

淡江大學 106 學年度日間部寒假轉學生招生考試試題

系別：物理學系三年級

科目：電磁學

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考試日期：1月6日(星期六) 第1節

本試題共 五 大題， 1 頁

*請列出各步驟及計算過程、或詳細說明，否則不予計分。

1. (10分) Please write down Maxwell's equations for electrostatics and magnetostatics in free space.
2. (30分) A metal sphere of radius a carries a charge Q . (a) Find the electric fields and potentials both inside and outside this sphere. (b) If this metal sphere is surrounded, out to radius b , by a linear dielectric material of permittivity ϵ . Find the potential at the center.
3. (20分) Two infinitely-long grounded metal plates, at $y = 0$ and $y = a$, are connected at $x = \pm b$ by metal strips maintained at a constant potential V_0 (a thin layer of insulation at each corner prevents them from shorting out. Find the potential inside the rectangular pipe.
4. (20分) (a) Find the magnetic of a very long solenoid, of radius R , consisting of n turns per unit length, each carrying a steady current I . (b) Find the self-inductance per unit length of this solenoid. (c) Find the energy stored in a section of length l of this solenoid
5. (20分) (a) Find the magnetic field a distance z above the center of a circular loop of radius R_0 , which carries a steady current I . (b) Use the result of (a) to calculate the magnetic field at the center of a uniformly charged spherical shell, of radius R and total charge Q , spinning at constant angular velocity ω .