3. A 20-kg block A is towed up the ramp of the 40-kg cart using the motor M mounted on the side of the cart, as shown in Figure 4. If the motor winds in the cable with a constant velocity of 5 m/s, measured relative to the cart, determine how far the cart will move when the block has traveled a distance $s = 2$ m up the ramp. Both the block and the cart are at rest when $s = 0$. The coefficient of kinetic friction between the block and the ramp is $\mu_k = 0.2$. Neglect the rolling resistance, and the other friction forces. (15%)

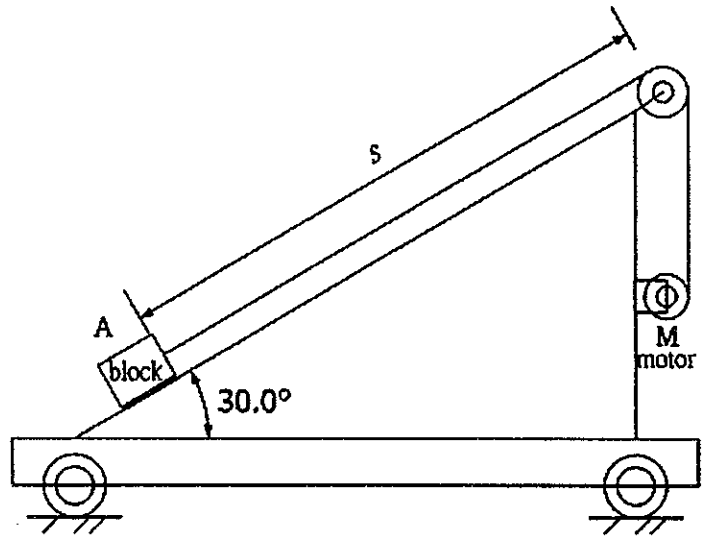

Figure 4

4. For a cam-follower mechanism shown in Figure 5 (unit = cm), the cam is rotating with a constant angular velocity 1 rad/sec, CCW. (15%)

(a) Find the sliding velocity between the cam and the follower at point P, in cm/sec. (7%)

(b) Find the angular acceleration of the follower 3, in rad/sec^2. (8%)

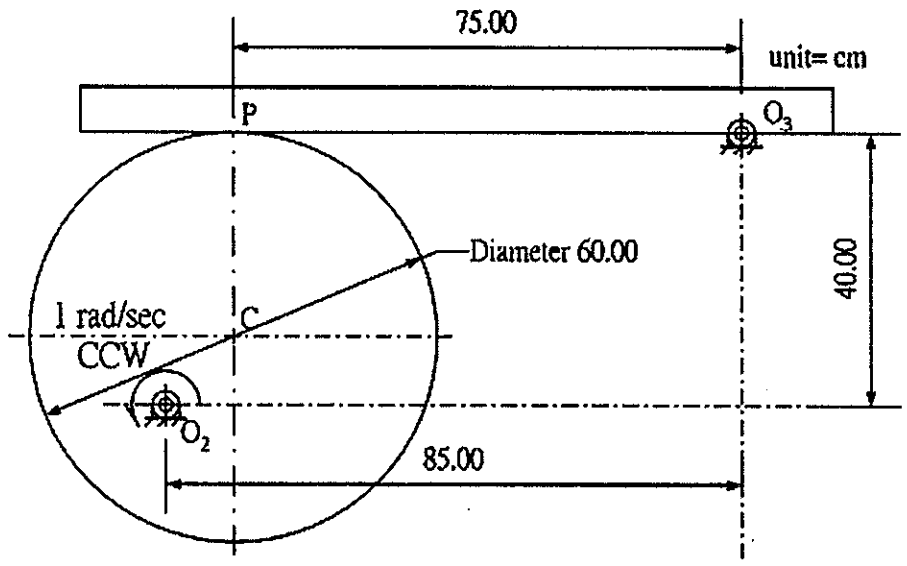

Figure 5

試題隨卷繳回

1. A crank slider mechanism is shown in Figure 1. Link 2 and link 3 are assumed to be massless. The mass of link 4 is 2 kg. The length of link 2 and link 3 are 40 cm and 80 cm, respectively. A varying torque T is applied on link 2 to make it rotate at a constant speed of 10 rad/s in the counterclockwise (CCW) direction. (35%)

(a) Determine the velocity of link 4 when θ is 150°. (10%)

(b) Determine the torque T when θ is 150°. All the joints are assumed to be frictionless. (15%)

(c) Determine the torque T when θ is 150° if there is friction ($f = \mu N$, $\mu = 0.3$) on the sliding pair between link 4 and link 1. (10%)

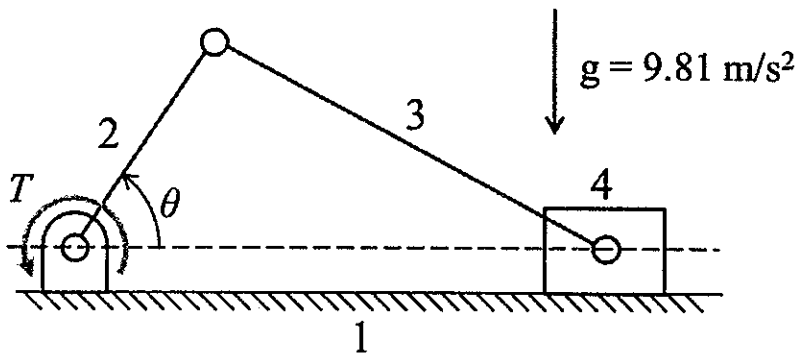

Figure 1

2. In Figure 2, sliders A and B are pin-jointed to link ABC and can slide along fixed tracks. (35%)

(a) Determine the path of point C (x, y), knowing that $\beta = 90^o$ and the locus of the instantaneous center I_C (x_c, y_c) between the fixed link and link ABC and locate the instantaneous center I_C when $\beta = 0^o$. What type of rigid body motion is link ABC undergoing? (10%)

(b) If the velocity V_A of the slider A is known, express the angular velocity of link ABC and the velocity of slider B in terms of V_A, a, b, θ, and β. If the acceleration A_A of the slider A is known, express the angular acceleration of link ABC in terms of A_A, a, b, θ, and β. (15%)

(c) Determine the mobility of the wedge assembly in Figure 3. Show the equation used to determine your answers. Does the double-slider mechanism in Figure 2 **kinematically** represent the mechanism equivalent to the wedge assembly in Figure 3? Please explain your own opinions in detail. (10%)

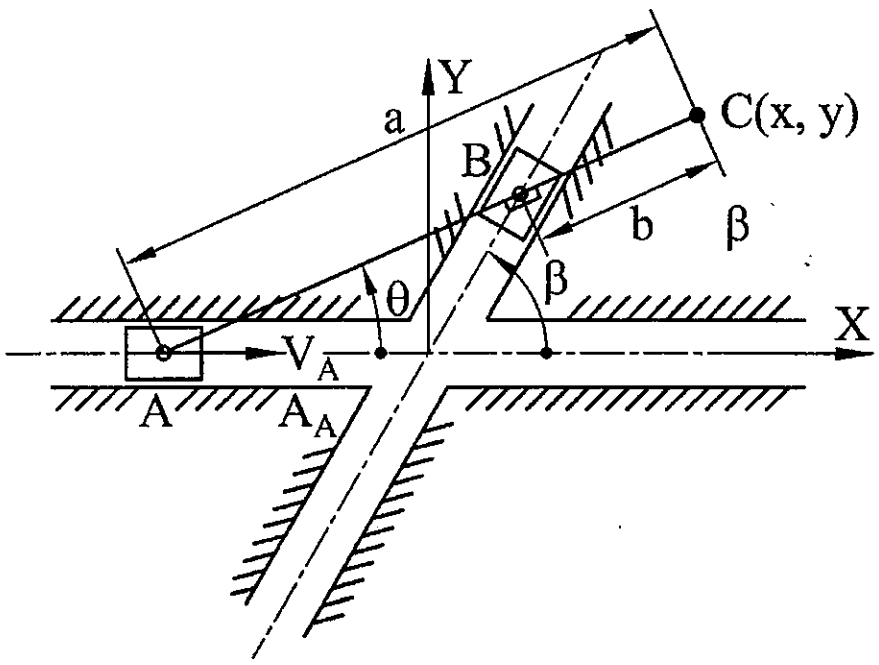

Figure 2

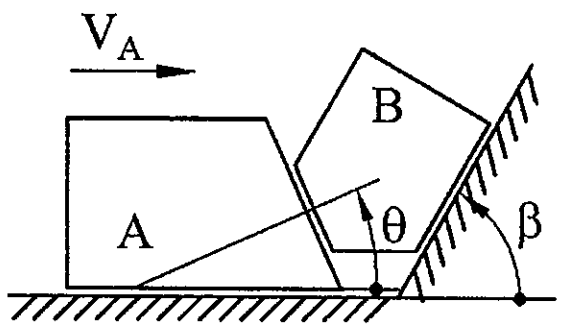

Figure 3

見背面