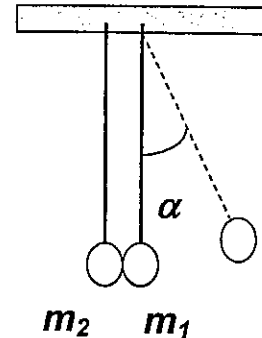


1. Consider two balls of masses m_1 and m_2 hung from above by two massless wires of the same length l as shown in the figure. The system is in a constant gravitational field g . The ball m_1 is initially released at a small angle α and subsequently collides with the other ball. The coefficient of restitution is assumed a constant e . Neglect the collision-induced deformation of the balls when the balls collide.



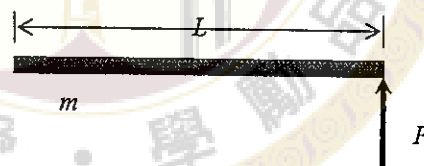
- (a) Find the maximum angle of the balls after the first collision. (10 分)
- (b) Find the energy loss during the first collision. (10 分)
- (c) Find the angle at which the second collision occurs. (5 分)

2. Consider a particle falling downward in a medium with an initial velocity v_0 from a height h in a constant gravitational field g . The particle moves under a retarded force which is proportional to the instantaneous velocity of the particle.

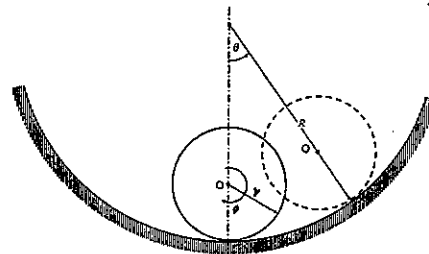
- (a) Find the terminal velocity. (10 分)
- (b) Find the velocity as a function of time. (10 分)
- (c) Find the displacement as a function of time. (5 分)

3. A uniform bar of mass m and length L , which is at rest on a horizontal surface E . At an instant, a horizontal force P is applied to the bar from its right end. The coefficient of friction between the bar and the surface is μ_s , and the gravitational acceleration is g . Please find the center of rotation at the instant when the force is applied.

(25 分)



4. A cylinder of radius r and mass m rolls without slipping along a circular path of radius R . Find the natural frequency of a small oscillation for the cylinder. (25 分)



試題隨卷繳回