

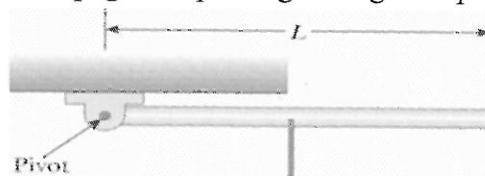
科目：普通物理(乙)

系所組：物理學系光電組

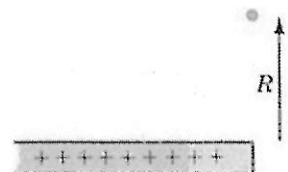
- 1) (35 pts) A non-uniform rod of length  $L$  has linear density given by  $\lambda = kx \left[ \frac{kg}{m} \right]$ , where  $x$  is the distance from the end of pivot, measured in meters. It is attached at one end to the frictionless pivot and is free to rotate about the pivot in the vertical plane, as figure. The rod is released from rest in the horizontal position.

Express your answer in terms of some or all of the variables  $k$ ,  $g$  and  $L$ .

- What is the mass of rod?
- How far from the  $x=0$  end is its center of mass?
- Find the moment of inertia  $I_{\text{pivot}}$  of the rod about the axis which is perpendicular to the rod and passes through the pivot?
- What is the moment of inertia of the rod about the center of mass  $I_{\text{cm}}$ ?
- What is the initial angular acceleration of the rod and the initial linear acceleration of its right end?
- Find the torque about the axis perpendicular to the page and passing through the pivot.

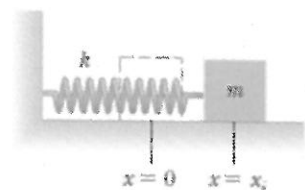


- 2) (20 pts) A semi-infinite line of charge has a uniform charge density  $\lambda$  C/m. Find the y-component of the electric field at a distance  $R$  from its end perpendicular to the axis.



- 3) (20 pts) The potential due to a point charge is given by  $V = k_e Q/r$ . Find: (a) the radial component of the electric field; (b) The  $x$  component of the electric field.

- 4) (25 pts) A block of mass  $m = 2.00$  kg is attached to a spring of force constant  $k = 500$  N/m as shown in Figure. The block is pulled to position  $x_i = 5.00$  cm to the right of equilibrium and released from rest. Find the speed the block has as it passes through equilibrium if (a) the horizontal surface is frictionless and (b) the coefficient of friction between block and surface is  $\mu_k = 0.350$ .



※ 注意：1. 考生須在「彌封答案卷」上作答。

2. 本試題紙空白部份可當稿紙使用。

3. 考生於作答時可否使用計算機、法典、字典或其他資料或工具，以簡章之規定為準。