

晶片二甲

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黃家輝

$$1-6: R = P \frac{\rho}{A} = 1.7 \times 10^{-8} \times \frac{1.1 \times 10^{-3}}{1.5 \times 10^{-6}} = 1.24 \times 10^{-2} \Omega$$

$$1-7: \frac{V_1}{3} = \frac{V_1}{6} + \frac{V_1 + 1}{2} \quad 12 - 2V_1 = V_1 + 3V_1 - 3V_1 \quad -6V_1 + 3V_1 = -12$$

$$\frac{V_1 - V_2}{2} = \frac{V_1 - 12}{8} + \frac{V_2}{8} \quad 4V_1 - 4V_2 = V_1 - 12 + V_2 \quad 3V_1 - 5V_2 = -12$$

$$\begin{cases} -6V_1 + 3V_2 = -12 \\ 4V_1 - 5V_2 = -12 \end{cases}$$

$$\text{① } -12V_1 + 6V_2 = -24$$

$$-8V_1 = -36 \therefore V_1 = 4.5 \quad V_2 = 1.8 \text{ V}$$

$$1-11: S \text{ 常閉接點} \Rightarrow 4 \Omega \text{ 支路短路} \therefore I = 0 \text{ A}$$

$$1-12: 2I_1 - 10I_2 - 10I_3 = 15$$

$$-10I_1 + 70I_2 - I_3 = 10$$

$$-10I_1 - I_2 + 20I_3 = -10$$

$$\therefore G_{11} + G_{21} + G_{31} = 2 + 20 + 20 = 6 \text{ S}$$

$$1-15: V_{2(x)}: \begin{array}{c} \text{Circuit diagram showing a voltage source } V_1 \text{ in series with a } 2 \Omega \text{ resistor, connected to a } 2 \Omega \text{ resistor and a } 4 \Omega \text{ resistor in parallel.} \end{array}$$

$$V_1 \times \frac{2}{2+2} \times \frac{2}{4} = V_1 \times \frac{2}{4} \times \frac{2}{4} = V_1 \times \frac{1}{4} \times \frac{2}{4} = \frac{V_1}{8}$$

$$V_{1(x)}: \begin{array}{c} \text{Circuit diagram showing a voltage source } V_2 \text{ in series with a } 2 \Omega \text{ resistor, connected to a } 2 \Omega \text{ resistor and a } 4 \Omega \text{ resistor in parallel.} \end{array}$$

$$V_2 \times \frac{2}{4} = \frac{1}{2}$$

$$a + b = \frac{3}{4} \text{ A}$$

$$1-18: V \times \frac{2}{12} = 9 \quad V = \frac{54}{2} = 27 \quad I_1 = \frac{9}{3}$$

$$I_2 = \frac{15}{20} = \frac{3}{4} \quad I = \frac{3}{3} + \frac{3}{4} = \frac{7}{4} = 1.75 \text{ A}$$

$$1-19: \begin{array}{c} \text{Circuit diagram showing a } 4 \text{ A current source in parallel with a } 2 \Omega \text{ resistor, connected to a } 6 \Omega \text{ resistor and a } 4 \Omega \text{ resistor in parallel.} \end{array}$$

$$4 \times \frac{5}{10} = 2 \text{ A}$$

$$1-20: (6 \parallel 3) + (6 \parallel 2) = 2 + 4 = 6 \quad I_1 = 9 \text{ A}$$

$$6:3=1:2 \quad V=21 \times 9 \quad V=3 \quad I_6=3 \text{ A} \quad I_3=6 \text{ A} \therefore I=3 \text{ A}$$

1-22:  $75 = \frac{100C_1}{C_1+C_2} - 15C_1 = 25C_1, C_1 = \frac{1}{3} C_2 = 11 \mu F \#$

1-23:  $Q_T = C_1 V_1 + C_2 V_2 = (C_1 + C_2) V \Rightarrow V = \frac{2 \times 1 + 1 \times 2}{2+1} = \frac{4}{3} \#$

1-27:  $\tau = RC = 30 \times 10^{-6} = 3 \times 10^{-5} \#$

$V_c(t) = V_{c0} \times e^{-\frac{t}{\tau}} = 5 \times 10^{-3} e^{-\frac{t}{3 \times 10^{-5}}} \#$

$i_c(t) = -i_c(t) = -C \frac{dV_c(t)}{dt} = -\frac{1.5}{3} \times 10^{-6} \times 5 e^{-\frac{t}{3 \times 10^{-5}}} = \frac{1}{6} e^{-\frac{t}{3 \times 10^{-5}}} \#$

$V_c(t = 3 \times 10^{-5}) = 5 \times e^{-1} = 5 \times e^{-1} \#$

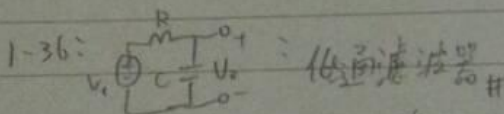
1-32:  $\tau = RC = [(0.5/11) + 4] \times 10^3 + 10^6 = 10^6, V_c = 0 \#$

$V_c(t \rightarrow \infty) = 4 \times \frac{10}{15+10} = 16V \#$

$\Rightarrow V_c(t) = (0-16)e^{-\frac{t}{10^6}} + 16 = 16(1 - e^{-\frac{t}{10^6}}) V_{eff} \#$

1-35:  $Z = R // (-jX_c) = \frac{R \times (-jX_c)}{R - jX_c} = \frac{-j2500}{12 - j50} = \frac{2500 \angle -90^\circ}{53.2 \angle -45^\circ} = \frac{47 \angle -45^\circ}{\sqrt{2}} \#$

$\Rightarrow I = \frac{V}{Z} = \frac{100 \angle 0^\circ}{\frac{47 \angle -45^\circ}{\sqrt{2}}} = \frac{100 \sqrt{2} \angle 45^\circ}{47} = 4 \angle 45^\circ \#$



$S_P = \frac{W_P}{\tau} = \frac{1}{\pi RC} = \frac{10^6}{\pi \times 2200 \times 10} = 497.3 \approx 500 Hz \#$

$\downarrow B = -3 \#$

3-1: 若以能帶來論, 在OK時導電帶中的能態則是全空而無自由電子

價電帶的能態被完全填滿而無空穴, 故無法導電

若以共價鍵來論, 在OK時所有的價電子均被拘束於共價鍵中

而無法挣脱與物外, 故不能導電

3-11: 導物電流是因為電位不均而有電場存在所產生的

極弱電流則是因為載子濃度不均所造成的

霍耳效應, Hall effect 在一半導性材料, 在x軸施加電壓, 在y軸

一電流I在z軸一磁場B, 所以會產生y軸電壓  $V_H$