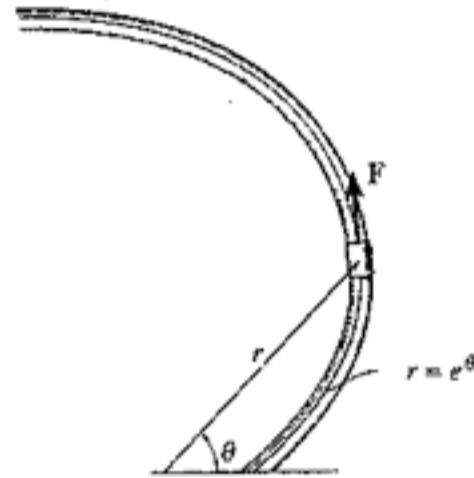
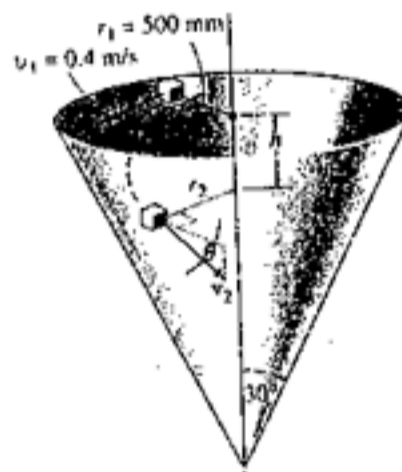


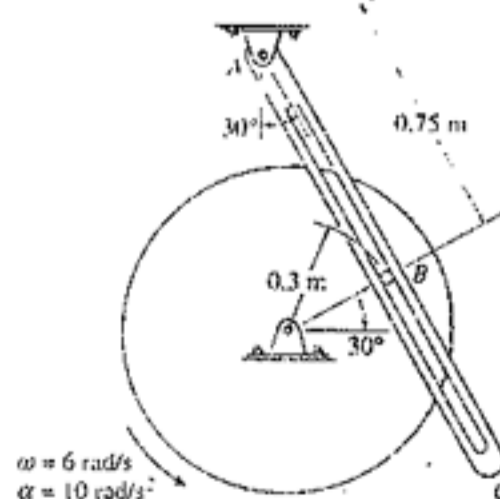
1. The collar has a mass of 2 kg and travels along the smooth horizontal rod defined by the equiangular spiral $r = (e^\theta)$ m, where θ is in radians. Determine the tangential force F and the normal force N acting on the collar when $\theta = 90^\circ$, if the force F maintains a constant angular motion $\dot{\theta} = 2$ rad/s. (15%)



2. A small block having a mass of 0.1 kg is given a horizontal velocity of $v_1 = 0.4$ m/s when $r = 500$ mm. It slides along the smooth conical surface. Determine the distance h it must descend for it to reach a speed of $v_2 = 2$ m/s. Also, what is the angle of descent θ , that is, the angle measured from the horizontal to the tangent of the path. (15%)



3. The disk rotates with the angular motion shown. Determine the angular velocity and angular acceleration of the slotted link AC at this instant. The peg at B is fixed to the disk. (20%)



(背面仍有題目,請繼續作答)

4. The sphere B, having a mass m_1 and radius R , is attached to a uniform rod of mass m_2 , length L , and rests in a horizontal position supported by two springs and one dashpot, as shown in Fig.4. The sphere is subjected to a periodic external force $F(t)$. Determine the differential equation of motion and magnification factor of the system. (30 %)

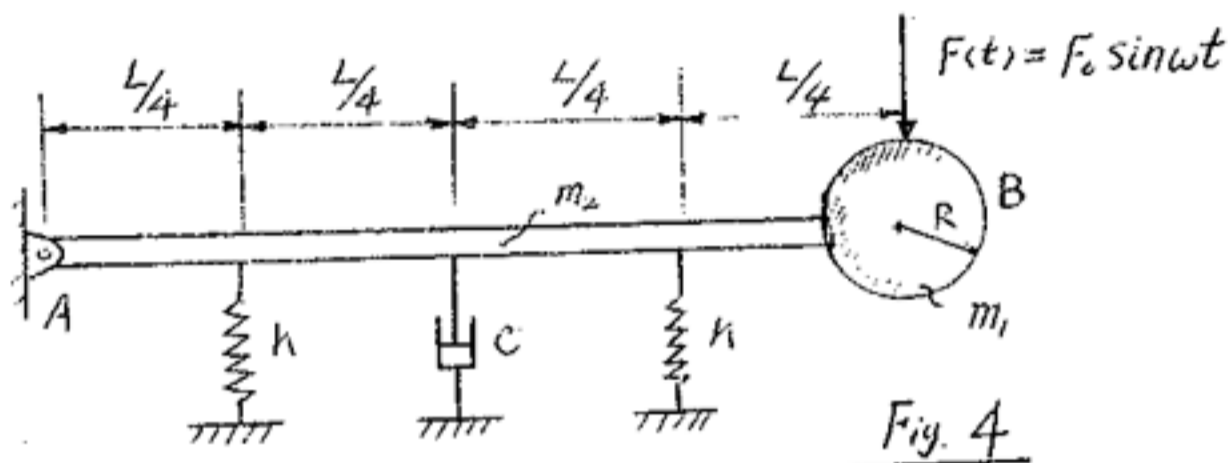


Fig. 4

5. A circular cylinder loaded on a rectangular plate, having mass m and M , respectively, as shown in Fig.5, are both rotating on the smooth angular velocity of these two bodies just after the corner of the plate strikes the peg P and the plate starts to rotate about P without rebounding. The coefficients of static and kinetic friction between the plate and the cylinder are $\mu_s = 0.4$ and $\mu_k = 0.3$, respectively. (20 %)

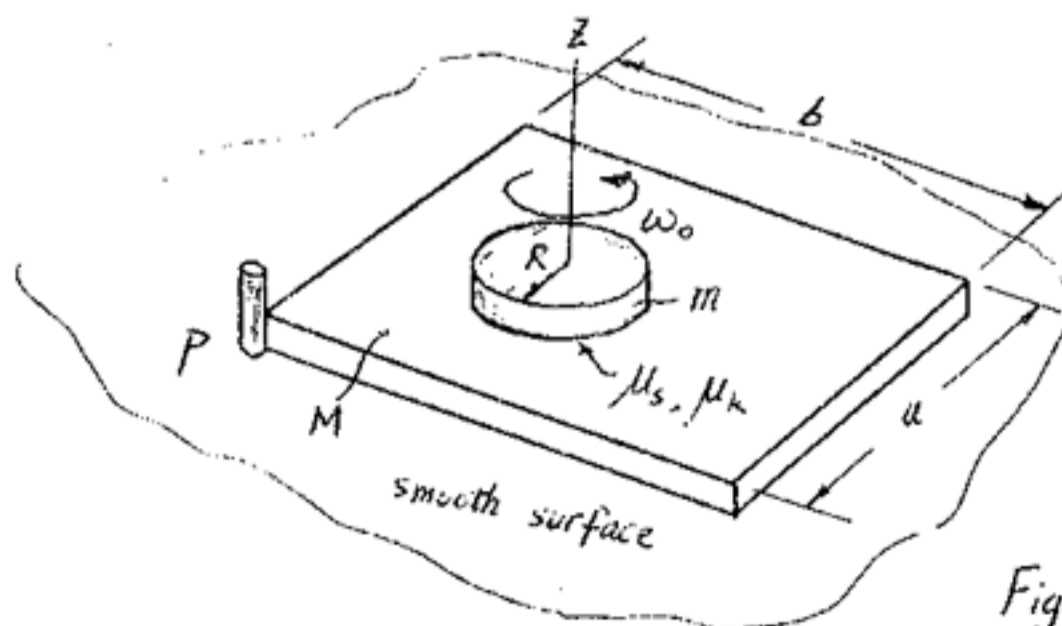


Fig. 5