系所組別： 奈米科技暨微系統工程研究所
考試科目： 工程力學　　　　　　　　　　　　　　　　考試日期：0219，節次：1
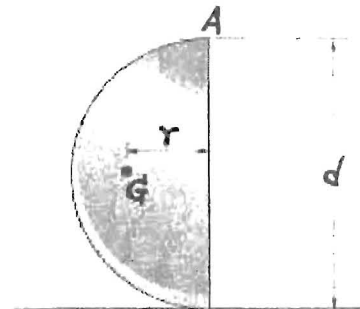
※ 考生請注意：本試題 ☑可 □不可 使用計算機

(1) Describe kinematics of a particle and kinetics of a particle in detail. Also, list the related basic equations. (10%)

(2) Describe kinematics of a rigid body and kinetics of a rigid body in detail. Also, list the related basic equations. (10%)

(3) A cord of negligible mass is wrapped around the outer surface of the cylinder of weight W and its end is subjected to a constant horizontal force P. If the cylinder rolls without slipping at A, determine its angular velocity in time t starting from rest. Neglect the thickness of the cord. (15%)
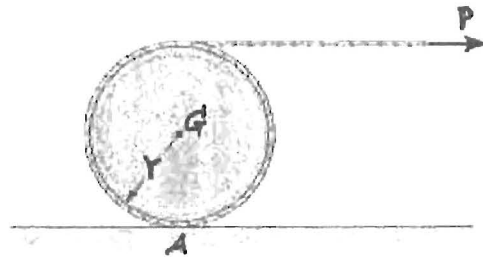
(4) The semicircular segment of mass M is released from rest in the position shown. Determine the velocity of point A when it has rotated counterclockwise 90°. Assume that the segment rolls without slipping on the surface. The moment of inertia about its mass center is I_G. (15%)
(M = 15 kg; r = 0.15 m; I_G = 0.25 kg.m^2; d = 0.4 m)

(背面仍有題目,請繼續作答)

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(5) The block A has mass m_A and rests on the pan B, which has mass m_B. Both are supported by a spring having a stiffness k that is attached to the bottom of the pan and to the ground. Determine the distance d the pan should be pushed down from the equilibrium position and then released from rest so that separation of the block will take place from the surface of the pan at the instant the spring becomes unstretched. (15%)
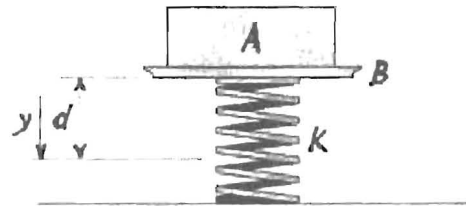
(6) Draw the shear and bending-moment diagrams for beam ABC. Note that there is a pin at B. (15%)
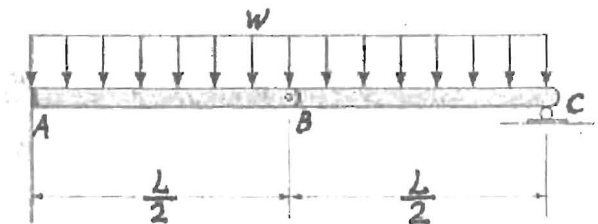
(7) Prove that the sum of the external forces acting on the system of particles is equal to the total mass of the particles times the acceleration of its center of mass G. (10%)

(8) A particle is moving with velocity v_0 when $s = 0$ and $t = 0$. If it is subjected to a deceleration of $a = -k v^3$, where k is a constant, determine its velocity and position as functions of time. (10%)