所別：<u>光電科學研究所碩士班</u>　<u>不分組</u>科目：<u>電磁學</u>

1. (15%) Two parallel conducting planes located at $z = \pm d/2$ carry surface current densities $\pm \vec{K} = \pm K\hat{x}$, respectively. Here $K = |\vec{K}|$, and $\hat{x}$ is the unit vector along the x axis. Find the magnetic field everywhere.

2. (15%) A conducting disk of radius a, thickness d, and conductivity σ is placed in a magnetic field $\vec{B}(t)$, which is parallel to its axis. If $\vec{B}(t) = \vec{B}_0 \sin \omega t$, find the induced current density at any point within the disk. Neglect the second-order magnetic field of the induced current.

3. (10%) An electromagnetic wave is incident on a slab of dielectric material that has parallel surfaces. If the wave is incident on the front surface at Brewster's angle, show that the refracted wave is incident on the rear surface at Brewster's angle also.

4. (10%) A point charge e moves with a constant velocity $\vec{u}$. (a) Draw the field lines for the $\vec{E}$ and $\vec{B}$ fields of this charge. (b) Draw the lines of Poynting vector. (c) Does this charge radiate any energy? Explain why.
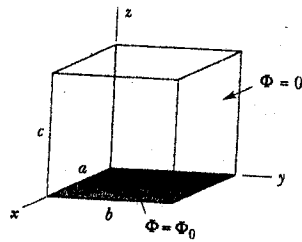
注意：總共8題，背面（下一頁）還有4題！

注意：背面有試題

所別：**光電科學研究所碩士班　不分組** 科目：**電磁學**

5. Evaluate $\vec{\nabla} \times (\vec{\nabla}\phi)$ and $\vec{\nabla} \cdot (\vec{\nabla}\phi)$ for $\phi = x^2 y$. (12%)

6. Calculate the potential within a conducting box (as shown in the figure below) for which all of the sides except one are grounded and the remaining side is at a potential $\Phi = \Phi_0$. Let the lengths of the sides in the x, y, and z directions be, respectively, a, b, and c. (13%)
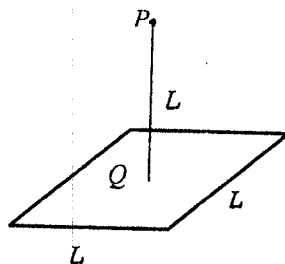

7. An infinitely large grounded conducting plate is bent as two half planes. The angle between these two planes is $90°$ (as you can see from the figure).

(viewed from the tip of the y-axis)
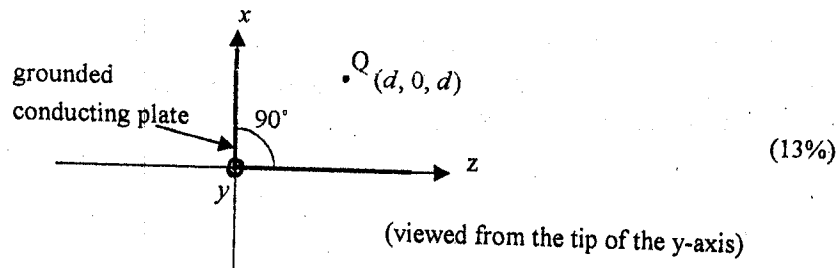
A point cheare Q is now placed at the coordinates $(d, 0, d)$. Calculate the induced surface charge density on the x-y plane ($y > 0$) and the electric field ($\vec{E}$) in the quadrant $x > 0$ and $z > 0$. (You may use the method of images, but make sure that you have all the images right!)

8. Charge Q is uniformly distributed on a square plate of size $L \times L$. Find the electric field (magnitude and direction) at the point P which is at a distance L above the center of the square. (Please define your own coordinate system) (12%)