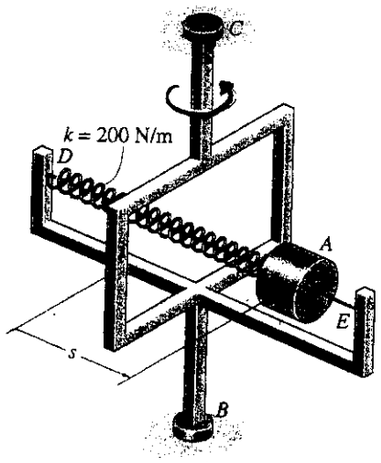
本試題是否可以使用計算機：☑可使用，□不可使用　（請命題老師勾選）

1. 下列敘述中，請將敘述正確之題號(a, b, c, …)寫在答案卷上. (10%)

   a. Average speed is the total displacement traveled divided by time.
   b. A particle can have an acceleration and yet have zero velocity.
   c. In general, the acceleration vector is tangent to the path.
   d. An inertial frame of reference has axes either translate or rotate.
   e. The equation of motion is valid only when applied from an inertial frame of reference.
   f. Only the problems involving conservative force systems may be solved by using conservation of energy theorem.

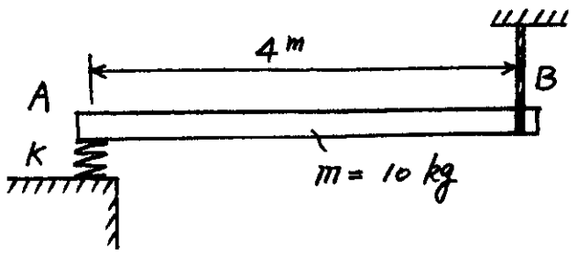
2. The collar A, having a mass of 5 kg, is attached to a spring having a stiffness of K=200 N/m. When rod BC rotates about the vertical axis, the collar slides outward along the smooth rod DE. If the spring is unstretched when s=0, determine the constant speed of the collar in order that s=250 mm. Also what is the normal force of the rod on the collar? Neglect the size of the collar. (20%)



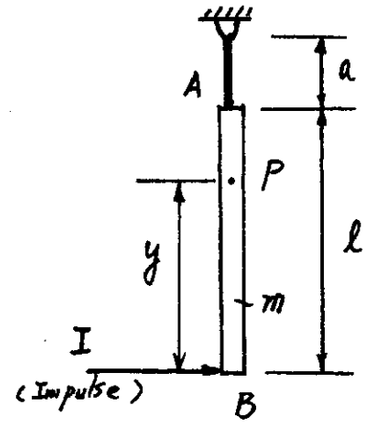
3. A ball has a mass of m and is dropped onto a surface from a height h. If the coefficient of restitution is e between the ball and the surface, determine the time needed for the ball to stop bouncing. (20%)

（背面仍有題目，請繼續作答）

4. The 10-kg slender rod is supported horizontally by a spring, having stiffness of *k*, at A and a cord at B. Determine the angular acceleration of the rod's mass center at the instant the cord at B is cut. (16 %)



5. The slender rod has a mass *m* and is suspended at its end by a cord. If the rod receives a horizontal blowing giving it an impulse *I* at its bottom B, determine the location *y* of the point P about which the rod appears to rotate, as well as the tension of the rod during the impact. (18 %)



6. Show that the kinetic energy of a rigid body under planar motion is equal to:

$$T = \frac{1}{2} m v_G^{\,2} + \frac{1}{2} I_G \omega^2$$

where *T* is the kinetic energy; *m* is the mass of body; v_G is the speed body at mass center G; I_G is moment of inertia for the body about an axis, perpendicular to the plane of motion, and passes through the mass center G; ω is the angular speed of the body. (16 %)