

國立彰化師範大學 102 學年度碩士班招生考試試題

系所：電信工程學研究所

選考丙

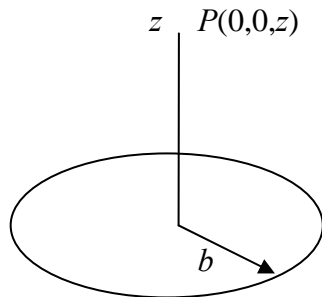
科目：電磁學

☆☆請在答案紙上作答☆☆

共 1 頁，第 1 頁

Weighting: Each problem counts 20%

1. If $f = x^3 y^2 z$, determine (a) ∇f and (b) $\nabla^2 f$ at the point $P(2, 3, 5)$ in the Cartesian coordinate system. (show all your work)
2. Given a static electric field intensity $\bar{D} = \hat{a}_x kx + \hat{a}_y ky + \hat{a}_z kz^2$ (V/m) in free space, find the charge density distribution ρ_v at the point $(3, 4, 1)$ (m). (please show all your work)
3. A spherical distribution of charge $\rho = \rho_o \frac{k}{R^2}$ exists in the region $R_i \leq R \leq R_o$. This charge distribution is concentrically surrounded by a conducting shell with inner radius R_i and outer radius R_o . Determine \bar{E} and V everywhere and find the surface charge density on the inner and outer surfaces of shell.
4. Calculate the V and \bar{E} at the point $P(0, 0, z)$ due to a uniform line charge density $\rho_l = \rho_o$ of the circle having radius b . And what is the V and \bar{E} when $z = 0$? (show your work in detail)



5. A uniform plane wave in air, $\bar{E}_i(z,t) = \hat{a}_x E_o \cos(2\pi \times 10^9 t - \beta z)$ is normally incident on a medium surface at $z = 0$. The medium has the relative dielectric constant of $\epsilon_r = 4$ and permeability $\mu_r = 1.0$.
 - (a) Calculate the value of β
 - (b) Find the reflection coefficient Γ at the interface
 - (c) Find the incident $\bar{H}_i(z,t)$ field