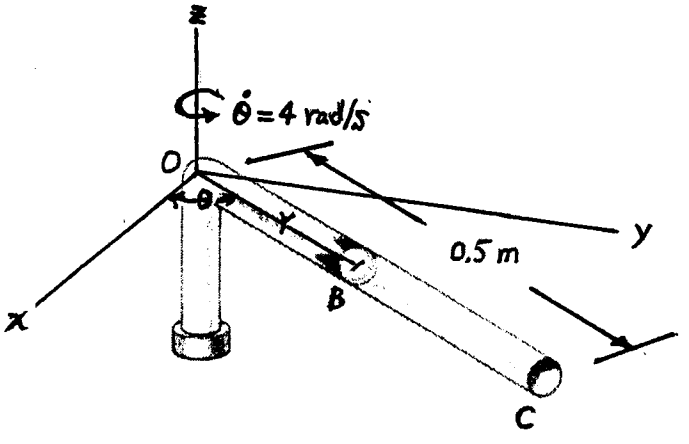
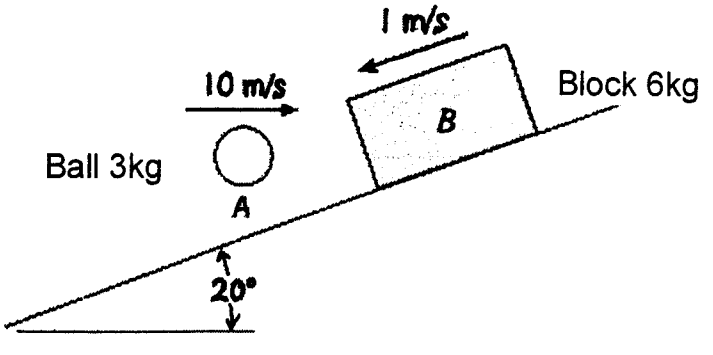
(1)The tube rotates in the horizontal plane at a constant rate of $\dot{\theta} = 4$ rad/s. if a 0.2-kg ball starts at the origin O with an initial radial velocity of $\dot{r} = 1.5$ m/s and moves outward through the tube. Determine

1. The equation of equilibrium in the r direction, and the initial conditions;(10%)
2. The solution of the above differential equation;(7%)
3. The radial and transverse components of the ball's velocity at the instance it leaves the outer end at C, r=0.5m. (8%)



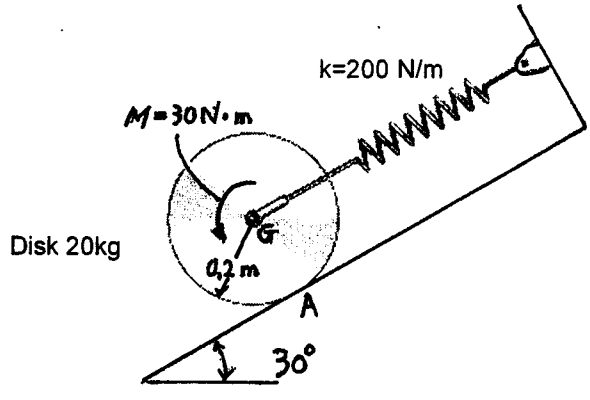

(2) The 3-kg ball is thrown so that it traveling horizontally at 10 m/s when it strikes the 6-kg block as it is traveling down the smooth inclined plane at 1 m/s. If the coefficient of restitution between the ball and the block is e=0.7, determine the speeds of the ball and the block just after impact. (25%)




(背面仍有題目,請繼續作答)

(3)

1. The 20-kg disk is originally at rest and the spring holds it in equilibrium. Determine its equilibrium position. (5%)
2. A couple moment M=30N-m is then applied to the disk as shown. Determine how far S the center of mass of the disk travels down along the incline, measured from the equilibrium position, before it stops. The disk rolls without slipping. (20%)




(4) The slender rod of length L and mass m is released from rest when $\theta=0^{\circ}$.

1. Draw the free body diagram of the system; (5%)
2. Determine, as a function of $\theta$, the normal and frictional forces which are exerted on the ledge at A as it falls downward. (10%)
3. At what angle $\theta$ does it begin slip if the coefficient of static friction at A is $\mu$ ? (10%)