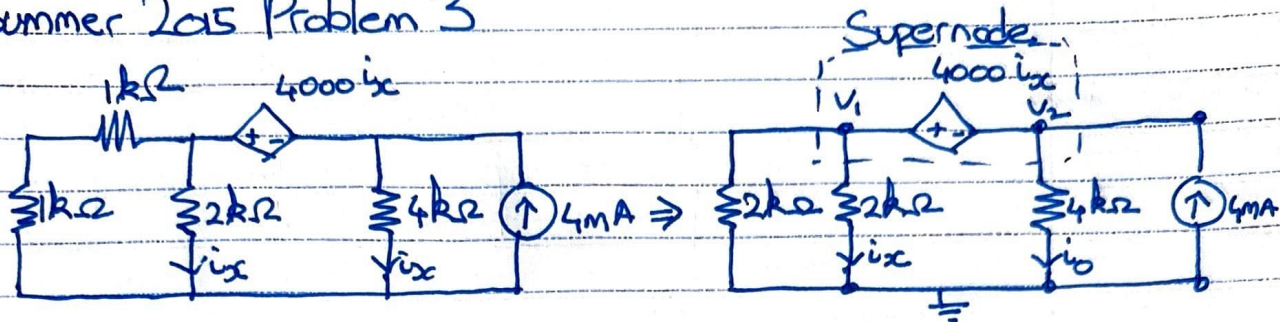


Summer 2015 Problem 3



At Supernode, apply KCL:

$$\frac{-v_1}{2k\Omega} + \frac{-v_1}{2k\Omega} + \frac{-v_2}{4k\Omega} + 4mA = 0$$

Convert in terms of i_x, i_o ($i_x = \frac{v_1}{2k\Omega}, i_o = \frac{v_2}{4k\Omega}$)

$$-2i_x - i_o = -4mA$$

$$\Rightarrow 2i_x + i_o = 4mA \quad \text{--- (1)}$$

Potential across CCVS: $4000i_x = v_1 - v_2$

Convert v_1 & v_2 to i_x, i_o

$$i_x = \frac{v_1}{2k\Omega} \Rightarrow v_1 = i_x \cdot 2k\Omega \quad \left| \quad i_o = \frac{v_2}{4k\Omega} \Rightarrow v_2 = i_o \cdot 4k\Omega \right.$$

$$\therefore 4000i_x = i_x \cdot 2000 - i_o \cdot 4000$$

$$\Rightarrow 2000i_x + 4000i_o = 0 \Rightarrow 2i_x + 4i_o = 0 \quad \text{--- (2)}$$

Solve: (2) - (1) $\Rightarrow 3i_o = 4mA \Rightarrow \boxed{i_o = \frac{4}{3}mA}$

$$i_x = -2i_o = -\frac{8}{3}mA$$