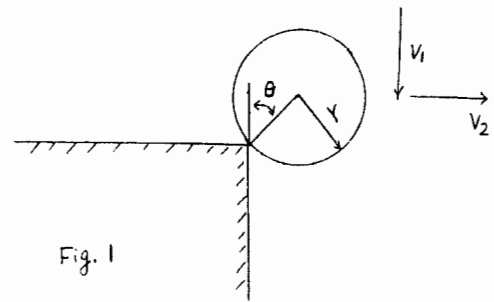
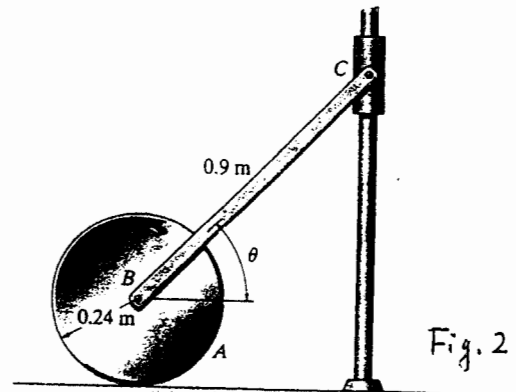


※ 考生請注意：本試題不可使用計算機。 請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

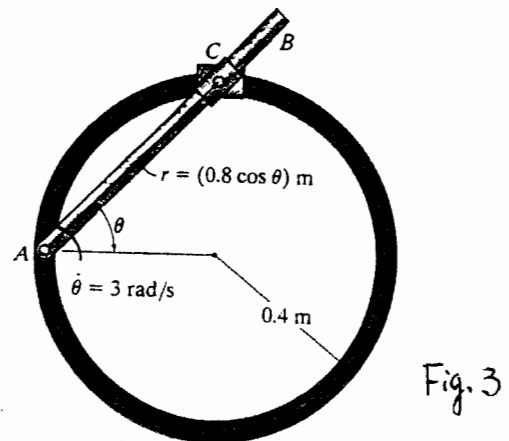
1. The solid ball of mass is dropped with a velocity V_1 the edge of the rough step. If it rebounds horizontally off the step with a velocity V_2 , determine the angle θ at which contact occurs. Assume no slipping when the ball strikes the step. The coefficient of restitution is e . (20%)



2. The system consists of a 10kg disk A, 2kg slender rod BC, and a 0.5kg smooth collar C. If the disk rolls without slipping, determine the velocity of the collar at the instant the rod becomes horizontal. i.e., $\theta=0^\circ$. The system is released from rest when $\theta=45^\circ$. (15%)



3. The smooth 0.5kg double-collar in Fig.3 can freely slide on arm AB and the circular guide rod. If the arm rotates with a constant angular velocity of $\dot{\theta} = 3 \text{ rad/s}$, determine the force the arm exerts on the collar at the instant $\theta=45^\circ$. Motion is in the horizontal plane. (15%)



4. A uniform plate of mass m is suspended in each of the ways shown in Fig.4a and Fig.4b. For each case determine immediately after the connection B has been released (A) the angular acceleration of the plate. (7%)(B) the acceleration of its mass center. (7%)

Fig.4a

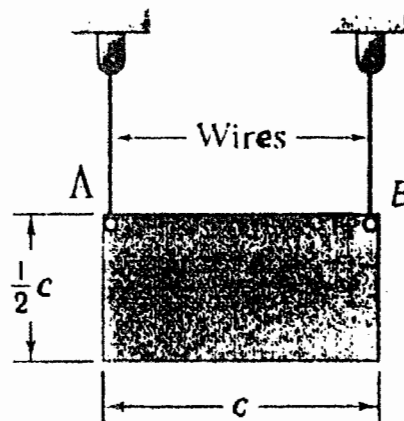
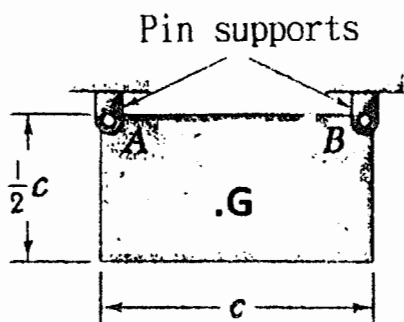


Fig.4b

Hint: $I_G = \frac{1}{12} m(a^2 + b^2)$ for thin rectangular plate

(背面仍有題目,請繼續作答)

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5. Four pins slide in four separate slots cut in a circular plate as shown in Fig.5. When the plate is at rest, each pin has a velocity directed as shown and of the same velocity relative to the plate when the plate rotates about O with a constant counterclockwise angular velocity ω , determine the acceleration of P1 and P3.(16%)
6. Sphere A of mass m and radius r rolls without slipping with a velocity V_1 on a horizontal surface when it hits squarely an identical sphere B that is at rest. Denoting by μ_k the coefficient of kinetic friction between a ball and the surface, neglecting friction between the spheres, and assuming perfectly elastic impact, determine (a) the linear and angular velocities of each sphere immediately after the impact, (10%)(b)the velocity of each sphere after it has started rolling uniformly.(10%)

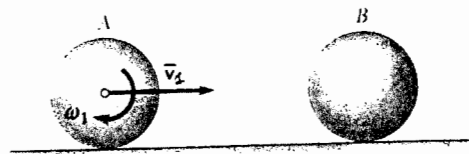
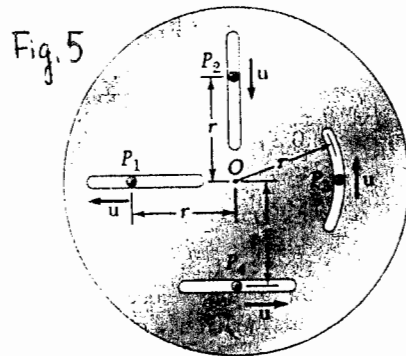


Fig. 6