

# 淡江大學 103 學年度日間部轉學生招生考試試題

34

系別：物理學系三年級

科目：電磁學

考試日期：7月20日(星期日) 第3節

本試題共 4 大題， 1/1 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  $R$ , carries a uniform surface charge density  $\sigma$ .
  - (a) Find the electric field at a distance  $z$  above the center of the disk.
  - (b) What does the property and formula you give in the limit  $R \rightarrow \infty$ ? Plot the field function of  $z$ , i.e.,  $E(z)$ .
  - (c) Check the case for  $z \gg R$  and give statements on your results.
  - (d) What is the electric field at the center of the disk?

2. (a) The potential at a distance  $z$  above the center of a straight-line segment of length  $2L$ , carries a uniform line charge density  $\lambda$ , is  $(\lambda / 2\pi\epsilon_0) \ln(L + \sqrt{z^2 + L^2})$ . Find the corresponding electric field.

- (b) A point charge  $+q$  sit at origin. What is the flux of  $\mathbf{E}$  through the surface of a equilateral triangle (等邊三角形) as shown in **Fig. 1**? (Answer the question by computation or explanation.)

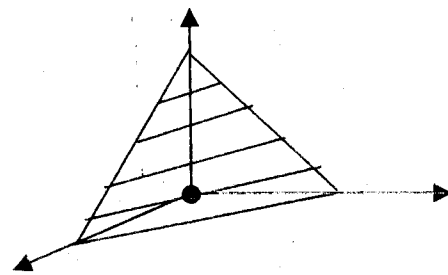


Fig. 1

3. An infinite straight wire carrying a steady current  $I$ . Find the magnetic flux through a tetragonal loop (sides length  $a$  and  $b$ ) placed near the wire, as shown in **Fig. 2**.

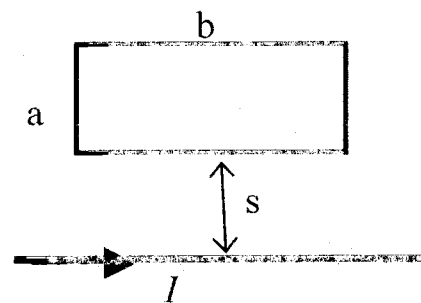


Fig. 2

4. Electromagnetic wave
  - (a) Derive electromagnetic wave equations for  $\mathbf{E}$  and  $\mathbf{B}$  propagation in a **linear** homogeneous medium, with dielectric constant  $\epsilon_r$ , relative permeability  $\mu_r$ , where there is no free charge or free current.
  - (b) Find the **speed** of propagation of the waves in terms of  $\epsilon_r$ ,  $\mu_r$  and light speed  $c$ .