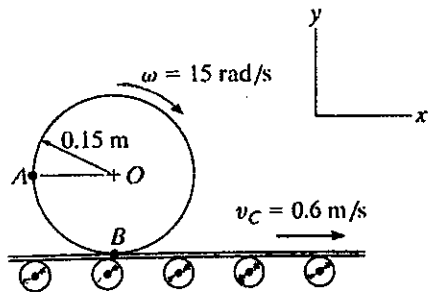
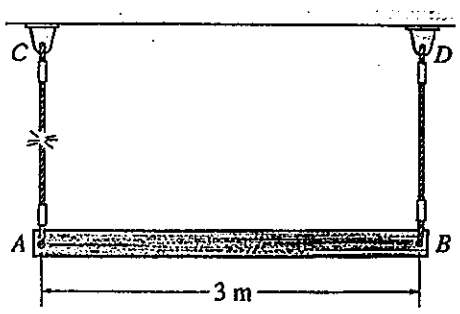
1. (25%) The cylinder, shown in the right figure, rolls without slipping on the surface of a conveyor belt which is moving at 0.6 m/s. The cylinder has a clockwise angular velocity $\omega = 15$ rad/s at the instant shown.
   (i) Please find the velocity of point B. (10%)
   (ii) Determine the velocity of point A. (15%)

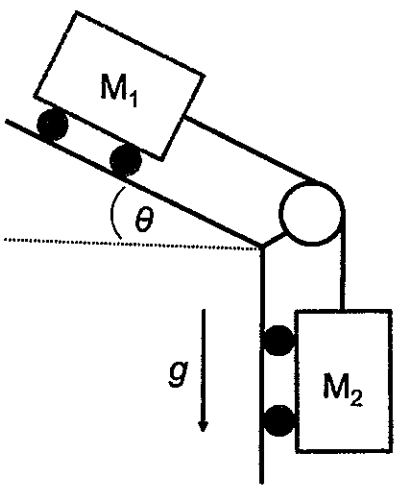


2. (25%) The uniform 50 kg bar is held in the equilibrium position by the cords AC and BD.
   (i) Please determine the tension in BD immediately after AC is cut. (12%)
   (ii) Find the angular acceleration of the bar at that instant. (13%)



3. (25%) A projectile is fired from at an angle of 45^0 above flat ground with initial energy E_0. At the top of its trajectory, the projectile explodes with additional energy E_0 into two fragments. One fragment of mass m_1 travels straight down.
   (i) Please find the velocity of fragment m_1 (magnitude and direction). (10%)
   (ii) Please find the velocity of fragment m_2 (magnitude and direction). (10%)
   (iii) What is the ratio of m_1/m_2 when m_1 is the maximum? (5%)

4. (25%) Two carts are connected by a massless cable that runs over a pulley on a frictionless track. Assume that the questions in this problem apply only to the period of time prior to the mass, M_1, contacting the pulley wheel.
   (i) How many independent coordinates are necessary to completely describe the motion of this system? (5%)
   (ii) Please draw a free diagram for each of the carts and designate the necessary coordinates. (10%)
   (iii) Please find an expression for the velocity and acceleration of mass M_2. (10%)



試題隨卷繳回