

淡江大學 102 學年度日間部轉學生招生考試試題

系別：物理學系三年級

科目：電磁學

考試日期：7月24日(星期三) 第3節

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※ 請詳細列出各步驟及計算過程,否則不予計分.

※ 每題 25 分.

1. $\vec{E}_a = c [(z^3)\hat{x} + (xy)\hat{y} + (2xz)\hat{z}]$

$$\vec{E}_b = c [(x^2 + y^2)\hat{x} + (2xy + 2yz^2)\hat{y} + (2y^2z)\hat{z}]$$

Here c is a constant with the appropriate units.

(a) Are they possible electrostatic fields? Why?

(b) For the possible one, find the corresponding charge density $\rho(x,y,z)$.2. A uniformly charged solid sphere of radius R with total charge q .

(a) Find the electric field inside and outside the sphere.

(b) Plot the field function of r , a distance from the center of the sphere.

3. $\vec{B}_a = k [(x^2)\hat{x} + (z^2)\hat{y} - (2xz)\hat{z}]$

$$\vec{B}_b = k [(xy)\hat{x} - (y^2)\hat{y} + (2yz)\hat{z}]$$

Here k is a constant with the appropriate units.

(a) Are they possible static magnetic fields? Why?

(b) For the possible one, find the corresponding current density $\vec{J}(x,y,z)$.

4. In free space, there is a uniform plane electromagnetic wave, where the electric field is given by

$$\vec{E} = \hat{x} 96 \cos(6z + \omega t) \quad (\text{V/m}).$$

Determine the follows:

(a) The velocity of propagation, including magnitude, direction and unit.

(b) The wave frequency.

(c) The wavelength.

(d) The magnetic field \vec{B} .