淡江大學 106 學年度日間部轉學生招生考試試題

系別：物理學系三年級　　科目：電磁學 26-1　　3-26

考試日期：7 月 21 日(星期五) 第 1 節　　本試題共 3 大題， 1 頁

1. The charge density of a charged sphere of radius a is given by

$$\rho(r) = \left(\frac{\rho_0}{a}\right) r$$

where ρ_0 is a constant and r is the radial coordinate.

(a) Use Gauss's law to find the electric fields inside and outside the sphere. (15%)

(b) Use the result in (a) to find the total energy of the electric field. (15%)

(c) Find the electric potential $V(r)$ everywhere assuming that the potential at $r = \infty$, $V(\infty) = 0$. (10%)

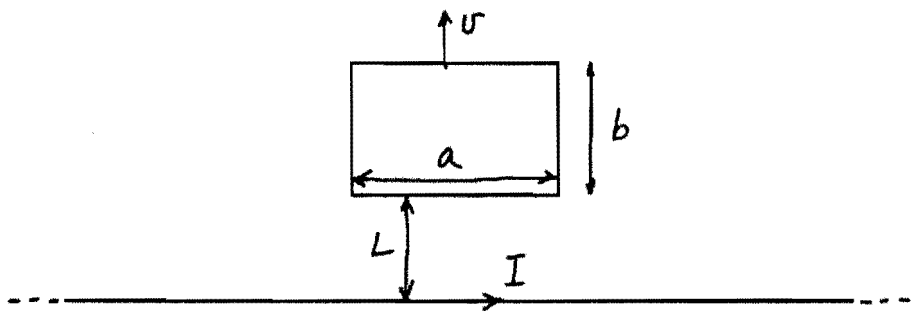
2. A long cylindrical cable (radius a) made up of linear material of magnetic susceptibility χ_m carries a uniform current I.

(a) Use Ampere's law to find the $\vec{H}$ field everywhere. (10%)

(b) Find the magnetization $\vec{M}$ in the cable. (5%)

(c) Find the magnetic field $\vec{B}$ everywhere. (10%)

3. A rectangular loop of wire (sides a and b and resistance R) is at a distance L from a very long wire which carries a current I as shown.



(a) Find the magnetic field $\vec{B}$ due to the long wire. (10%)

(b) Find the magnetic flux Φ through the rectangular loop. (10%)

(c) What is the induced current in the loop if the loop starts to move up with speed v, and in what direction? (15%)