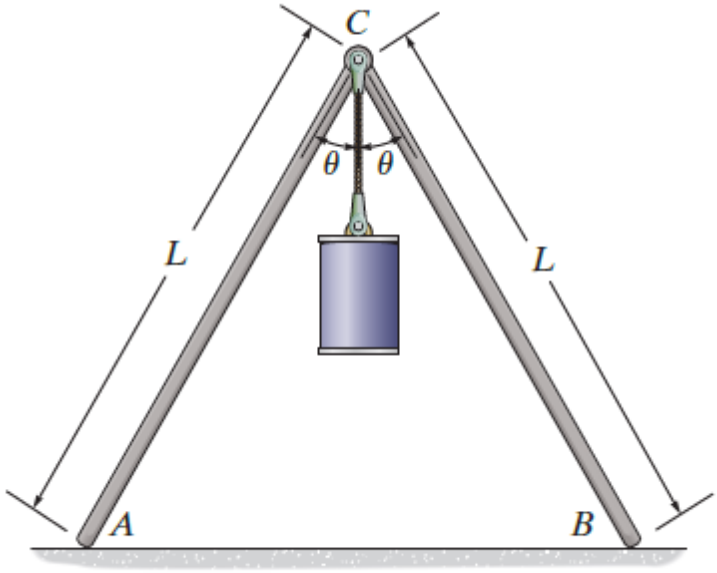
5- A 35-kg disk rests on an inclined surface for which μ_s =0.3. Determine the maximum vertical force **P** that may be applied to link *AB* without causing the disk to slip at *C*.

(P = 371.4 N)

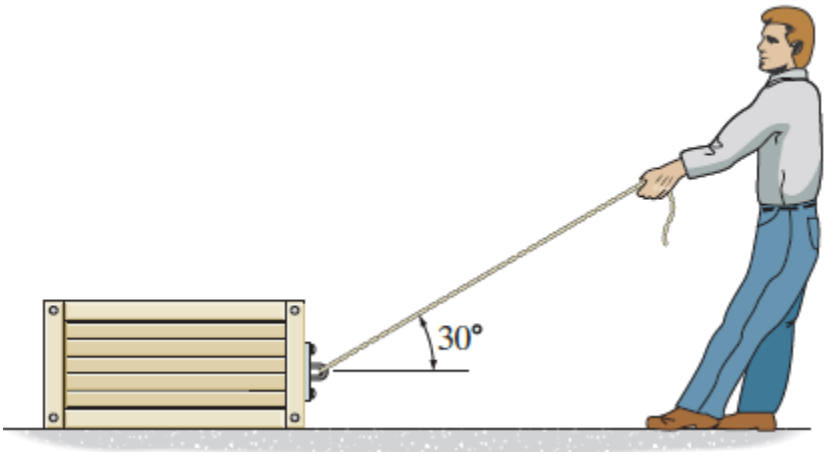


6- If $\theta = 30^0$ determine the minimum coefficient of static friction at *A* and *B* so that equilibrium of the supporting frame is maintained regardless of the mass of the cylinder C. Neglect the mass of the rods.

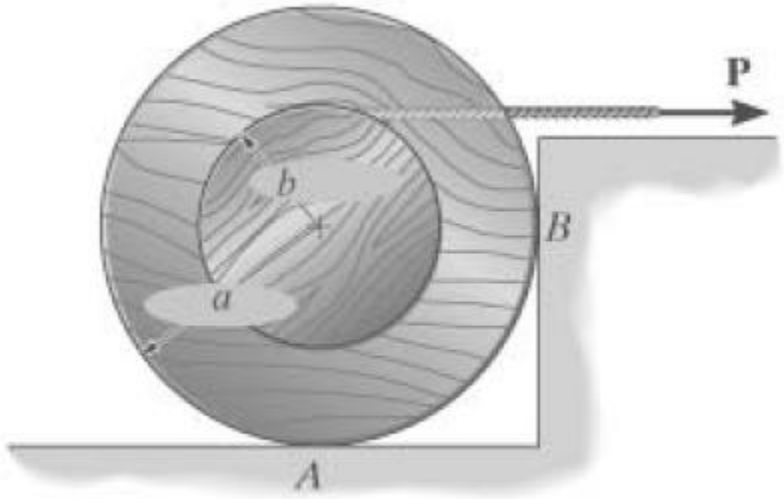
(0.577)



7- The coefficient of static friction between the 150-kg crate and the ground is $\mu_s = 0.3$, while the coefficient of static friction between the 80-kg man's shoes and the ground is $\mu_s' = 0.4$. Determine if the man can move the crate.



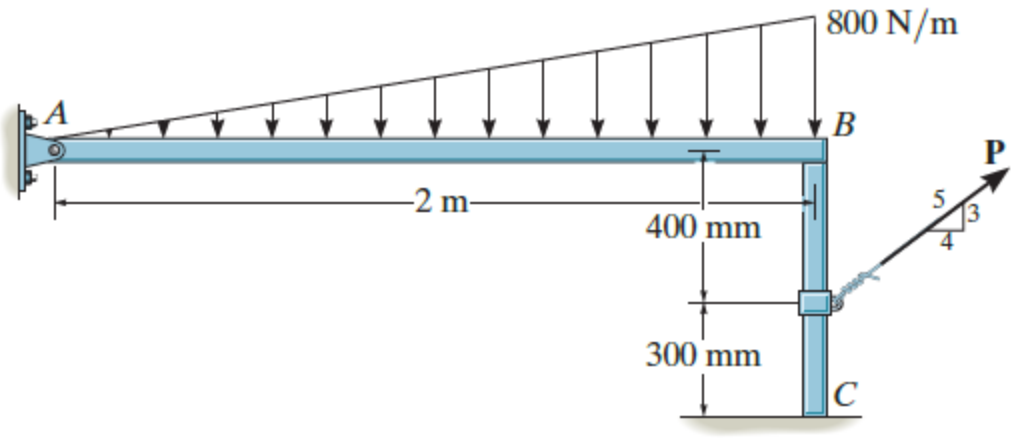
8- The spool of wire having a mass *M* rests on the ground at *A* and against the wall at *B*. Determine the forces acting on the spool at *A* and *B* for the given force *P*. The coefficient of static friction between the spool and the ground at point *A* is μ_s. The wall at *B* is smooth. Given: *P*= 800 N a= 0.45 m, M= 150 kg b= 0.25 m, μ_s =0.35.
(FA= 444 N < *FAmax*= 515 N)



9- The beam *AB* has a negligible mass and thickness and is subjected to a triangular distributed loading. It is supported at one end by a pin and at the other end by a post having a mass of 50 kg and negligible thickness. Determine the minimum force *P*

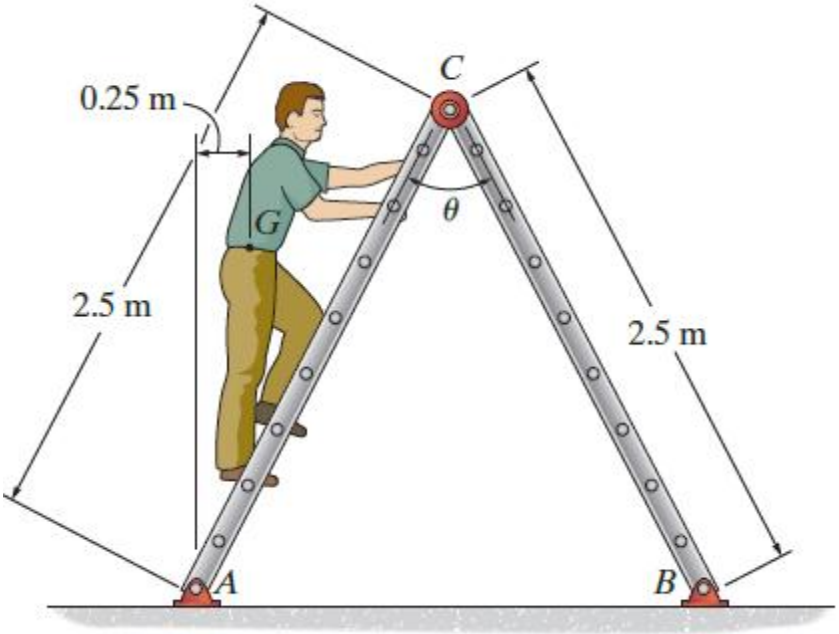
needed to move the post. The coefficients of static friction at *B* and *C* are μ_B =0.4 and μ_C =0.2 respectively.

(P = 355 N)



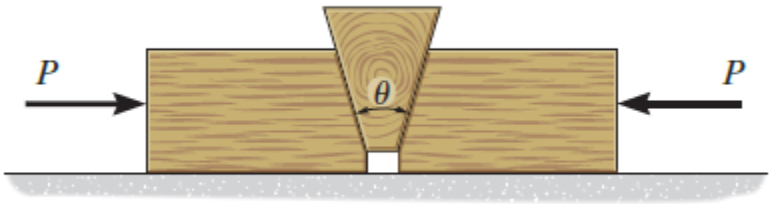
10- Determine the greatest angle so that the ladder does not slip when it supports the 75-kg man in the position shown. The surface is rather slippery, where the coefficient of static friction at *A* and *B* is . μ_s =0.3

(33.4°)



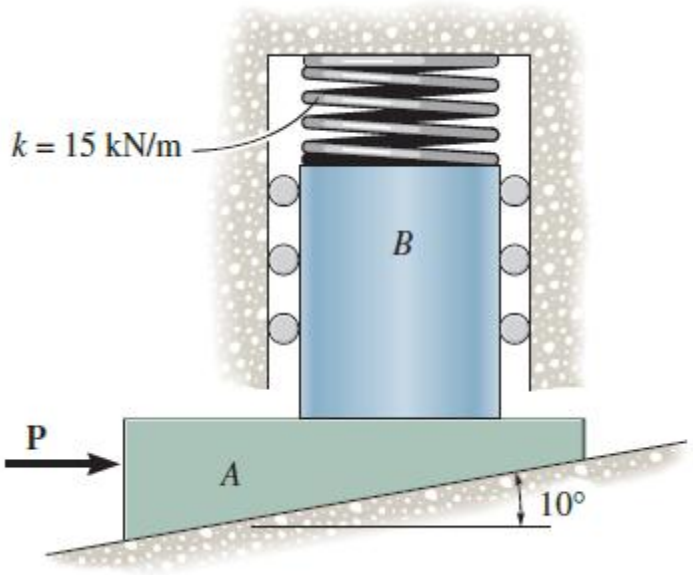
11- Determine the largest angle that will cause the wedge to be self-locking regardless of the magnitude of horizontal force *P* applied to the blocks. The coefficient of static friction between the wedge and the blocks is μ_s =0.3. Neglect the weight of the wedge.

(33.4 °)

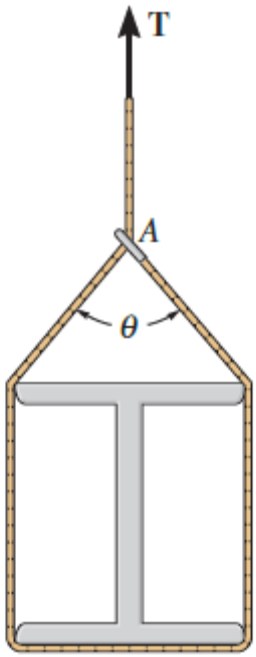


12- Determine the minimum applied force **P** required to move wedge *A* to the right.The spring is compressed a distance of 175 mm. Neglect the weight of *A* and *B*. The coefficient of static friction for all contacting surfaces is μ_s =0.35. Neglect friction at the rollers.

(P = 2.39 kN)

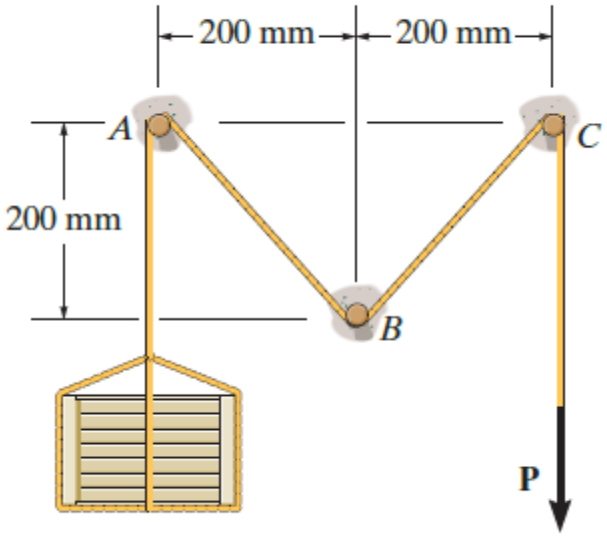


13- The smooth beam is being hoisted using a rope which is wrapped around the beam and passes through a ring at *A* as shown. If the end of the rope is subjected to a tension **T** and the coefficient of static friction between the rope and ring is $\mu_s = 0.3$, determine the angle of ɵ for equilibrium.
(99.2 ^{0})



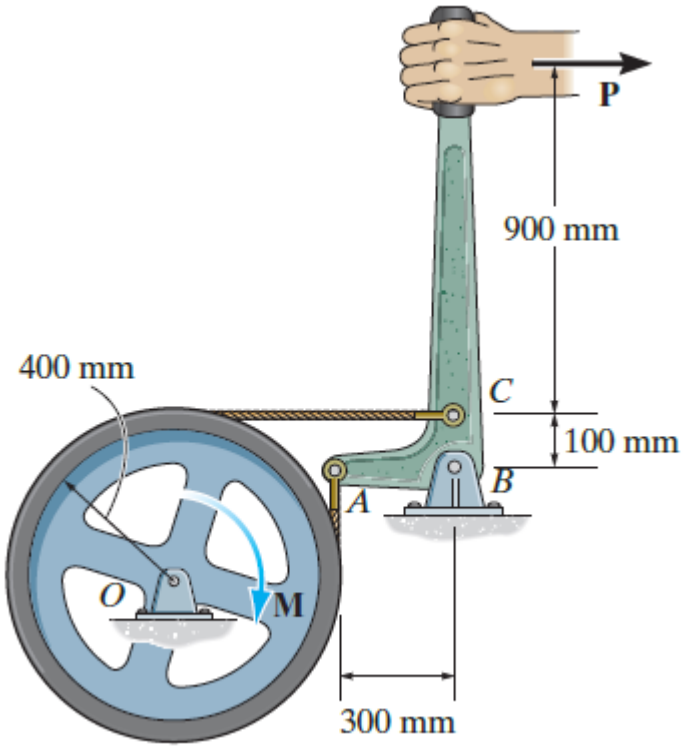
14- Determine the smallest force **P** required to lift the 40-kg crate. The coefficient of static friction between the cable and each peg μ_s =0.1.

(736 N)



15- If a force of P=200 N is applied to the handle of the bell crank, determine the maximum torque **M** that can be resisted so that the flywheel does not rotate clockwise. The coefficient of static friction between the brake band and the rim of the wheel is μ_s =0.3

(TA = 616.67 N TC = 150.00 N)


P
900 mm
400 mm
C
100 mm
B
A
O
M
300 mm