

臺灣綜合大學系統 105 學年度學士班轉學生聯合招生考試試題

科目名稱	電磁學	類組代碼	D14
		科目碼	D1492

※本項考試依簡章規定各考科均「不可以」使用計算機

本科試題共計 1 頁

- (10%) Please use time-dependent Maxwell's equations to derive the wave equation for \mathbf{E} .
- (15%) Please derive the **boundary conditions** at the interface between two materials for the electromagnetic fields.
- (15%) A 3GHz wave is normally incident from nonmagnetic medium 1 ($\epsilon_{r1} = 4$) to nonmagnetic medium 2 ($\epsilon_{r2} = 9$). Find out the values of reflection coefficient, transmission coefficient, and the standing-wave ratio (SWR).
- (20%) A finite line charge of length L carrying uniform line charge ρ_ℓ is coincident with the x -axis shown as Fig. 1. Determine \mathbf{E} from ρ_ℓ directly by applying Coulomb's law.

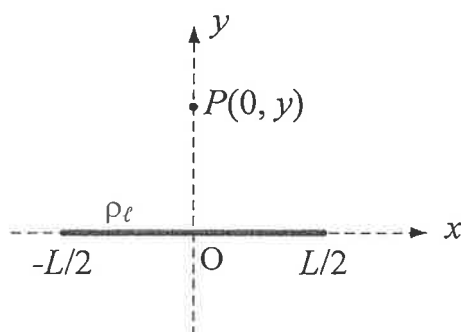


Fig. 1

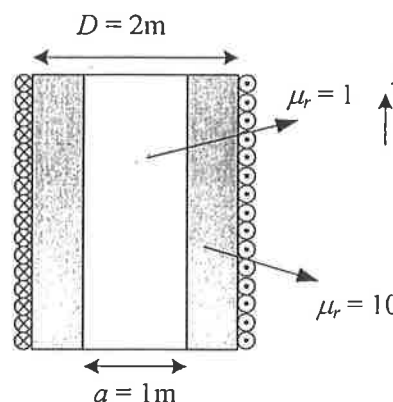


Fig. 2

- (20%) An infinite long cylindrical solenoid of diameter $D = 2$ m and a winding 20 turns per cm is filled with a magnetic material tube ($\mu_r = 10$) of inner diameter $a = 1$ m and outer diameter 2 m as shown in Fig. 2.
 - Find the magnetic field \mathbf{B} everywhere if the current is $I = 5$ A. (10%)
 - Find out the inductance per meter of the solenoid. (10%)
- (20%) A uniform plane wave in free space is given as

$$\mathbf{E} = (\mathbf{a}_x j3 - \mathbf{a}_y 2 + \mathbf{a}_z A_z) \cdot e^{j(1.6\pi x + 1.2\pi z)}$$
 - Find the value of A_z ? (5%)
 - The wavelength of the wave? (5%)
 - Find \mathbf{H} in phasor form. (5%)
 - Find out the time-average Poynting vector. (5%)