1. (25 %) The disk, with a circular slot of 200 mm radius, rotates about O with a constant angular velocity $\omega = 10$ rad/s. Determine the acceleration of the slider A at the instant $\theta = 30°$, $\dot{\theta} = 4$ rad/s, and $\ddot{\theta} = -2$ rad/s^2.
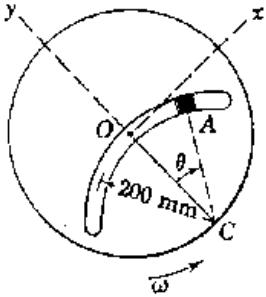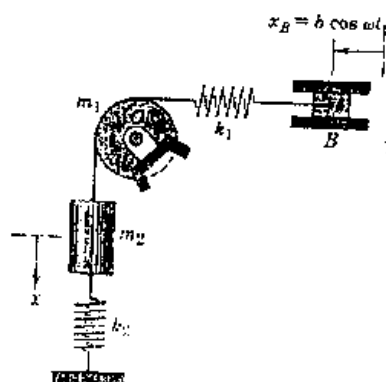

2. (25 %) A disk, of radius r and centroidal radius of gyration k, is placed on an incline and released from rest at time $t = 0$. Assuming the disk rolls without sliding, please find
   (a) the acceleration of the center at time t,
   (b) the velocity of the center at time t, and
   (c) the minimum value of the coefficient of static friction required to prevent sliding.
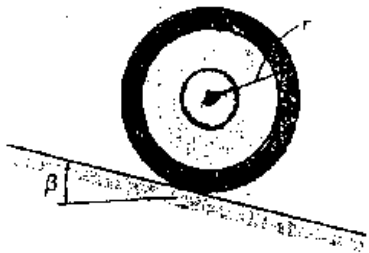
3. (25 %)　Two identical involute spur gears are in mesh. The module is 5 and the gears have 20 teeth each. The operating pressure angle is 20°.
   A. Determine the minimum value of addendum needed to ensure continuous transmission of motion.　15%
   B. Determine the maximum value of addendum allowed without causing any interference.　10%

4. (25 %)　The homogeneous solid cylindrical pulley has mass m_1 and radius r. If the attachment at B undergoes the indicated harmonic displacement, determine the equation of motion the system in terms of the variable x. The cord which connects mass m_2 to the upper spring does not slip on the pulley.