逢甲大學100學年度碩士班招生考試試題 編號：070 科目代碼：331

科目	電磁學	適用系所	電機工程學系電波組、光電組	時間	100分鐘

※請務必在答案卷作答區內作答。

1. What does the del operator ∇ stand for in Cartesian coordinates? (10%)

2. What are the general boundary conditions for electrostatic fields at an interface between two different dielectric media? (10%)

3. Consider a metallic rectangular box with sides a and b and height c. The side walls and the bottom surfaces are grounded. The top surface is isolated and kept at a constant potential V_0. Determine the potential distribution inside the box. (15%)

4. Two charges $(+q, -q)$ are arranged along the z-axis at $z = d/2$ and $z = -d/2$, respectively. Determine V at a distant point $P(R,\theta,\phi)$. (15%)

5. A coaxial transmission line with inner conductor of radius a and outer conductor having inner radius b has a coaxial cylindrical ferrite of permeability μ_1 extending from $r = a$ to $r = d$ (with $d < b$), and air from radius d to b. Find the inductance per unit length. (15%)

6. For each uniform plane wave traveling in vacuum characterized below, describe the polarization and direction of propagation. (15%)

   (a) $\vec{E} = \hat{a}_x e^{+jkz}$

   (b) $\vec{H} = (j\hat{a}_x - \hat{a}_y)e^{-jkz}$

   (c) $\vec{E} = (\hat{a}_x + \sqrt{3}\hat{a}_y)e^{-jkz}$

7. Derive the following differential equations in a homogeneous medium containing charges and currents. (15%)

$$\nabla^2\vec{E} - \mu\varepsilon\frac{\partial^2\vec{E}}{\partial t^2} = \frac{1}{\varepsilon}\nabla\rho + \mu\frac{\partial\vec{J}}{\partial t}$$

$$\nabla^2\vec{H} - \mu\varepsilon\frac{\partial^2\vec{H}}{\partial t^2} = -\nabla\times\vec{J}$$

8. State the law of conservation of magnetic flux. (5%)