**PROBLEM 12.37**

A 450-g tetherball $A$ is moving along a horizontal circular path at a constant speed of 4 m/s. Determine (a) the angle $\theta$ that the cord forms with pole $BC$, (b) the tension in the cord.

![Diagram of a tetherball](image)

**PROBLEM 12.48**

A series of small packages, each with a mass of 0.5 kg are discharged from a conveyor belt as shown. Knowing that the coefficient of static friction between each package and the conveyor belt is 0.40, determine (a) the force exerted by the belt on a package just after it has passed Point $A$, (b) the angle $\theta$ defining Point $B$ where the packages first slip relative to the belt.

![Diagram of a conveyor belt](image)

**PROBLEM 12.71**

The 100-g pin $B$ slides along the slot in the rotating arm $OC$ and along the slot $DE$ which is cut in a fixed horizontal plate. Neglecting friction and knowing that rod $OC$ rotates at the constant rate $\dot{\theta} = 12$ rad/s, determine for any given value of $\theta$ (a) the radial and transverse components of the resultant force $F$ exerted on pin $B$, (b) the forces $P$ and $Q$ exerted on pin $B$ by rod $OC$ and the wall of slot $DE$, respectively.

![Diagram of a rotating arm](image)

**PROBLEM 12.90**

A 3-lb collar can slide on a horizontal rod, which is free to rotate about a vertical shaft. The collar is initially held at $A$ by a cord attached to the shaft. A spring of constant 2 lb/ft is attached to the collar and to the shaft and is undeformed when the collar is at $A$. As the rod rotates at the rate $\dot{\theta} = 16$ rad/s, the cord is cut and the collar moves out along the rod. Neglecting friction and the mass of the rod, determine (a) the radial and transverse components of the acceleration of the collar at $A$, (b) the acceleration of the collar relative to the rod at $A$, (c) the transverse component of the velocity of the collar at $B$.

![Diagram of a collar](image)