

國立臺灣科技大學

九十二學年度博士班招生考試試題

系所組別：電子工程系博士班乙組

科目：電磁理論

總分 100 分

1. A positive point charge Q is located at a distance d above a large grounded (zero-potential) plane, as shown in Fig. 1. Find
- the potential at an arbitrary point $P(x,y,z)$ in the $y > 0$ region (10%)
 - the induced charge distribution on the surface of the conducting plane. (10%)

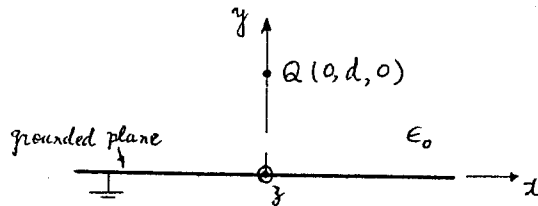


Fig. 1

2. Fig. 2 shows two parallel conducting plates. Each of the plates has a width w and the plates are separated by a dielectric medium (ϵ, μ) of thickness d . Neglect the fringing effect and find
- the capacitance per unit length (10%)
 - the inductance per unit length. (10%)

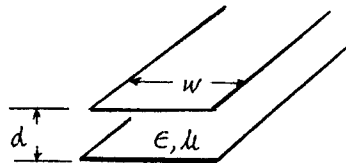


Fig. 2

3. In a laboratory experiment conducted on a 50-ohms lossless transmission line terminated in an unknown load impedance, it is found that the standing wave ratio is 2.0. The successive voltage minima are 25 cm apart, and the first voltage minimum occurs at 5 cm from the load. Find
- the load impedance (10%)
 - the reflection coefficient at the load end. (10%)



國立臺灣科技大學

九十二學年度博士班招生考試試題

系所組別：電子工程系博士班乙組

科 目：電磁理論

4. A TE_{10} wave at 10GHz propagates in a rectangular metallic waveguide with inner dimension $a = 1.5$ cm and $b = 0.6$ cm, which is filled with polyethylene ($\epsilon_r = 2.25$, $\mu_r = 1$). Determine
- (a) the guide wavelength (10%)
 - (b) the wave impedance. (10%)
- 5 (a) Write down Maxwell's equations in both differential and integral forms. (10%)
- (b) Explain the physical significance of each Maxwell's equation. (10%)

