國立彰化師範大學 97 學年度碩士班招生考試試題

系所：電信工程學研究所碩士班　　科目：電磁學

☆☆請在答案紙上作答☆☆　　共 1 頁，第 1 頁

Weighting: Each problem counts 20%

1. Using the spherical coordinates to calculate (a) $\nabla\left(1/\rho\right)-\nabla\times(\cos\theta\nabla\phi)$, and

   (b) $\nabla\phi-\nabla\times\left(\rho\nabla\theta/\sin\theta\right)$

2. Given a static electric field intensity $\overline{E}=\hat{a}_R(10/R)$ (mV/m) in free space, find the charge density distribution ρ_v at the point （3, 4, 0）(cm). (please show all your work)

3. Find the energy required to assemble a sphere of charge of radius *b* with the volume charge density $\rho_v=\rho_o\frac{b}{R}$

4. Find the magnetic flux density at point *P* in Fig. 1 where *P* is the center of the circle and the current *I* follows from the -∞ and goes around the circle of radius *b* clockwise, and then follows to +∞.

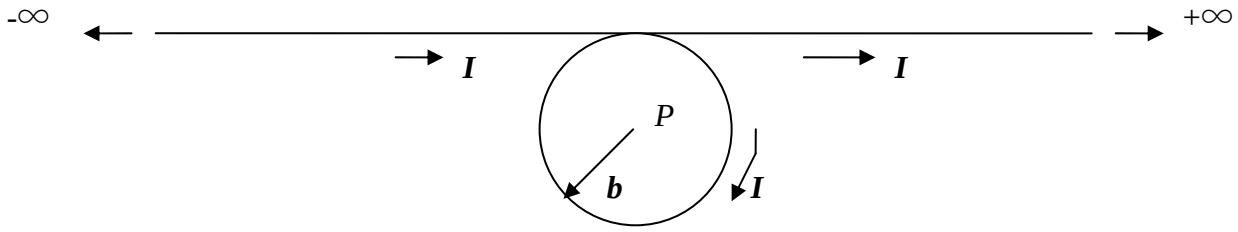

Fig. 1　The wire current *I* follows from -∞ and goes around a circle of a radius *b*, then to +∞.

5. A uniform plane wave in air with $\overline{E}_i(x,t)=\hat{a}_x E_0\cos(10^8 t-\beta z)+\hat{a}_y E_0\sin(10^8 t-\beta z)$ (V/m) is incident normally on a perfect conducting wall in the *z* = 0 plane. Find the following in phasor form
   (a) $\overline{E}_r$ and $\overline{H}_r$ (reflected fields)
   (b) Find the polarization of the incident wave and the reflected wave. (LP, RHCP, LHCP, EP)
   (c) The induced current density on the wall

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