

國立彰化師範大學 101 學年度碩士班招生考試試題

系所： 電信工程學研究所

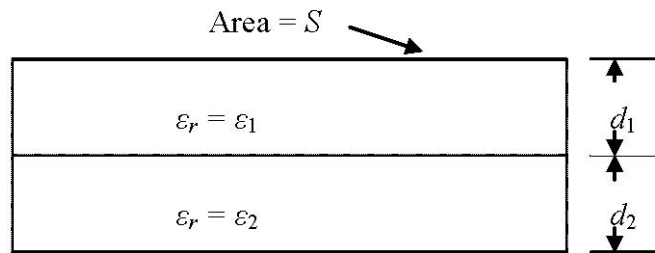
科目： 電磁學

☆☆請在答案卷上作答☆☆

共 1 頁，第 1 頁

Weighting: Each problem counts 20%

1. For a scalar function f and a vector function \bar{A} , prove that $\nabla \times (f\bar{A}) = f \nabla \times \bar{A} + (\nabla f) \times \bar{A}$ in Rectangular coordinates system and calculate $\nabla(1/\rho) - \nabla \times (\cos\theta \nabla\phi)$ in appropriate coordinates systems. (show all your work)
2. Given a static electric field intensity $\bar{E} = \hat{a}_x kx^2 + \hat{a}_y ky$ (V/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 capacitance of the parallel-plate capacitor shown in Figure. Find the electric field intensity between the plates if a potential V_o is applied to the top plate and the bottom plate is grounded. Also find the surface charge density on each plate conductor (top and bottom plates). (20%)



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 $-\infty$ and goes around the circle of radius b clockwise, and then follows to $+\infty$.

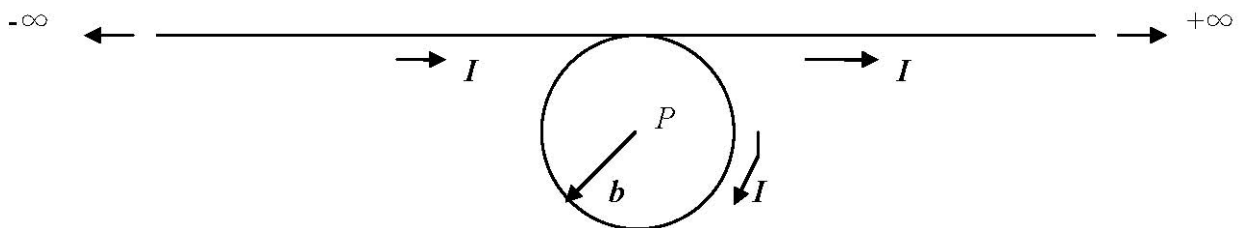


Fig. 1 The wire current I follows from $-\infty$ and goes around a circle of a radius b , then to $+\infty$.

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