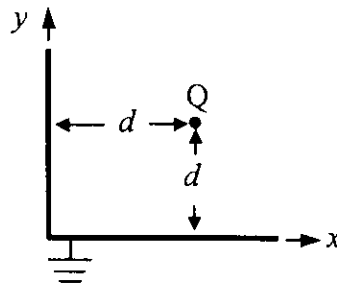


*作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符!!

1. (a) What are the boundary conditions for electrostatic fields at an interface between a conductor and a dielectric with permittivity ϵ . (5 points)
- (b) What is the resistance of a lossy material with conductivity σ and dimensions of $a \times b \times c$. (5 points)
- (c) What is a magnetic dipole? Define *magnetic dipole moment*. (5 points)
2. A point charge Q is located at a distances d from two grounded perpendicular conducting half-planes as shown in the figure. Determine the surface charge density ρ_s on the horizontal conducting plane of $x \geq 0$. (15 points)



3. Consider a coaxial cable with an inner conductor of radius a and an outer conductor whose inner radius is b . The space between the conductor is filled with a dielectric whose permittivity varies linearly from ϵ_1 at $r = a$ to ϵ_2 at $r = b$. Find the capacitance and inductance per unit length of the cable. (20 points)

(Hint: $\int \frac{dx}{x^2 + kx} = \frac{1}{k} \ln \left(\frac{x}{x+k} \right)$)

4. The electric and magnetic fields of a general TEM wave traveling in the $+z$ direction along a transmission line may have both x - and y -components, and both components may be functions of the transverse dimensions.
 - (a) Find the relations among $E_x(x,y), E_y(x,y), H_x(x,y), H_y(x,y)$ (5 points)
 - (b) Verify that all the four fields components in part (a) satisfy the two-dimensional Laplace's equation for static fields. (5 points)

國立交通大學 97 學年度碩士班考試入學試題

科目：電磁學(2053)

考試日期：97 年 3 月 8 日 第 3 節

系所班別：電信工程學系 組別：電信系乙組

第 2 頁, 共 2 頁

* 作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符!!

5. A right-hand circularly polarized plane wave represented by the phasor

$$E(z) = E_0(a_x - ja_y)e^{-j\beta z}$$

impinges normally on a perfectly conducting wall at $z=0$

- (a) Determine the polarization of the reflected wave. (5 points)
- (b) Find the induced current on the conducting wall. (5 points)
- (c) Obtain the instantaneous expression of the total electric intensity based on the cosine time reference. (5 points)

6. A d-c voltage V_0 is applied at $t = 0$ directly to the input terminal of an open-circuited lossless transmission line of length L as shown in the following figure. Sketch the transient voltage and current waves on the line for the following time intervals:

- (a) $0 < t < T (= L/u)$ (note: u is the propagation velocity of the wave on the line) (5%)
- (b) $T < t < 2T$ (5 points)
- (c) $2T < t < 3T$ (5 points)
- (d) $3T < t < 4T$ (5 points)
- (e) What happens after $t = 4T$? (5 points)

