註:本次考試　不可以參考自己的書籍及筆記；　不可以使用字典；　不可以使用計算

Park I Terminology Explanation 解釋名詞 (40% 每題5分，共40分)

a) Coulomb's law　庫倫定律　　　　b) Ohm's law　歐姆定律
c) Electromotive force　電動勢　　　d) Lenz's law　愣次定律
e) Poynting vector　坡印廷向量　　　f) Self-inductance　自感
g) Capacitive reactance　容抗　　　 h) Kirchhoff circuit laws　克希荷夫電路定律

Park II Problems 問題 (60% 每題15分，共60分)

Ex.1) A long, thin, straight wire of length L has a positive charge Q distributed uniformly along it. Use Gauss' law to show that the electric field created by this wire at the radial distance r has a magnitude of $E = \lambda/(2\pi\varepsilon_0 r)$, where $\lambda = Q/L$.

　　有一長且細的直線電荷分佈，長度L並沿著該直線均勻分佈正電荷Q。利用高斯定律計算離此直電荷分佈徑向r距離處所產生的電場之大小可寫成 $E = \lambda/(2\pi\varepsilon_0 r)$，其中線電荷密度為 $\lambda = Q/L$。

Ex.2) A square coil and a rectangular coil are each made from the same length of wire. Each contains a single turn. The long sides of the rectangle are twice as long as the short sides. Find the ratio $\tau_{square}/\tau_{rectangle}$ of the maximum torque that these coils experience in the same magnetic field when they contain the same current.

　　一正方形線圈與一長方形線圈兩者都是用同樣長度的導線所繞成的，二者都只有單圈結構。長方形線圈的長邊長度是短邊的兩倍。兩線圈都處在同樣的磁場中，並且兩線圈上的電流也都相等。求兩線圈所受的最大力矩的比值 $\tau_{square}/\tau_{rectangle}$ 應為何？

Ex.3) A parallel-plate capacitor with a plate separation d is connected to a battery with a potential defference V. The plates are pulled apart till the separation is $2d$. What is the change in each of the following quantities: (a) the potential difference; (b) the charge on each plate; (c) the energy stored in the capacitor?

　　一平行板電容其兩平板相距 d 並且連接上一電池，電池的電位差為V。若兩平板被拉開至相隔 $2d$ 的距離。則下列各量值的變化為何？(a) 兩板間的電位差；(b) 各板上的電荷；(c) 電容儲存的能量？

Ex.4) An ideal infinite solenoid has n turns per unit length and carries a current I. Use Ampere's law to show its magnetic field inside the solenoid?

　　一理想的無窮長度的螺線管，每單位長度有 n 匝並帶有電流 I，利用安培定律計算螺線管內的磁場大小？