

1. (25%) The concrete pipes are stacked in the yard as shown in figure 1. Determine the minimum coefficient of static friction at each point of contact so that the pile does not collapse.

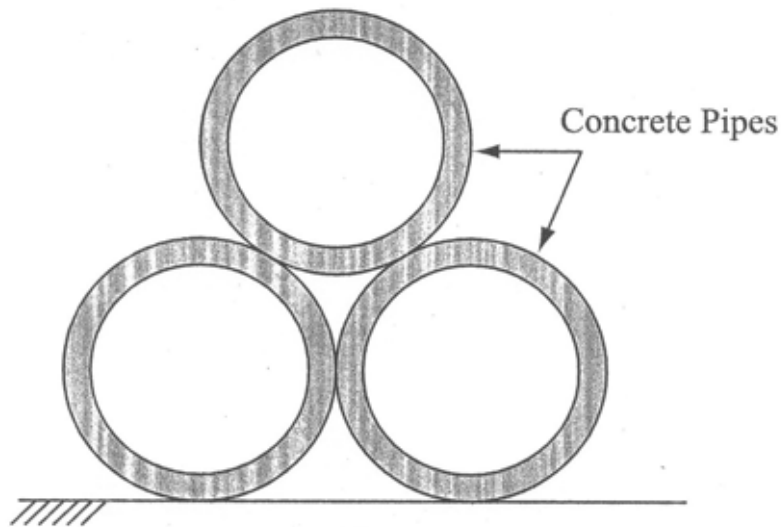


Figure 1

2. (25%) Soil pressure acting on the concrete retaining wall is represented as a loading per foot length of wall. If concrete has a specific weight of  $150 \text{ lb/ft}^3$ , determine the magnitude of the soil distribution,  $w_1$  and  $w_2$ , and the friction force  $F$  for equilibrium.

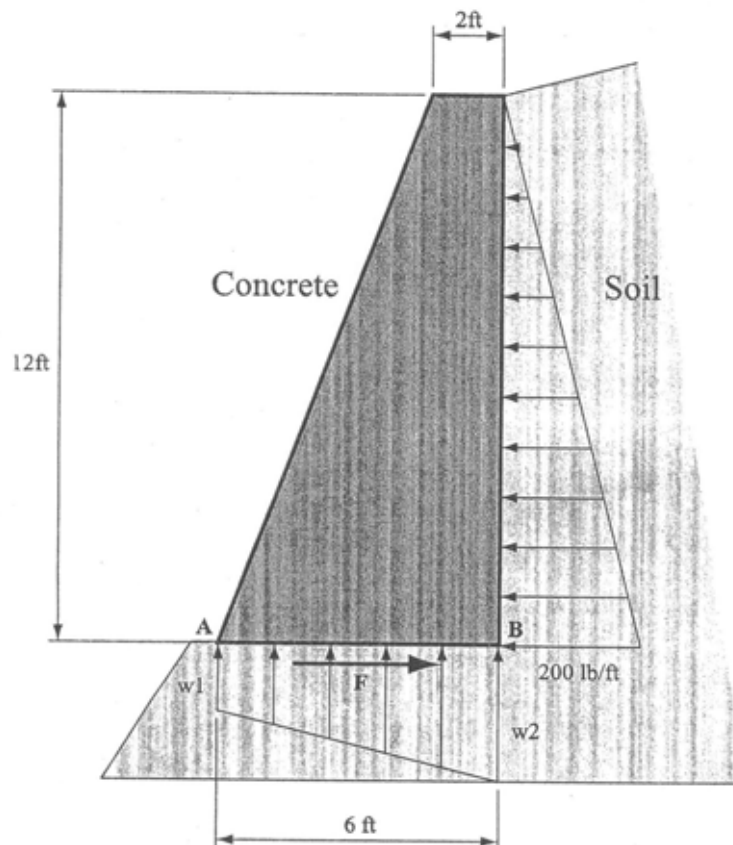


Figure 2

3. (15%) The 5-Kg pendulum bob  $B$  is released from rest when  $\theta = 0^\circ$ . Determine the initial tension in the cord and also at the instant the bob reaches point  $D$ ,  $\theta = 45^\circ$ . Neglect the size of the bob.

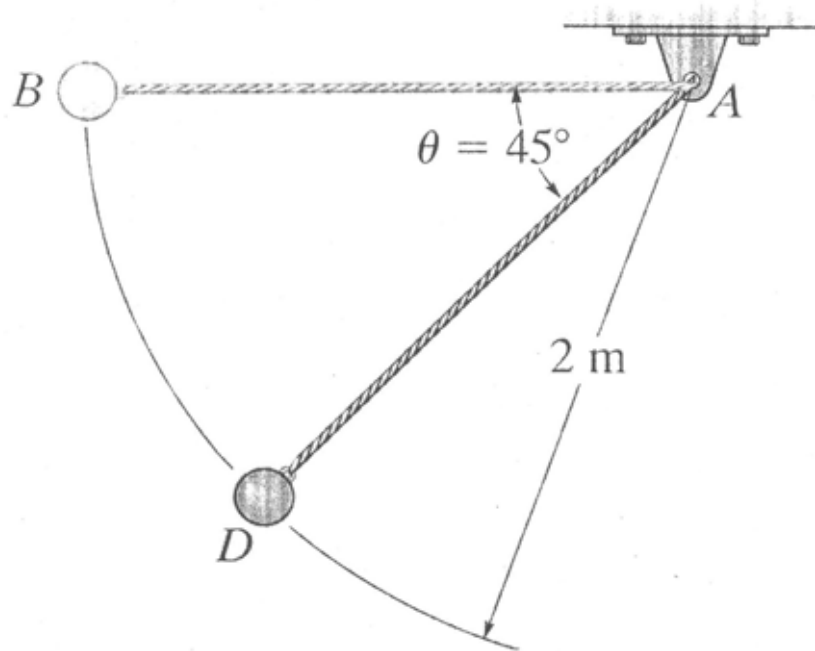


Figure 3

4. (15%) If the girl throws the ball with a horizontal velocity of 3 m/s, determine the distance  $d$  so that the ball bounces once on the smooth surface and then lands in the cup at C. Take  $e = 0.8$ .

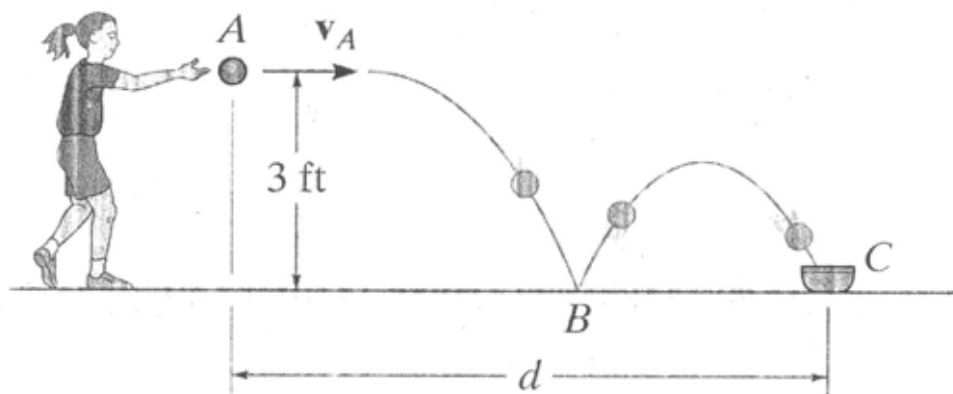


Figure 4

5. (20%) The pendulum consists of a uniform 5-Kg plate and 2-Kg slender rod. Determine the horizontal and vertical components of reaction that the pin  $O$  exerts on the rod at the instant  $\theta = 30^\circ$ , at which time its angular velocity is  $\omega = 3 \text{ rad/s}$ .

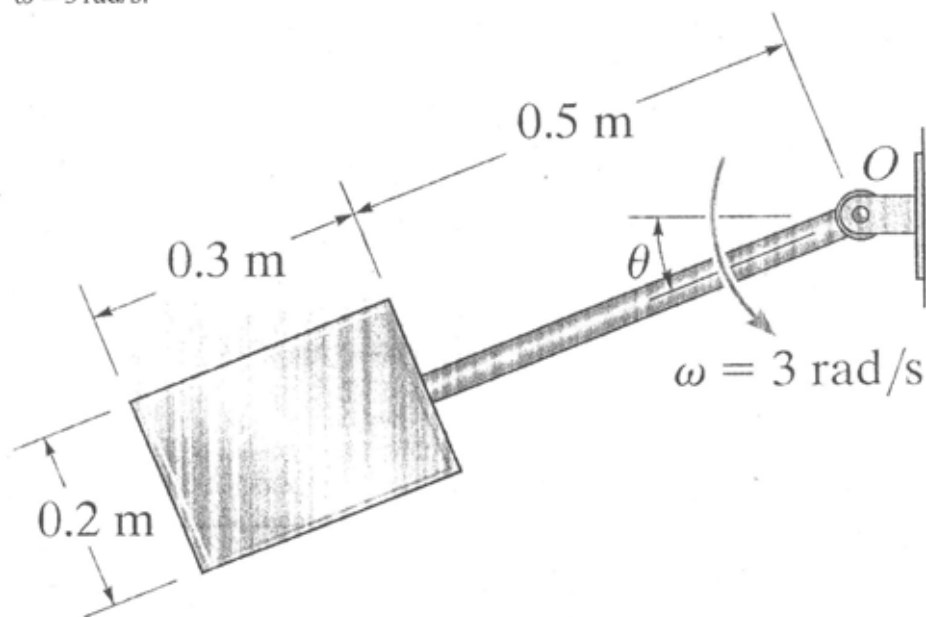


Figure 5