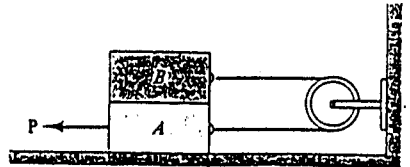1. The coefficient of kinetic friction at all surfaces of contact is μ. If a horizontal force P is applied to the bottom block in case shown below. Determine the acceleration of the bottom block (15%).

2. A ball is thrown down an incline whose angle of elevation is θ. The initial velocity is u at an angle of elevation β. (1) Derive an expression for the distance D measured along the incline at which the ball will return to the incline. (10%) (2) Determine the maximum height H (measured perpendicularly to the incline) of the ball.(10%) (3) Determine the corresponding velocity at the maximum height H. (10%)
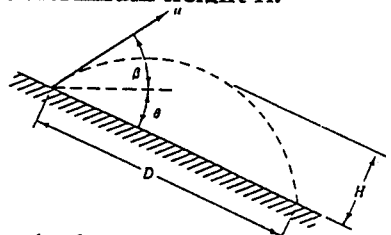
3. A uniform rod of length L and weight W is attached to two wires, each of length b. The rod is released from rest when $\theta = 0^o$ and swings to the position $\theta = 90^o$, at which time wire BD suddenly breaks. Determine the tension in wire AC
(a) immediately before wire BD breaks (10%)
(b) immediately after wire BD breaks (20%)

$$\left(I_G = \frac{1}{12} m L^2 \right)$$
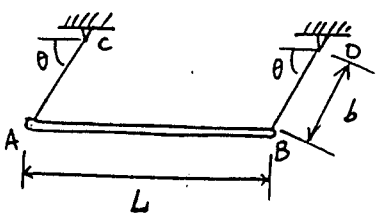
4. The 6-lb slender rod AB is released from rest when it is in the horizontal position so that it begins to rotate clockwise. A 1-lb ball is thrown at the rod with a velocity $v = 50$ ft/s. The ball strikes the rod at C at the instant the rod is in the vertical position as shown. Determine the angular velocity of the rod just after the impact. Take the coefficient of restitution e = 0.7. (25%)

$$\left(I_G = \frac{1}{12} m L^2 \right)$$