本試題是否可以使用計算機：☑可使用　，　☐不可使用　（請命題老師勾選）

A1. [25%] The uniform slender pole shown in Fig. *A*1 has a mass of 100kg and a moment of inertia $I_G = 75\ \text{kg}\cdot\text{m}^2$. The coefficient of static and kinetic friction between the end of the pole and the surface are $\mu_s = 0.3$ and $\mu_k = 0.5$, respectively. The pole is originally at rest.

(a) Translate the problem described above into Chinese. [10%]

(b) Determine the pole's angular acceleration at the instant the 400-N horizontal force is applied. [15%]

A2. [25%] Fig. *A*2 shows a pendulum which can rock alternately on the two supports *A* and *B*. The polar radius of gyration about the center of gravity *G* of the pendulum is $2\sqrt{3}$ cm. The pendulum is released from the position shown.

(a) Determine the angular velocity of the pendulum immediately after contact has occurred with *B*. [15%]

(b) Describe the principles used for the solution in English. [10%]

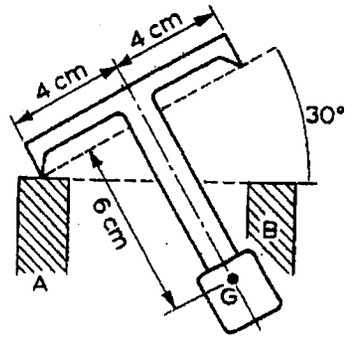

Fig. *A*2

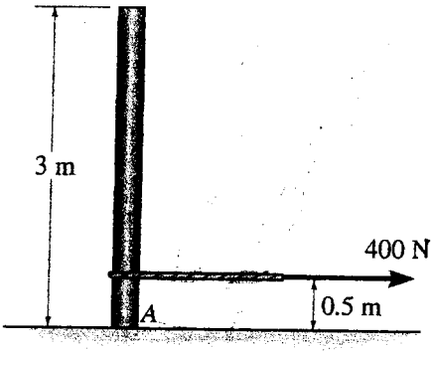

Fig. *A*1

（背面仍有題目，請繼續作答）

本試題是否可以使用計算機：☑可使用，☐不可使用　（請命題老師勾選）

B1. (a) Please translate the followings in Chinese: "A worm is similar in shape to a screw thread. The mating gear called the wheel, often has teeth that are curved at their tips to permit greater contact area. Power is always supplied to the worm. In fact, worm and wheel gear sets are typically self-locking". [5 %]

(b) Please give a skeleton drawing for each mechanism within a single-cylinder gas engine, and give the name (in English) of each element of the mechanisms. [8 %]

B2. For the inverted slider-crank mechanism as shown in Fig. B2, O_2O_3 = 500 mm, O_2B_2 = 600 mm, please determine (analytically or graphically) the angular acceleration of link 3. [15 %]

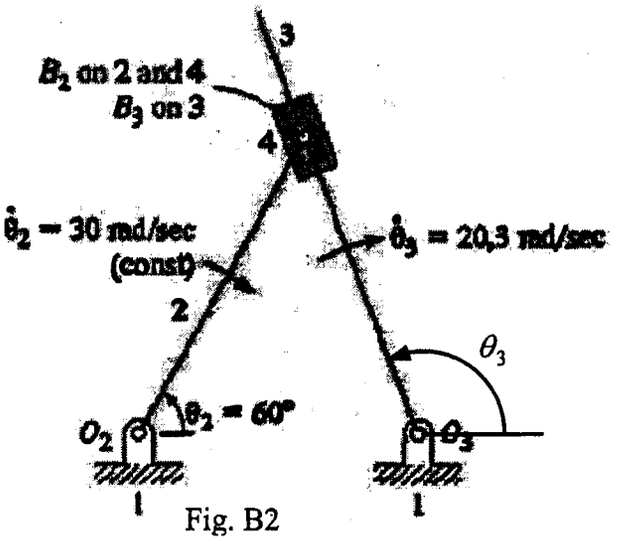

Fig. B2

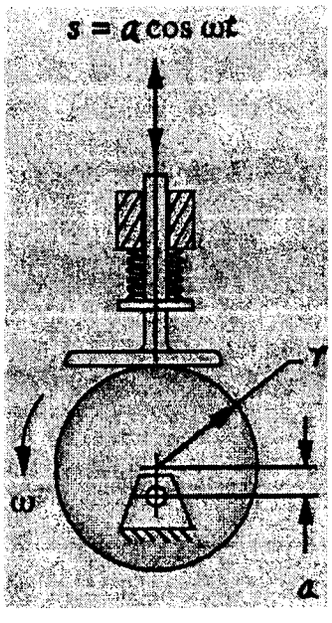

Fig. B3

B3. The cam in Fig. B3 is a pure eccentric disk with a as the eccentricity and turns at a velocity of ω (constant). The masses of the follower and the cam (their mass centers are located at their geometric centers) are m_f and m_c, respectively. The spring has a stiffness constant k and has a preload (i.e., the spring force when the follower is at its lowest position) of L_p. At instant t, please give (a) the formulation of the kinetic energy of the mechanism, (b) the formulation of the potential energy of the mechanism, (c) the formulation of the follower force (exerted by the cam). (d) If a = 50 mm, ω = 300 rpm (constant), m_f = 3 Kg, m_c = 10 Kg, k = 30 N/m, L_p = 0.5 N, please find the maximum and minimum follower forces. [22 %]