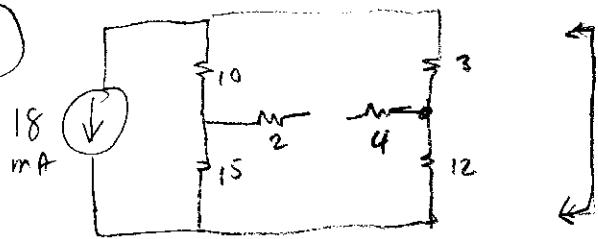


3.10



$$R_{load} = 9.375 \text{ K}$$

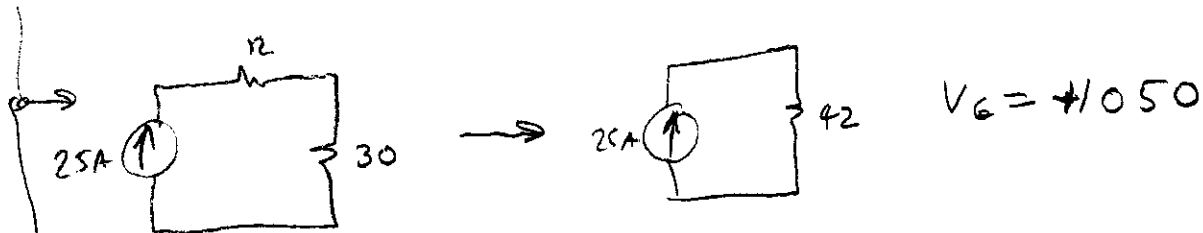
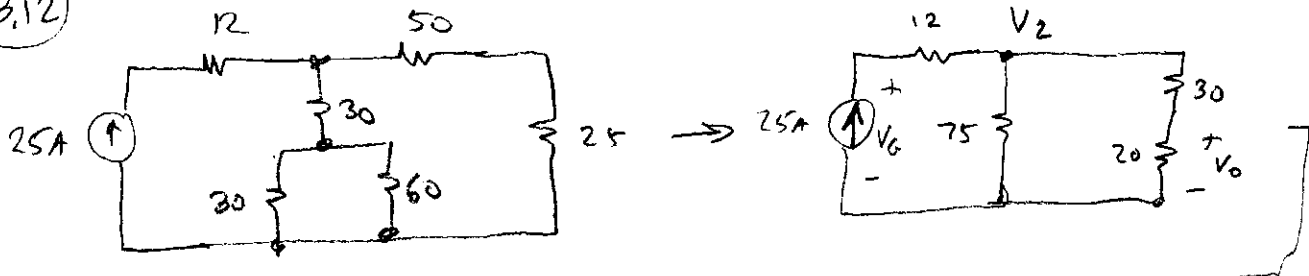
$$V_{source} = 168.75$$

$$V_+ = 101.25$$

$$V_- = 135$$

$$V_o = 101.25 - 135 = -33.75$$

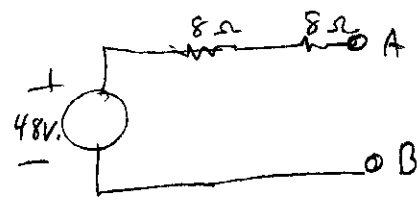
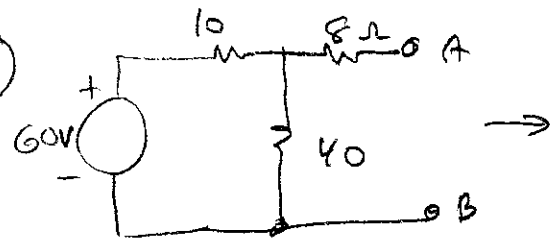
3.12



$$V_2 = (1050) \frac{30}{42} = 750$$

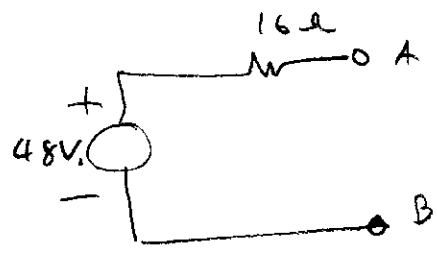
$$V_o = (750) \frac{20}{50} = 300$$

4-56

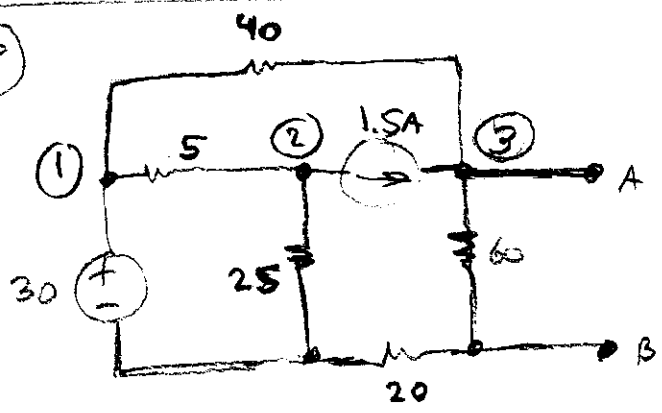


$$V = 60 \frac{40}{50} = 48$$

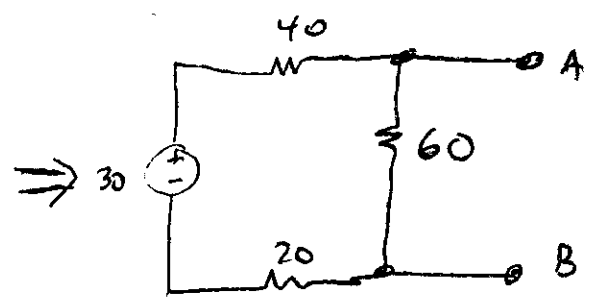
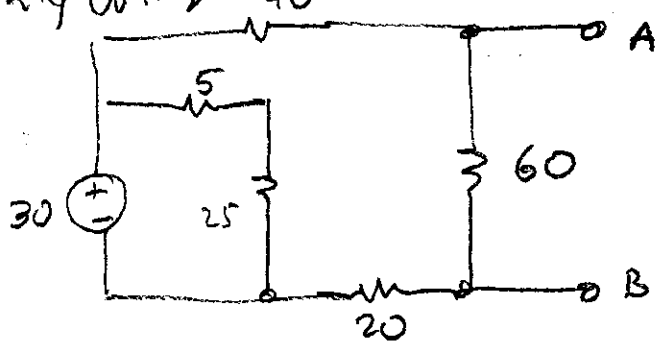
$$R = \frac{1}{\frac{1}{10} + \frac{1}{40}} = 8$$



58



Superposition i  
only voltage source



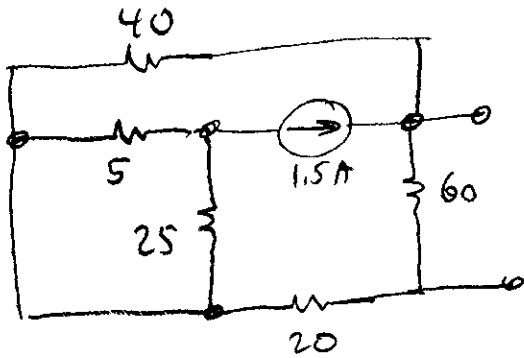
$$V_{oc} = 30 \frac{60}{60 + 40 + 20} = 15 \text{ V}$$

$$I_{sc} = \frac{V_s}{R} = \frac{30}{60} = 0.5 \text{ A}$$

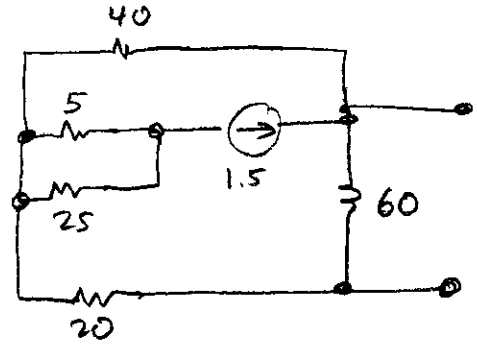
$$R_{eq} = \frac{1}{\frac{1}{60} + \frac{1}{40 + 20}} = 30$$

58 continued

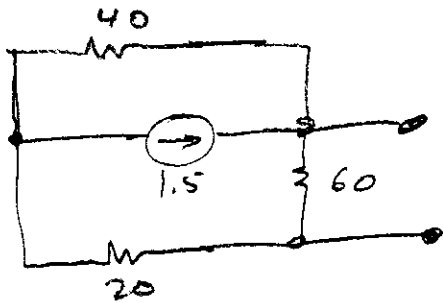
Only current source



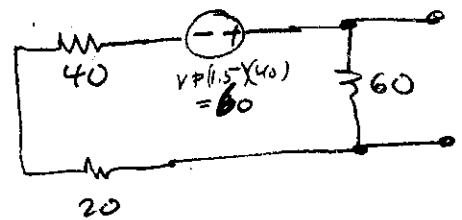
⇒



⇒



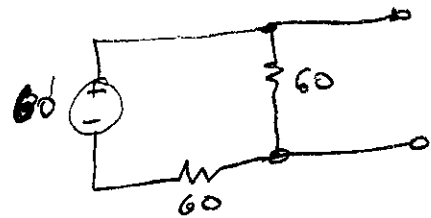
⇒



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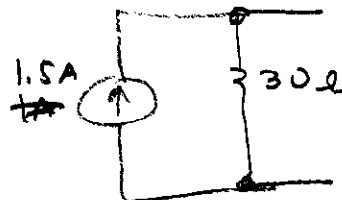
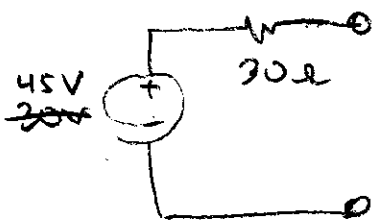
$$V = 60 \left( \frac{60}{110} \right) = \cancel{18} 30$$

$$I_{sc} = \frac{60}{60} = \cancel{5} 1 \text{ A}$$

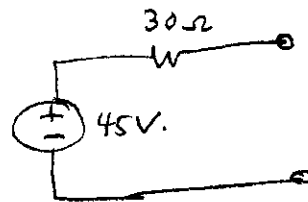
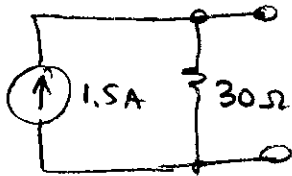
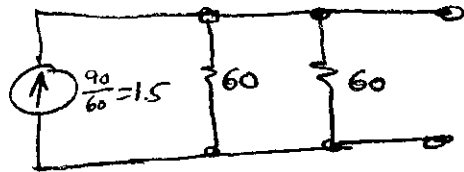
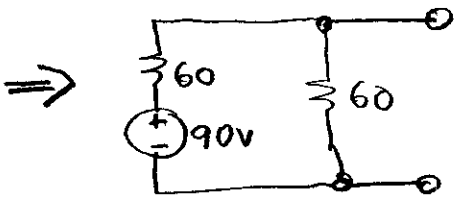
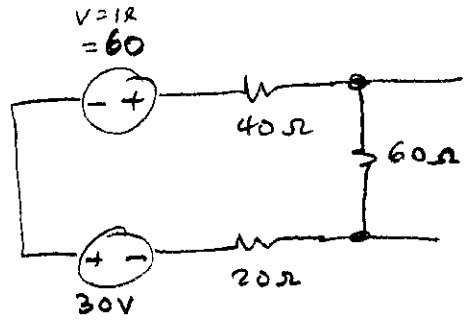
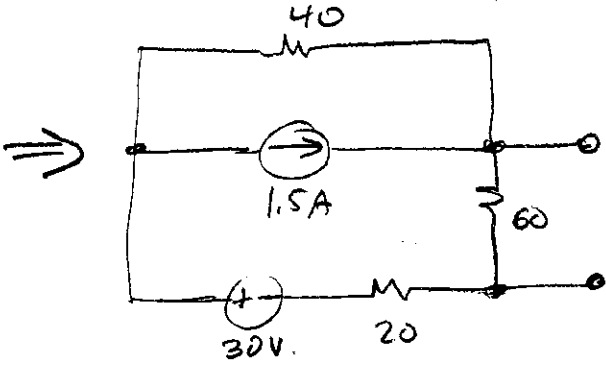
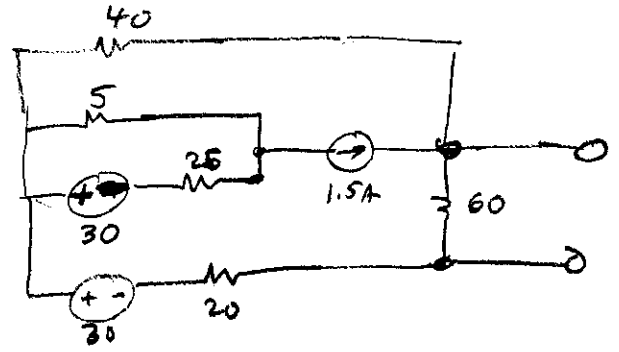
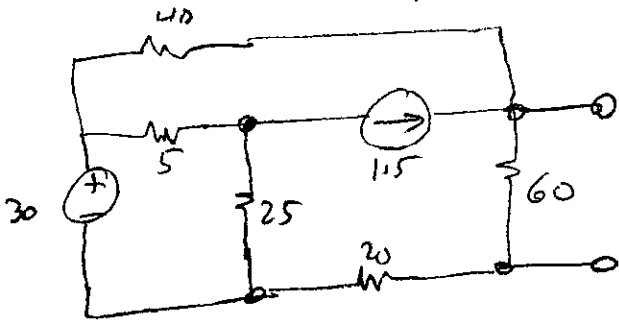
$$R_{EQ} = \frac{15}{5} = \cancel{3} 30$$

$$\frac{30}{1} = 30$$

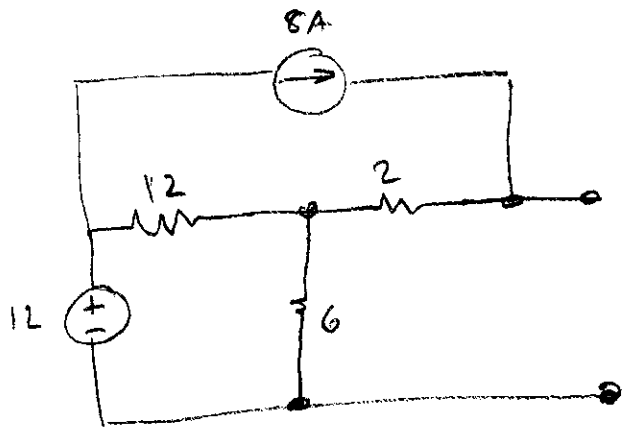
Total:  $V = \cancel{30} \text{ V}, 45 \text{ V},$   
 $I = \cancel{1} \text{ A}, 1.5 \text{ A}$   
 $R = 30 \Omega$



58 - alt -- by series & parallel, etc.

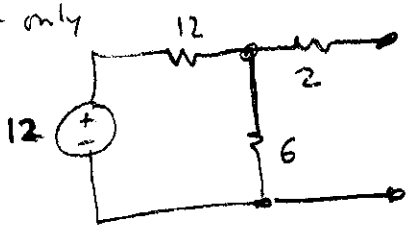


59

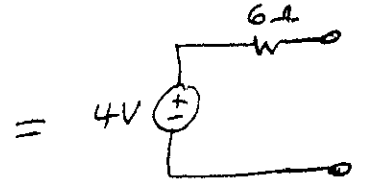
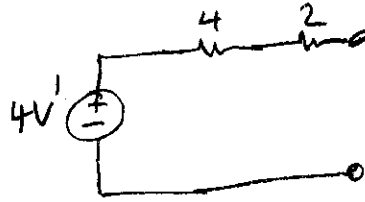


Superposition:

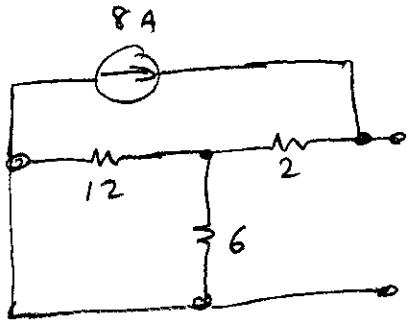
Volt only



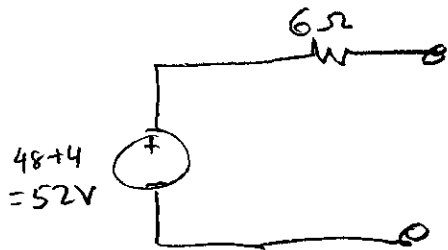
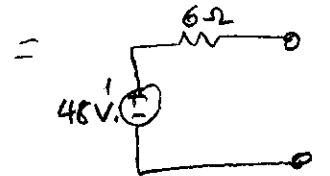
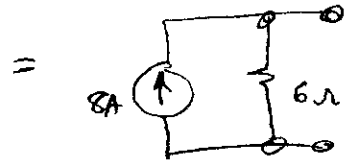
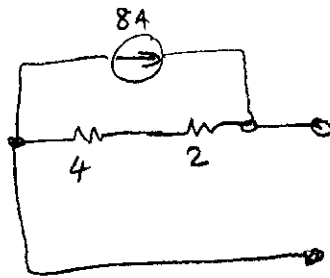
⇒



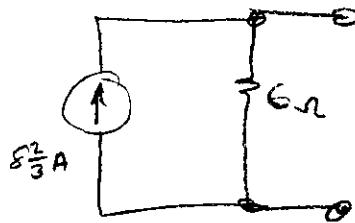
Curr



⇒

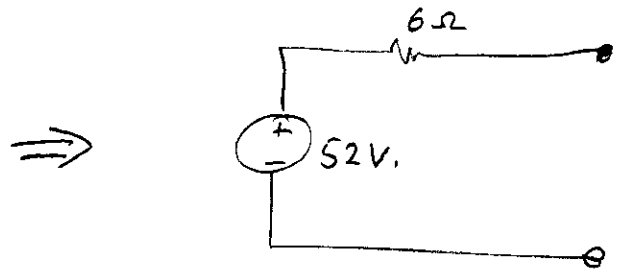
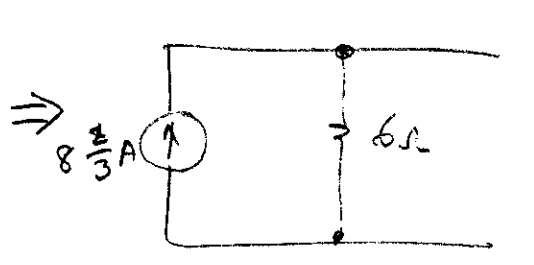
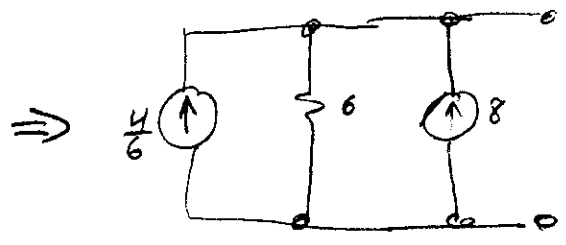
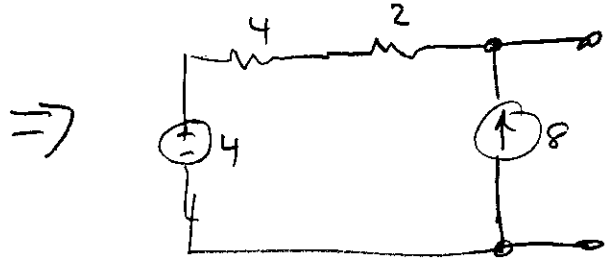
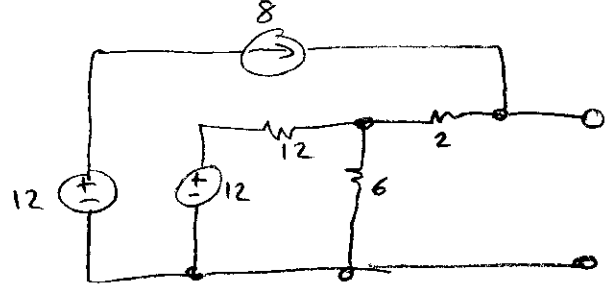
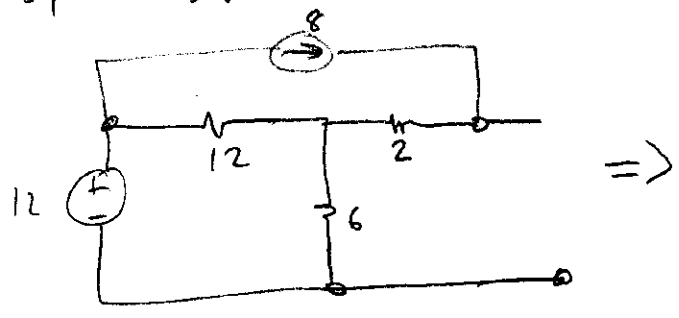


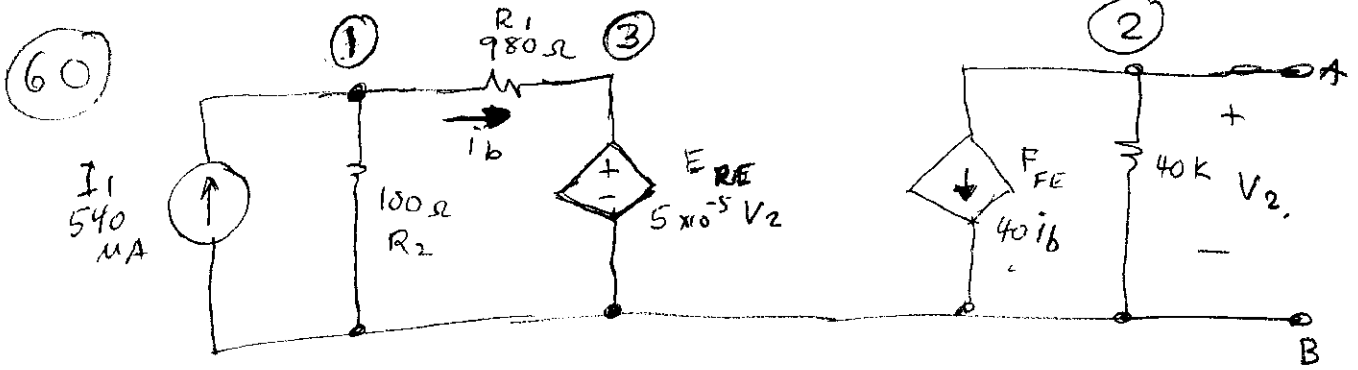
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59

By transformations only





Open circuit:

$$\begin{aligned} \textcircled{3} \quad V_3 &= 5 \times 10^{-5} V_2 \\ \textcircled{2} \quad \frac{V_2}{40k} + 40 i_b &= 0 \\ \textcircled{1} \quad \frac{V_1}{100} - 540 \mu A + i_b &= 0 \\ i_b &= \frac{V_1 - V_3}{980} \end{aligned}$$

Too much work.

~~$$\begin{aligned} \textcircled{1} \quad \frac{V_1}{100} - 540 \mu A + \frac{V_1 - V_3}{980} &= 0 \\ \textcircled{2} \quad \frac{V_2}{40k} + 40 \frac{V_1 - V_3}{980} &= 0 \end{aligned}$$~~

$$\begin{aligned} i_b &= \frac{V_1 - 5 \times 10^{-5} V_2}{980} \\ i_b &= \frac{V_1}{980} - \frac{V_2}{19.6 \times 10^6} \end{aligned}$$

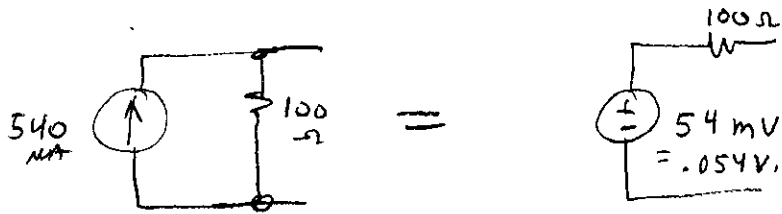
$$\textcircled{1} \quad \frac{V_1}{100} - 540 \times 10^{-6} + \frac{V_1}{980} - \frac{V_2}{19.6 \times 10^6} = 0$$

$$\textcircled{2} \quad \frac{V_2}{40 \times 10^3} + \frac{40}{980} V_1 - \frac{40}{19.6 \times 10^6} V_2 = 0$$

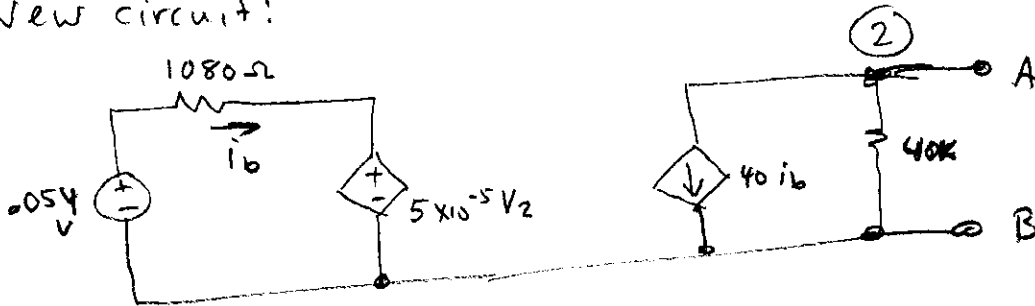
$$\textcircled{1} \quad V_1 (0.01102) + V_2 (-51.02 \times 10^{-9}) - 540 \times 10^{-6} = 0$$

$$\textcircled{2} \quad V_1 (-0.0482) + V_2 (25 \times 10^{-6} - 51.02 \times 10^{-9}) - 540 \times 10^{-6} = 0$$

60) Alternate approach -  
Thevenin equivalent of input -



New circuit:



$$i_b = \frac{0.054 - 5 \times 10^{-5} V_2}{1080}$$

$$\textcircled{2} \quad \frac{V_2}{40000} + 40 i_b = 0$$

$$\frac{V_2}{40000} + 40 \left( \frac{0.054 - 5 \times 10^{-5} V_2}{1080} \right) = 0$$

$$V_2 (25 \times 10^{-6}) + 2 \times 10^{-3} + V_2 (-1.852 \times 10^{-6}) = 0$$

$$V_2 (23.15 \times 10^{-6}) + 2 \times 10^{-3} = 0$$

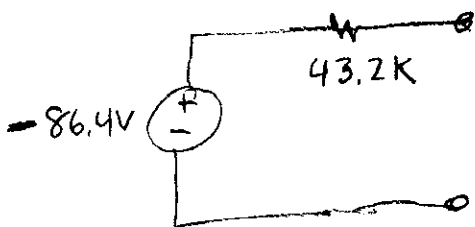
$$V_2 = \frac{-2 \times 10^{-3}}{23.15 \times 10^{-6}} = -86.4$$

short ckt.

$$I_{sc} = -40 i_b \Big|_{V_2=0}$$

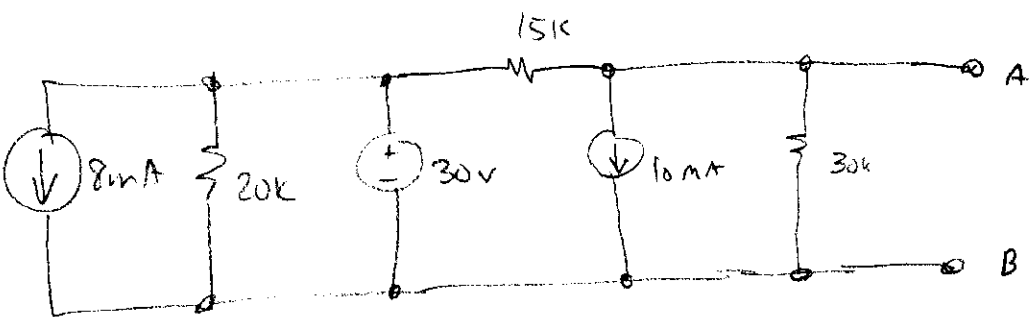
$$i_b = \frac{0.054}{1080} = 50 \mu\text{A}$$

$$= -(40)(50 \mu\text{A}) = 2 \text{ mA}$$





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↓

