

國立中央大學99學年度碩士班考試入學試題卷

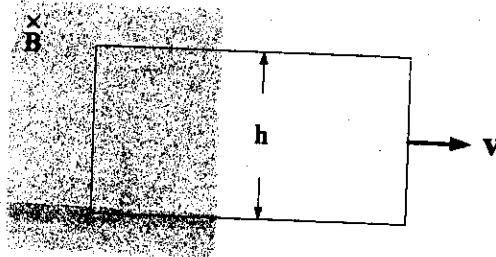
所別：光電科學與工程學系碩士班 不分組(一般生) 科目：電磁學 共 2 頁 第 1 頁
 不分組(在職生)

*請在試卷答案卷(卡)內作答

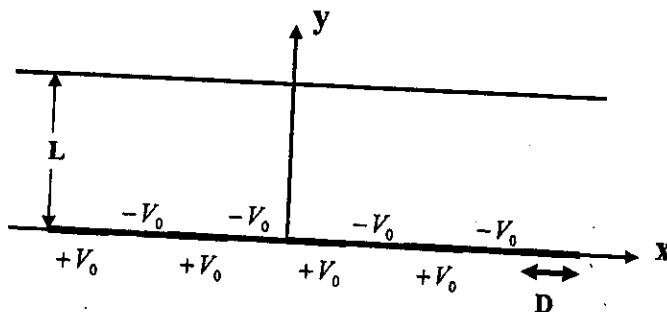
*本科考試禁用計算器

- By what method was the value of the magnetic permeability μ_0 determined? (5%)
 - How do we define 1 Ampere and 1 Coulomb in electromagnetism? (10%)
 - Determine the magnetic field B inside an infinitely long solenoid carrying a current density of 1 Amp/meter. (10%)
- An infinitely long straight wire carries a constant current I_0 that is turned on abruptly at $t=0$.

 - Determine the electric and the magnetic fields at time t as a function of the distance s from the wire. (10%)
 - At what condition does the results in (a) reduce to the static case? (5%)
- Assume that the wire loop of a generator is made out of a perfect conductor with mass m . In this case, the current will be limited only by the back electromotive force associated with the self-inductance L of the loop. As shown in the following figure, in the shaded region there is a uniform magnetic field B and the loop is pulled to the right with speed v . Describe in what motion the loop behaves? (10%)



- Consider two concentric spherical metal shells of radii R_1 and R_2 ($R_2 > R_1$). If the outer shell has a charge Q and the inner shell is grounded, what is the charge on inner shell? (6%)
- An infinite conducting grounded plate is situated on the x - y plane ($z=0$ plane). A point charge Q is placed at the position $(0, 0, d)$ on the z -axis. Find the induced charge density at the surface of the plate as a function of the distance from the origin of the coordinate system. (8%)
- What is the meaning of "skin depth"? What is the ratio of the skin depth in copper at frequency 10 Kc/sec to that at frequency 100 Mc/sec? (6%)
- A square-wave potential in x (period $2D$) is in the x - z plane and the plane at $y=L$ is at zero potential as shown in the figure. The problem is independent of z . Find the potential at all points between $y=0$ and $y=L$. (15%)



參考用

注意：背面有試題

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8. An uniform electric field E_0 is applied in the z-direction, i.e. $\vec{E} = E_0 \hat{z}$, where \hat{z} is a unit vector in the z-direction. A dielectric sphere of radius R and with relative permittivity (or dielectric constant) ϵ_r , is placed in this electric field and is centered at the origin of the coordinate system. Find the electric field inside this dielectric sphere. (15%)

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