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	D13
		科目碼	D1391
※本項考試依簡章規定各考科均「不可以」使用計算機		本試題共計	2 頁

皆為單選題，每題5分，共20題，總分100分。不答0分，每題答錯倒扣1分。

1. A=(-1, 2, 0), B=(-1, 0, 3). Please calculate the |AXB| (A)7 (B)10 (C)4 (D)5 (E)1

2. V=(x^2, $3xz^2$, $-2xz$). Please calculate the $\nabla \cdot V$ at the point (1, 1, 2) (A)0 (B)3 (C)10 (D)9 (E)-3

3. $\int_0^6 (3x^2-2x-1)\delta(x-3)dx$ (A)0 (B)10 (C)15 (D)20 (E)-10

4. Suppose the electric field in some region is found to be $E=kr^3\hat{r}$, in spherical coordinates (k is a constant). Find the charge density ρ (A)$\varepsilon_0 kr^2$ (B) $2\varepsilon_0 kr^2$ (C) $3\varepsilon_0 kr^2$ (D) $4\varepsilon_0 kr^2$ (E) $5\varepsilon_0 kr^2$

5. Which one of the electrostatic field is possible (A)(xy, yz, 3zx) (B)(y^2, 2xy+x^2, 2yz) (C)(2xy, -2yx, 3zx) (D) (3x, y, $2z^2$) (E) (xz, 3y, yz)

6. Find the energy of a uniformly charged spherical shell of total charge q and radius R (A)$\frac{q^2}{\pi\varepsilon_0 R}$ (B) $\frac{q^2}{2\pi\varepsilon_0 R}$ (C) $\frac{2q^2}{\pi\varepsilon_0 R}$ (D) $\frac{q^2}{8\pi\varepsilon_0 R}$ (E) $\frac{3q^2}{4\pi\varepsilon_0 R}$

7. Find the electric field produced by a uniformly polarized (P) sphere of radius R (A)$\frac{P}{\varepsilon_0}$ (B) $\frac{4\pi P}{3\varepsilon_0}$ (C) $\frac{-P}{3\varepsilon_0}$ (D) $\frac{4\pi P}{\varepsilon_0}$ (E) $\frac{-4\pi P}{3\varepsilon_0}$

8. A sphere of radius R carries a polarization P(r)=kr, k is a constant and r is the vector from the center. Calculate the bound volume charge density (A)k (B)-k (C)3k (D)-3k (E)0

9. A sphere of radius R carries a polarization P(r)=kr, k is a constant and r is the vector from the center. Calculate the electric field at r < R (A) $\frac{kr}{4\varepsilon_0}$ (B) $\frac{kr}{\varepsilon_0}$ (C) $\frac{-kr}{4\varepsilon_0}$ (D) $\frac{-kr}{\varepsilon_0}$ (E)0

10. A capacitor is filled with linear dielectric, and the capacitance is C. The voltage difference is V. Calculate the charge energy (A) $\frac{CV^2}{2}$ (B) $\frac{CV^2}{4}$ (C) CV^2 (D) $\frac{CV^2}{4\pi}$ (E)0

11. Find the magnetic field a distance s from a long straight wire carrying a steady current I (A)0 (B) $\frac{\mu_0 I}{s}$ (C) $\frac{\mu_0 I}{2\pi s}$ (D) $\frac{3\mu_0 I}{4\pi s}$ (E) $\frac{\mu_0 I}{4\pi s}$

12. An infinitely long cylinder, of radius R, caries a frozen-in magnetization, parallel to the axis, $M=ks\hat{z}$, where is a constant and s is the distance from the axis; there is no free current anywhere. Find the magnetic field inside the cylinder (A)0 (B) $\mu_0 ks$ (C) $2\pi\mu_0 ks$ (D) $2\mu_0 ks$ (E) $4\pi\mu_0 ks$

13. An infinitely long cylinder, of radius R, caries a frozen-in magnetization,

背面有題，請繼續作答。

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	D13
		科目碼	D1391
※本項考試依簡章規定各考科均「不可以」使用計算機		本試題共計	2 頁

parallel to the axis, $M = ks\hat{z}$, where is a constant and s is the distance from the axis; there is no free current anywhere. Find the magnetic field outside the cylinder (A)0 (B) $\mu_0 ks$ (C) $2\pi\mu_0 ks$ (D) $2\mu_0 ks$ (E) $4\pi\mu_0 ks$

14. A capacitor C has been charged up to potential V; at time t=0, it is connected to a resistor R, and begin to discharge. What is the discharge time constant (A)R/C (B)C/R (C)RC (D)1/RC (E)3RC

15. A battery of emf V and internal resistance r is hooked up to a variable load resstance, R. If you want to deliver the maximum possible power to the load, what resistance R should you choose? (A)r (B)r/2 (C)1/r (D)2/r (E)2r

16. A capacitor C is charge up to a voltage V and connected to an inductor L in series. What is the discharge time constant? (A)LC (B) $\sqrt{LC}$ (C) $\frac{1}{\sqrt{LC}}$ (D) $\frac{1}{LC}$ (E) $\sqrt{3}LC$

17. The electromagnetic wave velocity in vacuum is (A) $\mu_0\varepsilon_0$ (B) $\frac{1}{\mu_0\varepsilon_0}$ (C) $\sqrt{\mu_0\varepsilon_0}$ (D) $\frac{1}{\sqrt{\mu_0\varepsilon_0}}$ (E) $\mu\varepsilon$

18. The energy per unit time, per unit area, transported by the electromagntic field is (A) $\frac{\mu_0}{\varepsilon_0}(\vec{E}\times\vec{B})$ (B) $\varepsilon_0(\vec{E}\times\vec{B})$ (C) $\frac{\varepsilon_0}{\mu_0}(\vec{E}\times\vec{B})$ (D) $\frac{1}{\mu_0}(\vec{E}\times\vec{B})$ (E) $(\vec{E}\times\vec{B})$

19. The momentum per unit time, per unit area, transported by the electromagntic field is (A) $\frac{\mu_0}{\varepsilon_0}(\vec{E}\times\vec{B})$ (B) $\varepsilon_0(\vec{E}\times\vec{B})$ (C) $\frac{\varepsilon_0}{\mu_0}(\vec{E}\times\vec{B})$ (D) $\frac{1}{\mu_0}(\vec{E}\times\vec{B})$ (E) $(\vec{E}\times\vec{B})$

20. Electromagnetic wave in vacuum, the electric field is E, magnetic field is B, and the speed is C. Which one is correct? (A) $E = B$ (B) $E = CB$ (C) $CE = B$ (D) $C^2E = B$ (E) $E = C^2B$