

不能导电。在0K时半导体所能容纳自由电子，若以价电带来论。电子都被填满而不能导电，故无法导电。

从共价键来论，0K时所有的价电子都被共价键拘束，而无法移动，故不能导电。

硅半导体的材料，导电性会因温度上升而增加。

费米能级 E_f 是指电子出现的几率为 50% 的能级。

半导体的载子导电自由电子和电子洞。

$$1.6 \times 10^{-19} \times n \times (m_{11} + m_p)$$

$$1.6 \times 10^{-19} \times 1.45 \times 10^{18} \times (1.500 + 1.50)$$

$$P = \frac{1}{6} = 2.2 \times 10^4$$

漂移电流：电荷不均而由电场所产生的。

扩散电流：载子浓度不均所产生的。

外质半导体又称掺杂半导体，是掺入了杂质物的半导体。

即在本质半导体中入了掺杂物，使其电学性质较

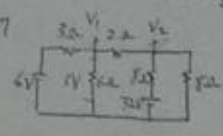
本质半导体发生了改变。

1-6

$$R = \rho \times \frac{L}{A^2}$$

$$R = 1.723 \times 10^{-8} \times \frac{30}{\pi \left(\frac{0.3 \times 10^{-3}}{2} \right)^2} = 0.4127 \Omega$$

1-7

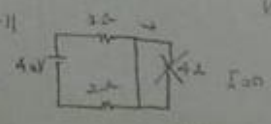


$$\begin{cases} \frac{V_1 - 6}{3} + \frac{V_1}{6} + \frac{V_1 - V_2}{2} = 0 \\ \frac{V_2 - 32}{7} + \frac{V_2}{8} + \frac{V_2 - V_1}{2} = 0 \end{cases}$$

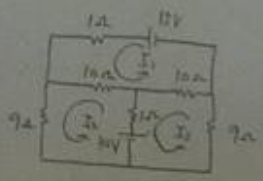
$$\begin{cases} 2V_1 - 12 + V_1 + 2V_1 - 3V_2 = 0 \\ V_2 - 32 + V_2 + 4V_2 - 4V_1 = 0 \end{cases}$$

$$\begin{cases} 6V_1 - 3V_2 = 12 \\ -4V_1 + 6V_2 = 32 \\ 12V_1 - 6V_2 = 24 \\ 8V_1 = 56 \\ V_1 = 7 \\ V_2 = 10 \end{cases}$$

1-11

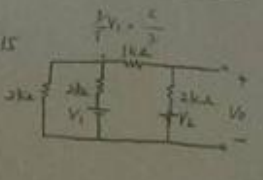


1-12



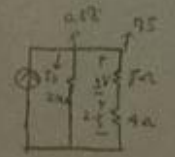
$$\begin{cases} 21I_1 - 10I_2 - 10I_3 = 12 \\ -10I_1 + 20I_2 - I_3 = 10 \\ -10I_1 - I_2 + 20I_3 = 10 \end{cases}$$

1-15



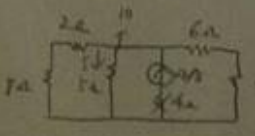
$$\begin{aligned} V_0 &= v_1 + v_2 \\ \frac{V_1}{2} &= \frac{V_2}{2} \times \frac{2}{8} \\ \frac{1}{2} + \frac{1}{2} + \frac{1}{8} &= \frac{2V_1}{8} \\ 2/2 &= 1 \\ \frac{1}{2} V_2 &= \frac{1}{4} V_1 \end{aligned}$$

1-17



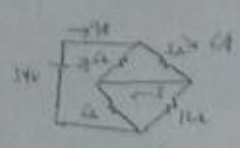
$$\begin{aligned} \frac{I}{4} &= 0.625 \\ 0.625 \times 4 &= 2.5 \\ 7.5 \div 20 &= 0.375 \\ 0.375 + 0.625 &= 1A \end{aligned}$$

1-19



$$\begin{aligned} \frac{4}{\frac{1}{10} + \frac{1}{5} + \frac{1}{10}} \\ 4 \times \frac{10}{4} &= 10 \\ 10 \div 5 &= 2 \end{aligned}$$

1-20



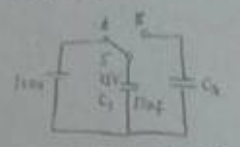
$$(60I) + (40I) = 6A$$

$$\frac{I}{10} + \frac{I}{10} = 6$$

$$9 \times \frac{I}{9} = 6$$

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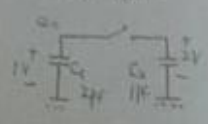
1-22



$$25 \times 13A = 10 \times C_1$$

$$C_1 = 11 \mu F$$

1-23

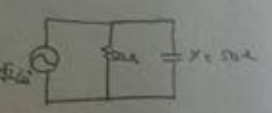


$$\begin{aligned} 2 \times 1 + 2 \times 1 &= 3 \times V \\ V &= \frac{4}{3} \end{aligned}$$

1-27

$$\begin{aligned} (v) RC &= 30 \times 10^{-3} \text{ sec} = 30 \times 10^{-3} \text{ sec} \\ V(t) &= V_0 \times e^{-t/RC} = 5 \times e^{-t/30} \\ \Rightarrow 20 &= 5 \times e^{-t/30} \\ V(t) &= 5 \times e^{-t/30} \end{aligned}$$

1-31



$$f = \frac{10\sqrt{2} \angle 45^\circ}{50\sqrt{2} \angle 45^\circ}$$

1-36

$$f = 20 \times \frac{1}{RC} = 20 \frac{L}{R}$$

$$f = \frac{1}{20 \times 10 \times 10^{-6}} = 50 \text{ Hz}$$