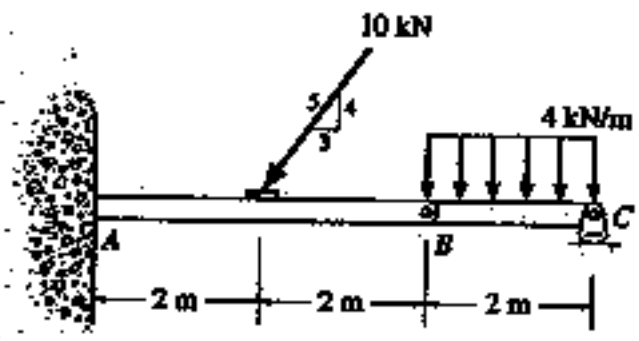


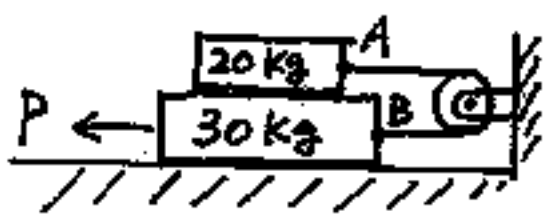
(1)

Two rigid beams are pin connected at B, as shown. Determine the reactions at supports A and C. Neglect the weight and thickness of beams. (15%)



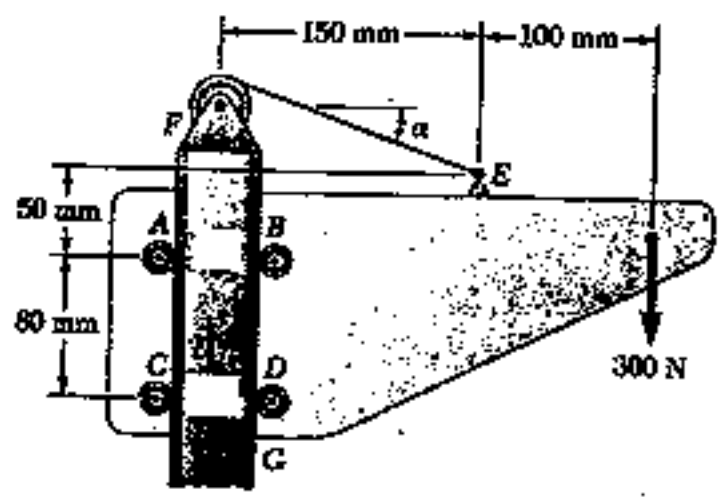
(2)

As shown in figure, the static and kinetic coefficients of friction are $\mu_s = 0.4$ and $\mu_k = 0.3$, respectively between all surfaces of contact. Determine the smallest force P required to start the 30Kg block moving. (15%)



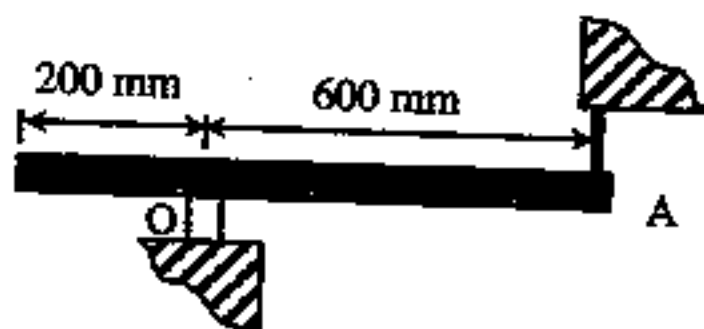
(3)

A movable bracket is held at rest by a cable attached at E and by frictionless rollers. Knowing that the width of post FG is slightly less than the distance between the rollers, determine the force exerted on the post by each roller when $\alpha = 20^\circ$. (20%)



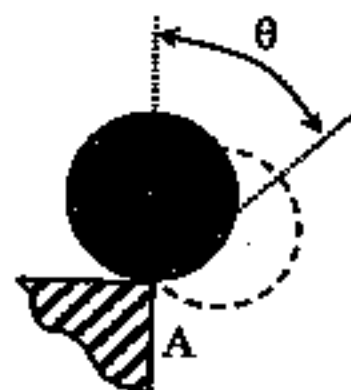
(4)

The uniform slender rod has a mass of $m = 5\text{kg}$. It is suspended horizontally by a cord at A. If the cord at A is cut, determine the reaction at the pin O, (a) when the rod is still in the horizontal position, and (b) when the rod swings to the vertical position. (20%)



(5)

A large roll of paper having a mass of $m = 20\text{ Kg}$ and radius $r = 150\text{ mm}$ is resting over the edge of a table, such that the end of the paper on roll is attached to the table's surface. If the roll is disturbed slightly from its equilibrium position, determine the angle θ at which it begins to leap off the table edge A as it falls. The centroidal radius of gyration of the roll is $k_G = 75\text{ mm}$. (15%)



(6)

A cylinder of radius r and mass m rolls without slipping with a small angle along a curve path of radius R as shown below. How many degrees of freedom of the system? Find the equation of motion of the cylinder. (15%)

