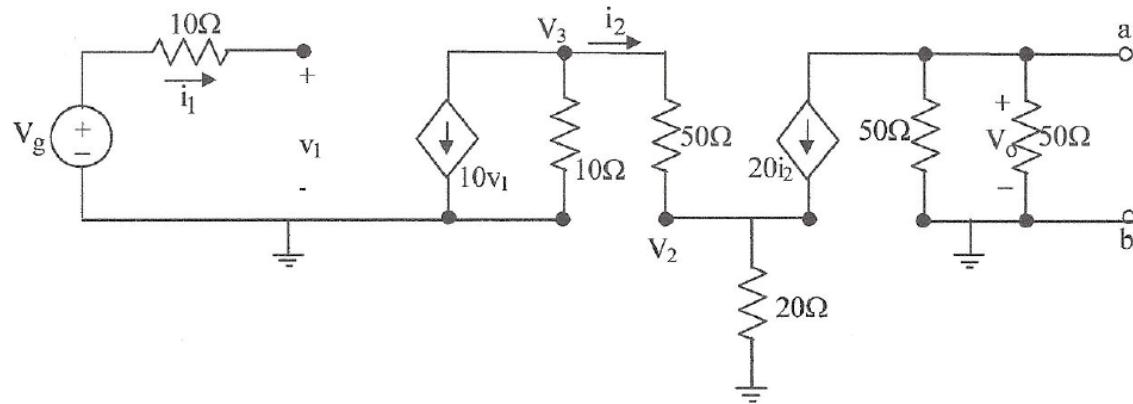
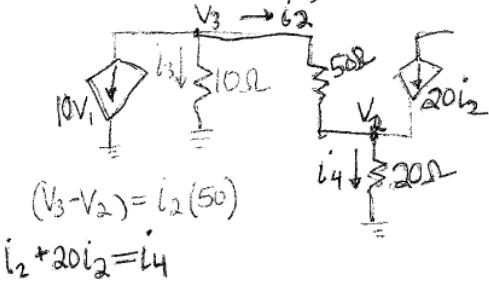


1. Given $V_g = 10\text{mV}$, find V_o . Find the Thevenin equivalent between terminals a-b.



$$V_o = -20i_2(50 \parallel 50) = -20i_2(25)$$



$$i_2 + 20i_2 = i_4$$

$$V_4 = i_4(20) = 2i_2(20)$$

$$V_3 = i_3(10)$$

$$10V_1 + i_3 + i_2 = 0$$

$$i_3 = -10V_1 - i_2$$

$$\therefore V_3 = -10(10)V_1 - 10i_2$$

$$i_2 = \frac{V_3 - V_2}{50} = \frac{-10(10V_1 + i_2) - 2i_2(20)}{50}$$

$$\frac{50}{50}i_2 + \frac{10}{50}i_2 + \frac{2i_2(20)}{50}i_2 = -\frac{10(10V_1)}{50}$$

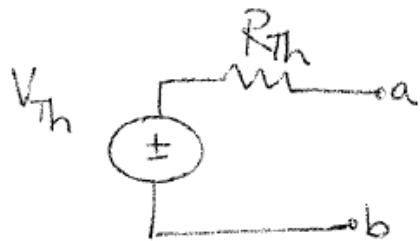
$$i_2 = -0.208V_1$$

$$V_1 = V_g$$

$$\therefore V_o = -20(25)(-0.208)(10\text{mV})$$

$$\Rightarrow V_o = 1.04 \text{ V}$$

(cont.)



$V_{Th} = V_o$ (open-circuit voltage between a & b)

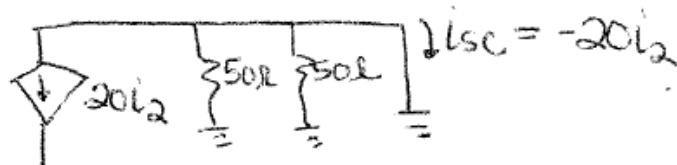
{Note that this is true since no current flows through R_{Th} when a to b is left open}

R_{Th} can be found by shorting a to b and leaving V_{Th} ⇒

$$R_{Th} = \frac{V_{Th}}{I_{SC}}$$

A circuit diagram for calculating R_{Th} . A voltage source V_{Th} with a polarity sign is connected between terminals a and b. The terminals are shorted (a is connected to b), forming a closed loop. The current flowing through this loop is labeled I_{SC} .

$I_{SC} \Rightarrow$



V_{Th} (in terms of i_2) = $V_o = -20i_2 (50||50)$

$$\therefore R_{Th} = \frac{-20i_2 (25)}{-20i_2} = 25\Omega$$