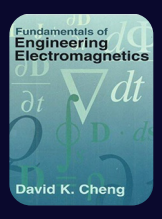
練習1

第4章，第154頁



Fundamentals of Engineering Electromagnetics

ISBN：9780201566116

目錄

解答 已驗證 2年前提供

步驟1

步驟1 / 3

(a)

- Calculating the value of the electric intensity,

$$E = \frac{J}{\sigma}$$

$$= \frac{7 \times 10^{6}}{5.8 \times 10^{7}}$$

$$= 0.121 \text{ V/m}$$

- Thus,

$$\boxed{E = 0.121 \text{ V/m}}$$

步驟2

步驟2 / 3

(b)

- Calculating the electron drift velocity as shown,

$$u_e = -\mu_e E$$

$$= -3.2 \times 10^{-3} \times 0.121$$

$$= 3.872 \times 10^{-4} \text{m/s}$$

- Thus,

$$\boxed{u_e = 3.872 \times 10^{-4} \text{m/s}}$$

結果

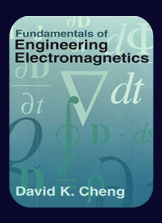
步驟3 / 3

$(a)\ E = 0.121 \text{ V/m}$

$(b)\ u_e = 3.872 \times 10^{-4} \text{m/s}$

練習2

第4章，第156頁



Fundamentals of Engineering Electromagnetics

ISBN：9780201566116

目錄

解答 已驗證 2年前提供

步驟1

步驟1 / 4

- Calculating the overall resistance,

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$= \frac{1}{1} + \frac{1}{2} + \frac{1}{4}$$

$$= 1.75$$

步驟2

步驟2 / 4

- Rearranging,

$$R = \frac{1}{1.75}$$

$$= 0.571\ \mathrm{M\Omega}$$

- Thus,

$$\boxed{R = 0.571\ \mathrm{M\Omega}}$$

步驟3

步驟3 / 4

- Calculating the overall conductance as shown,

$$G = \frac{1}{R}$$

$$= 1.75\ \mu\mathrm{S}$$

- Thus,

$$\boxed{G = 1.75\ \mu\mathrm{S}}$$

結果

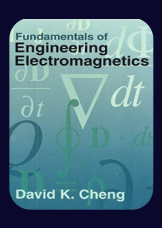
步驟4 / 4

$$R = 0.571\ \mathrm{M\Omega}$$

$$G = 1.75\ \mu\mathrm{S}$$

練習3

第4章，第159頁



Fundamentals of Engineering Electromagnetics

ISBN：9780201566116

目錄

解答 已驗證 2年前提供

步驟1

步驟1 / 5

(a)

- Calculating the value of the relaxation time,

$$\tau = \frac{\epsilon}{\sigma}$$

$$= \frac{\epsilon_0 \epsilon_r}{\sigma}$$

$$= \frac{8.85 \times 10^{-12} \times 3}{10^{-15}}$$

$$= 26550 \text{ s}$$

步驟2

步驟2 / 5

- Therefore,

$$\tau = \frac{26550}{3600}$$

$$= 7.375 \text{ h}$$

- Thus,

$$\boxed{\tau = 7.375 \text{ h}}$$

步驟3

步驟3 / 5

(b)

- Calculating the time required for a charge decay to 1% of its value using the following expression,

$$\rho_v = rho_0 e^{-\frac{\sigma}{\epsilon}\tau}$$

步驟4

步驟4 / 5

- Rearranging,

$$\frac{\rho_v}{rho_0} = e^{-\frac{\sigma}{\epsilon}\tau}$$

$$0.01 = e^{-\frac{10^{-15}}{8.85 \times 10^{-12} \times 3}\tau}$$

$$\ln(0.01) = e^{-\frac{1}{26550}\tau}$$

$$-4.6 = -\frac{1}{26550}\tau$$

$$\tau = 122130 \text{ s}$$

$$\tau = 33.925 \text{ h}$$

- Thus,

$$\boxed{\tau = 33.925 \text{ h}}$$

結果

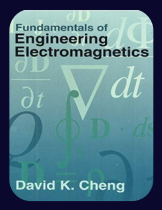
步驟5 / 5

$$\tau = 7.375 \text{ h}$$

$$\tau = 33.925 \text{ h}$$

練習4

第4章，第161頁



Fundamentals of Engineering Electromagnetics

ISBN：9780201566116

目錄

解答 已驗證 2年前提供

步驟1

步驟1 / 2

- Considering the following relation,

$$\frac{J_1}{J_2} = \frac{\sigma_1}{\sigma_2}$$

- Therefore, calculating the value of J_2,

$$J_2 = J_1 \times \frac{\sigma_2}{\sigma_1}$$

$$= 10(a_y 3 + a_z 4) \times \frac{2\sigma_1}{\sigma_1}$$

$$= 20(a_y 3 + a_z 4)$$

- Thus,

$$\boxed{J_2 = 20(a_y 3 + a_z 4)}$$

結果

步驟2 / 2

$$J_2 = 20(a_y 3 + a_z 4)$$