

國立彰化師範大學九十六學年度碩士班招生考試試題

系所：電信工程學研究所

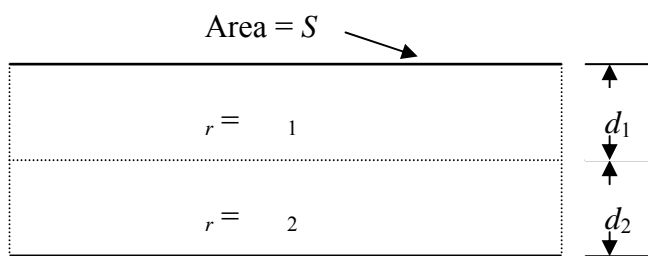
科目：電磁學

☆☆請在答案紙上作答☆☆

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Weighting: Each problem counts 20%

1. For a scalar function f and a vector function \bar{A} , prove that $\nabla \times (f \bar{A}) = f \nabla \times \bar{A} + (\nabla f) \times \bar{A}$ and $\nabla \cdot (f \bar{A}) = f \nabla \cdot \bar{A} + \bar{A} \cdot \nabla f$ in Rectangular coordinates system.
2. Given a static electric field intensity $\bar{E} = \hat{a}_x kx + \hat{a}_y ky + \hat{a}_z kz$ (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 capacitance of the parallel-plate capacitor shown in Figure. Find the electric field intensity between the plates if a potential V_0 is applied to the top plate and the bottom plate is grounded. Also find the surface charge density on each plate conductor.



4. A uniform plane wave in air with $\bar{E}_i(x, t) = \hat{a}_x E_0 \sin(2\pi \times 10^8 t - \beta z)$ (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) The induced current density on the wall
5. Find the expression of the input impedance, Z_{in} , for a cascaded transmission line shown in figure. If R_L is a pure real value and the λ is the guided wavelength of the wave propagated in the transmission line, find the values of R_t and l_t for the matching condition (no reflection). Calculate the Z_{in} under the match condition.

