

淡江大學 95 學年度轉學生招生考試試題

36

系別：物理學系三年級

科目：電 磁 學

36-1

准帶項目請打「V」	
X	簡單型計算機

本試題共 1 頁

※ 請詳細列出各步驟及計算過程,否則不予計分.

※ 每題 25 分

1. A disk of radius R with uniform surface charge density σ , lies in the xy plane.
 - (a) Find the potential at a distance z above the center of the charge distributions.
 - (b) Use the result in (a) to find the electric field at a distance z above the center of the disk.
2. A point charge q is imbedded at the center of a sphere of linear dielectric material (with susceptibility χ_e and radius R).
 - (a) Find the electric field, the polarization, and the bound charge densities, ρ_b and σ_b .
 - (b) What is the total bound charge on the surface?
 - (c) Where is the compensating negative bound charge located?
3. A circular loop of wire, with radius R , lies in the yz plane, centered at the origin, and carries a steady current I running counterclockwise as viewed from the positive x axis.
 - (a) Find the magnetic field a distance x above the center of the circular loop.
 - (b) What is its magnetic dipole moment?
 - (c) What is the approximate magnetic field and vector potential at point $(0, y, 0)$ for $y \gg R$.
4. Electromagnetic waves.
 - (a) Derive electromagnetic wave equations for \vec{E} and \vec{B} propagating in a linear homogeneous medium (permittivity ϵ , permeability μ) where there is no free charge or free current.
 - (b) Find the speed of propagation of the waves and give some discussions.
 - (c) In the case of the monochromatic plane waves, prove that the waves are transverse and \vec{E} and \vec{B} are mutually perpendicular.