

科目：電磁學 適用：應光系

編號：422

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

 本試題
共 1 頁
第 1 頁
I. True or False (5% for each)

1. Electric field inside a metal conductor is zero.
2. The relative permittivity of SiO₂ is larger than 1.
3. The tangential component of the electric field on the metal surface is zero in static electric field.
4. $\nabla \times \vec{E}$ is always zero in time-varying magnetic field.
5. Accelerated or decelerated charges will generate electromagnetic radiation.

II. A radially dependent surface charge is distributed on a disk of radius a in the x - y plane and is characterized in cylindrical coordinates by surface density $\rho_s = \rho_0 \left(\frac{a}{r}\right)$, where ρ_0 is a constant. Determine the electric field strength and electric potential everywhere on the z axis. (25%)

III. A disk of radius a lies in the x - y plane, with the z axis through its center. The charge density is characterized in cylindrical coordinates by surface density $\rho_s = \rho_0 \left(\frac{a}{r}\right)$, where ρ_0 is a constant. The disk rotates about the z axis at angular velocity Ω rad/s. Determine the magnetic field intensity everywhere on the z axis. (25%)

IV. A parallel-plate capacitor is filled with a nonuniform dielectric characterized by $\epsilon_r = 2 + 10^6 x^2$, where x is the distance from one plate in meters. If the surface area $S = 0.01 \text{ m}^2$ and the distance between the two plates $d = 2 \text{ mm}$, calculate the capacitance. (25%)