

大同大學 九十一 學年度 碩士班入學考 試題

考試科目：電磁學

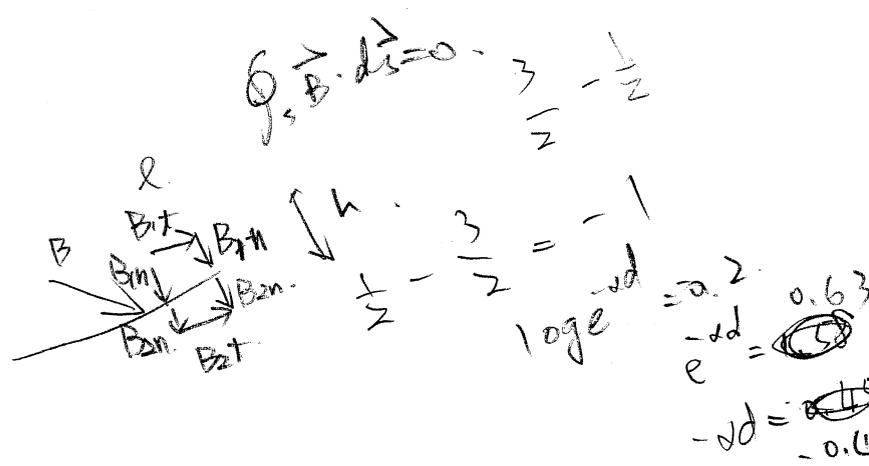
所別：通訊工程研究所

第1/1頁

註：本次考試不可以參考自己的書籍及筆記； 不可以使用字典； 可以使用計算器。

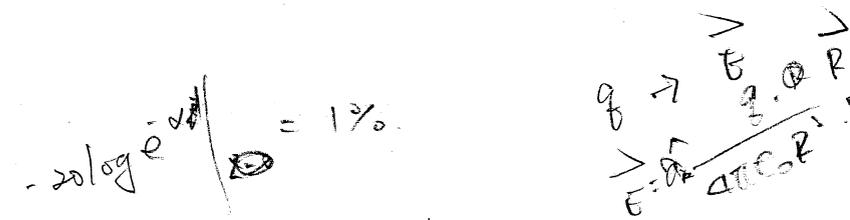
1. By applying the Gauss's law and Ampère's law, please derive the magnetic boundary conditions for B and H between medium 1 with μ_1 and medium 2 with μ_2 , where B and H are the magnetic flux density vector and magnetic intensity vector, respectively. μ_1 and μ_2 are the permeability for these media.

2. Explain the following terms:
- Omni-directional antenna pattern
 - Antenna gain
 - Wave polarization
 - Antenna array
 - Antenna radome



3. The electric field intensity of a linearly polarized uniform plane wave propagating in the z-direction in seawater is $\vec{E} = \vec{a}_x 10 \cos(10^7 \pi t)$ v/m at $z=0$. The constitutive parameters of sea water are $\epsilon_r = 72, \mu_r = 1$, and $\sigma = 4$ S/m.

- Determine the attenuation constant.
- Determine phase constant
- Determine phase velocity in sea water
- Determine the wavelength in sea water
- Find the distance at which E is 1% of its value at $z=0$ (given $\ln(100)=4.605$)



4. A point charge is placed at a distance d from an infinitely extended conducting plane, calculate the surface charge density on the conducting plane.

References:

$$\nabla \cdot \vec{A} = \frac{1}{\rho} \frac{\partial}{\partial \rho} (\rho A_\rho) + \frac{1}{\rho} \frac{\partial}{\partial \phi} (A_\phi) + \frac{\partial}{\partial z} (A_z) \quad \text{[Cylindrical]}$$

$$\nabla \cdot \vec{A} = \frac{1}{r^2} \frac{\partial}{\partial r} (r^2 A_r) + \frac{1}{r \sin \theta} \frac{\partial}{\partial \theta} (\sin \theta A_\theta) + \frac{1}{r \sin \theta} \frac{\partial}{\partial \phi} (A_\phi) \quad \text{[Spherical]}$$

$$\nabla \times \vec{B} = \frac{1}{\rho} \begin{vmatrix} \vec{a}_\rho & \rho \vec{a}_\phi & \vec{a}_z \\ \frac{\partial}{\partial \rho} & \frac{\partial}{\partial \phi} & \frac{\partial}{\partial z} \\ B_\rho & \rho B_\phi & B_z \end{vmatrix} \quad \text{[Cylindrical]}$$

$$\nabla \times \vec{B} = \frac{1}{r^2 \sin \theta} \begin{vmatrix} \vec{a}_r & r \vec{a}_\theta & r(\sin \theta) \vec{a}_\phi \\ \frac{\partial}{\partial r} & \frac{\partial}{\partial \theta} & \frac{\partial}{\partial \phi} \\ B_r & r B_\theta & r(\sin \theta) B_\phi \end{vmatrix} \quad \text{[Spherical]}$$