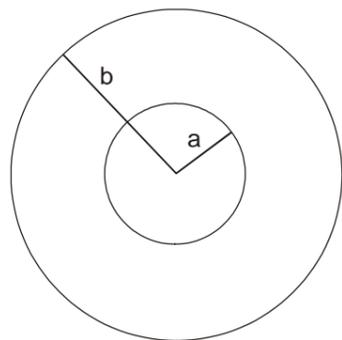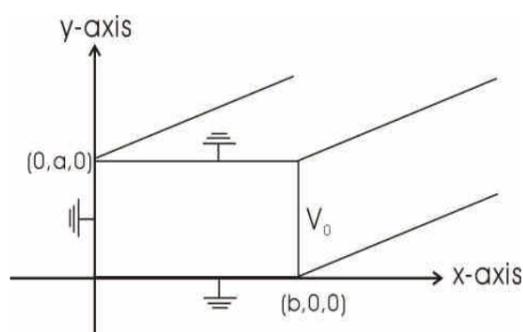# 國立嘉義大學 99 學年度

電子物理學系碩士班（乙組）招生考試試題

科目：電磁學

1. Find the capacitance of two concentric spherical metal shells, with radii a and b. (10%)
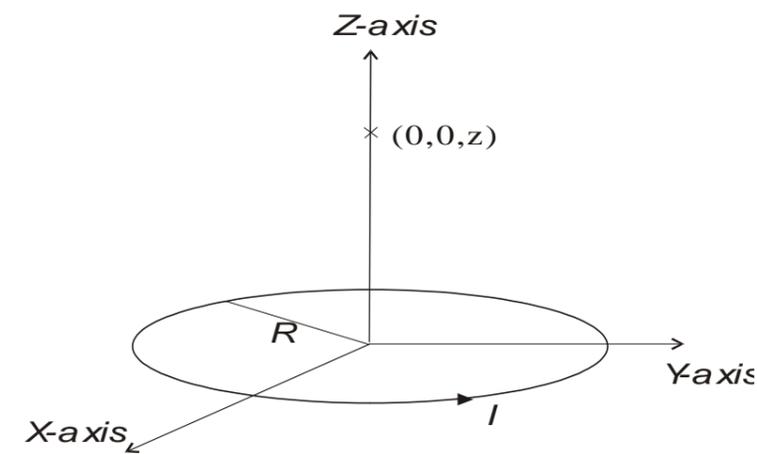

2. Explain the meaning of uniqueness theorems. (10%)

3. Find the electric potential inside the infinite pipe as shown in the below figure. (20%)

4. What is an electric dipole moment? What is a magnetic dipole moment? (10%)

5. Find the magnetic field at a distance z above the center of a circular loop of radius R, which carry a steady current I. (10%)

6. A thick slab extending from $z=-a$ to $z=+a$ carries a uniform volume current $J\hat{x}$. Find the magnetic field, as a function of z, outside the slab. (10%)

7. Write down Maxwell's Equations in free space. (10%)

8. The electric and magnetic field of a plane wave with single frequency in vacuum are represented by $\tilde{E}(z,t) = E_0 e^{i(kz-\omega t+\phi)}$ and $\tilde{B}(z,t) = B_0 e^{i(kz-\omega t+\phi)}$, where E_0 and B_0 are real amplitudes. Explain why $B_0 = \dfrac{E_0}{c}$. (10%)

9. A plane wave $\vec{E}(z,t) = E_0 \cos(kz-wt+\phi)\hat{x}$, $\vec{B}(z,t) = \dfrac{E_0}{c}\cos(kz-wt+\phi)\hat{y}$.

   Calculate the time averaged energy density $<u> = ?$ (10%)