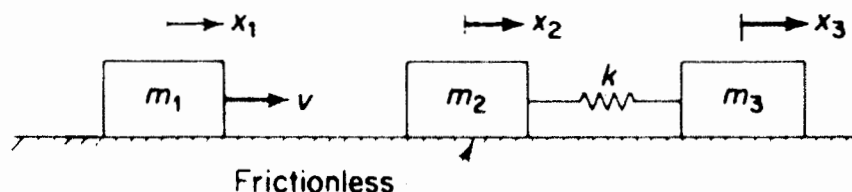※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (20%) A particle having a mass m and a velocity v_m in the y direction is projected onto a horizontal belt that is moving with a uniform velocity v_b in the x direction. There is a coefficient of sliding friction μ between the belt and the particle. Assuming that the particle first touches the belt at the origin of the fixed xy coordinate system and remains on the belt, find the coordinate (x, y) of the point where sliding stops.
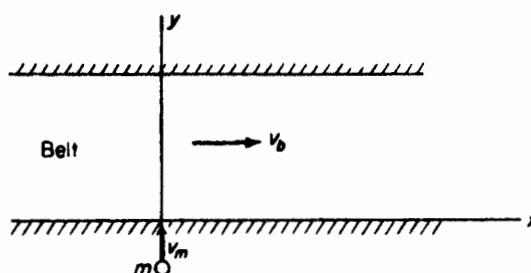
2. (30%) Three masses are of the same mass, m. Mass m_1 hits m_2 with inelastic impact ($e=0$) while sliding horizontally with velocity v along the common line of centers of the three equal masses. Initially, masses m_2 and m_3 are stationary and the spring is unstressed. Find
   (a) The velocities of m_1, m_2, and m_3 immediately after impact;
   (b) The maximum kinetic energy of m_3;
   (c) The minimum kinetic energy of m_2 after impact;
   (d) The maximum compression of the spring;
   (e) The final motion of m_1.

Frictionless

(背面仍有題目,請繼續作答)

3. Derive the equations of motion or the dynamic model of the spring-bar system as shown in figure 3. The length and the mass of the slender uniform bar are l and m, respectively. Also, spring constant is K. (25%)
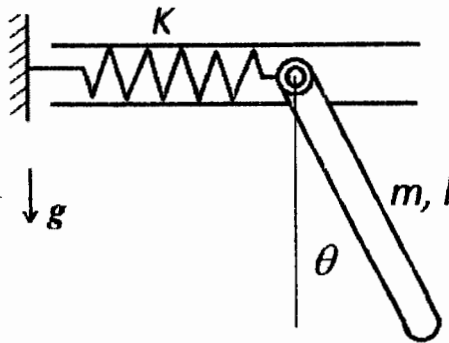

Figure 3

4. Consider the rotating thin disc system in figure 4.

   a. Derive the angular momentum of the thin disc for constant ω_1 and ω_2. Also, the mass of the disc is m. (15%)
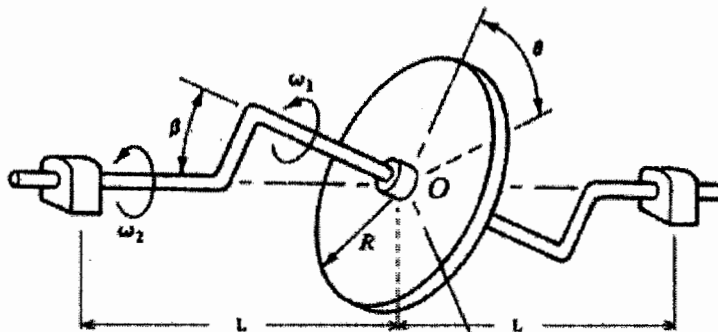   b. What is the torque at O on the disc? (10%)

Figure 4