

國立中山大學 101 學年度碩士暨碩士專班招生考試試題

科目：電磁學【光電所碩士班】

題號：4083
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1. (5%) How to combine two orthogonal linearly polarized waves to a circularly polarized wave?
2. (10%) Please derive the reflection coefficient and transmission coefficient of a perpendicular polarization plane wave launched from medium 1 to medium 2. The impedances in media 1 and 2 are η_1 and η_2 , respectively. The incident and refractive angles are θ_1 and θ_2 , respectively.
3. (5%) (a) What is a phasor?
(5%) (b) What is the difference between a phasor and a vector?
4. (5%) (a) What is the skin depth (depth of penetration) of a conductor?
(5%) (b) Consider a typical conductive metal. How much does the skin depth of the metal change if there is a 4-fold increase of the EM wave frequency?
5. (5%) (a) What is the quality factor of a resonator?
(5%) (b) How does the quality factor of a resonator change if the material of the resonator is changed from copper to silver?
(5%) (c) Consider a hollow cubic cavity which has a dominant resonant frequency of 10(GHz). What should the size of the cavity be?
6. (15%) Consider a coaxial cylindrical capacitor with the inner cylinder conductor of radius a and outer cylinder conductor of radius b . The conductivity, permittivity and permeability of the inside material are σ , ϵ , and μ , respectively. The length of the capacitor is L .
(a) Find the potential difference between the inner and outer conductors. (5%)
(b) Find the capacitance per unit length. (5%)
(c) Find the inductance per unit length. (5%)
7. (5%) (a) What is a Hertzian dipole?
(10%) (b) Define the directive gain and directivity of an antenna.
8. (20%) Consider a lossless $50(\Omega)$ transmission line terminated in an unknown load impedance. The distance between successive voltage minima is 20 (cm), and the first minimum is located at 5 (cm) from the load. The standing-wave ratio on the lossless transmission line is found to be 3.0.
(a) Find the reflection coefficient Γ . (5%)
(b) Find the load impedance Z_L . (5%)
(c) Find the equivalent length and terminating resistance of a line such that the input impedance is equal Z_L . (10%)