

國立彰化師範大學 97 學年度碩士班招生考試試題

系所：電子工程學系碩士班

組別：甲組

科目：電磁學

☆☆請在答案紙上作答☆☆

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Weighting: Each problem counts 20%

1. Using the spherical coordinates to calculate (a) $\nabla\left(\frac{1}{\rho}\right) - \nabla \times (\cos\theta \nabla\phi)$, and
 (b) $\nabla\phi - \nabla \times \left(\frac{\rho \nabla\theta}{\sin\theta}\right)$
2. Given a static electric field intensity $\bar{E} = \hat{a}_r(10/R)$ (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 + .

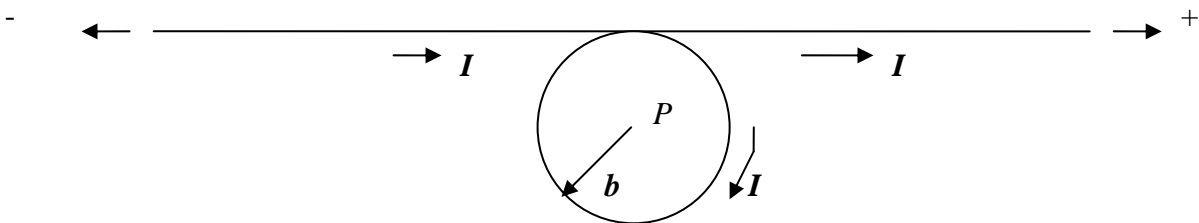


Fig. 1 The wire current I follows from - and goes around a circle of a radius b , then to + .

5. A uniform plane wave in air with $\bar{E}_i(x,t) = \hat{a}_x E_0 \cos(10^8 t - \beta z) + \hat{a}_y E_0 \sin(10^8 t - \beta z)$ (V/m) is incident normally on a perfect conducting wall in the $z = 0$ plane. Find the following in phasor form
 - (a) \bar{E}_r and \bar{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