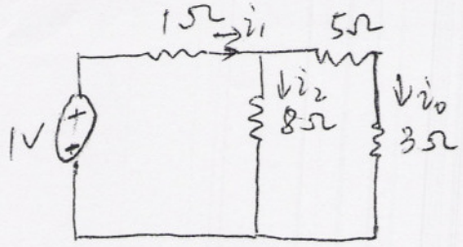
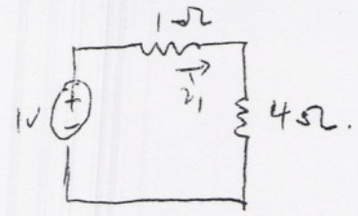
Ch4

1.



$i_0' = i_1' - i_2'$

$\boxed{i_0' = 0.1A}$



$i_1' = \frac{1}{5} = 0.2A$

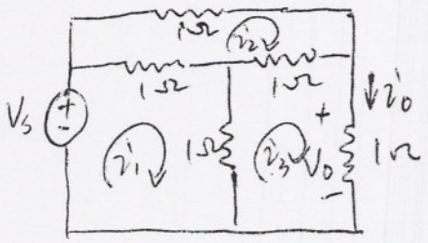
$i_2' = 0.1A$

linear: 10V → $\boxed{i_0' = 1A}$

2. $i_{2\Omega}' = 0.25A$, $V_0 = 2(0.25) = \boxed{0.5V}$

Linear, 1mA $V_0 = \boxed{0.5mV}$

3. (a)



$$\begin{cases} 1 + 2i_1' - i_2' - i_3' = 0 \\ -i_1' - i_2' + 3i_3' = 0 \\ -i_1' + 3i_2' - i_3' = 0 \end{cases} \Rightarrow \begin{cases} i_1' = 1A \\ i_2' = -1.5A \\ i_3' = 0.5A \end{cases}$$

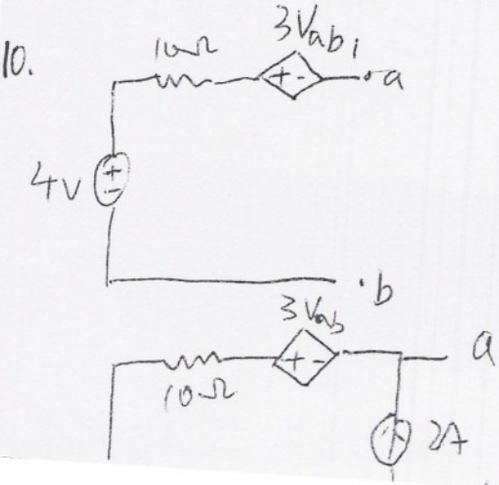
$i_0' = i_3' = \boxed{0.5A}$

$V_0 = 1 \cdot (0.5) = \boxed{0.5V}$

(b) Linear, $\boxed{i_0' = 5A}$ $\boxed{V_0 = 5V}$

(c) $V_s = 10V$, $\boxed{i_0' = 0.5A}$ $V_0 = i_0 R = 0.5 \times 10 = \boxed{5V}$

10.

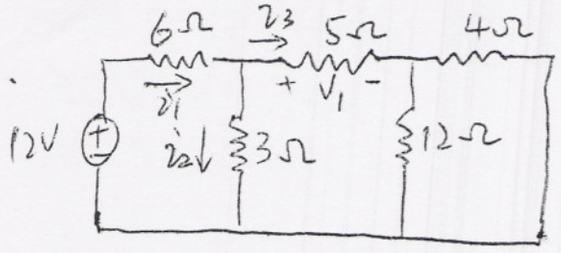


$V_{ab1} = 4 - 3V_{ab1} \Rightarrow V_{ab1} = 1V$

$V_{ab2} = 2 \times 10 - 3V_{ab2} \Rightarrow V_{ab2} = 5V$

$V_{ab} = V_{ab1} + V_{ab2} = 1 + 5 = \boxed{6V}$

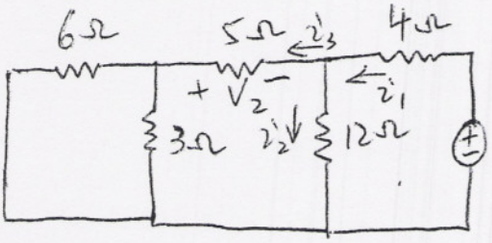
12.



$i_1' = \frac{12}{90} \times 1 = \frac{22}{15}$ A

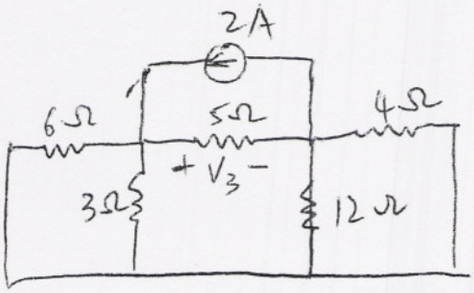
$i_3' = \frac{3}{11} i_1' = 0.4$A

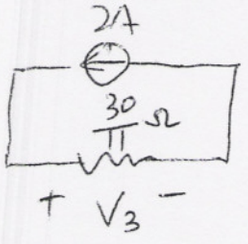
$V_1 = 2$V



$i_1' = \frac{19}{160} \times 19 = \frac{361}{160}$ A

$i_3' = \frac{12}{19} i_1' = \frac{228}{160}$ A



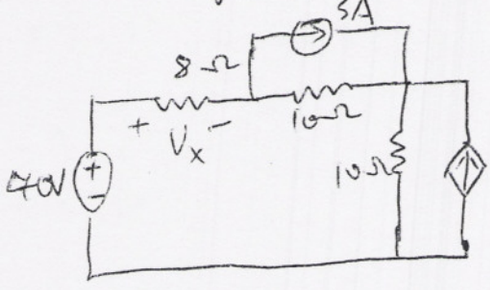


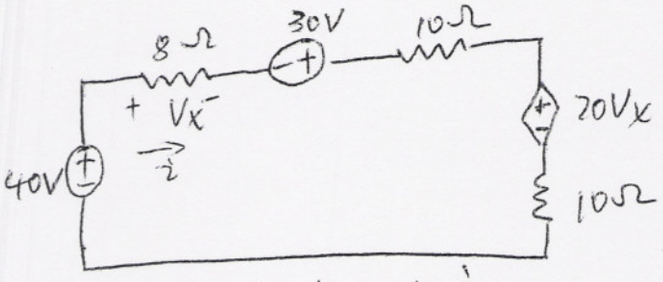
$V_2 = -\frac{228}{160} \times 5 = 7.125$V

$V_3 = 2\left(\frac{30}{11}\right) = 5.455$V

$V = V_1 + V_2 + V_3 = 2 + 7.125 + 5.455 = \boxed{14.57\text{ V}}$

24

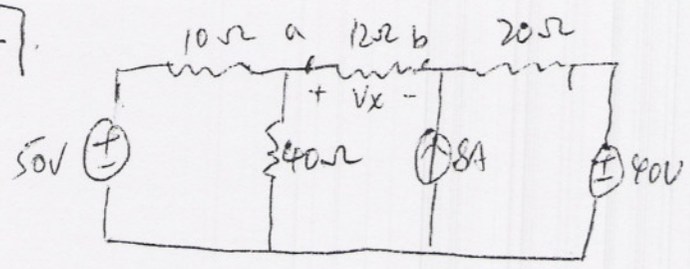




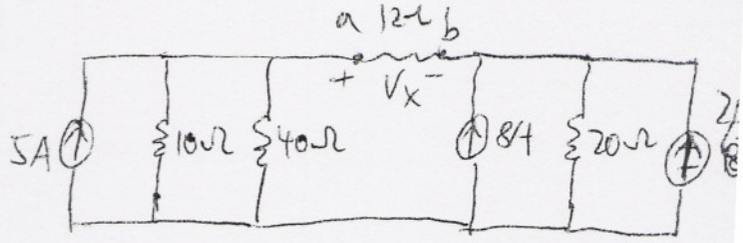
KVL, $40 - 8i + 30 - 10i - 20V_x - 10i = 0$

$V_x = 8i$, $i = \frac{70}{188}$, $V_x = 8 \times \frac{70}{188} = \boxed{2.99\text{V}}$

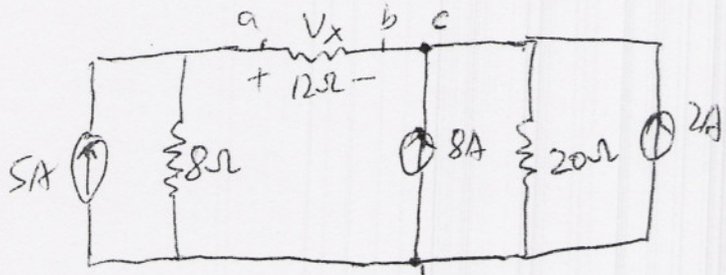
27.



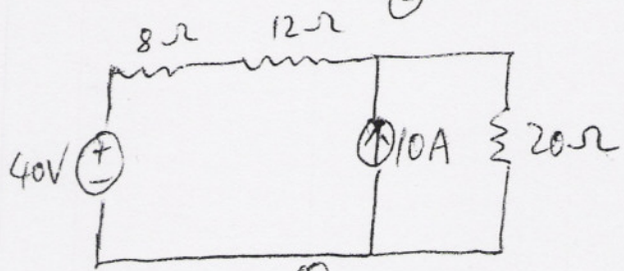
①



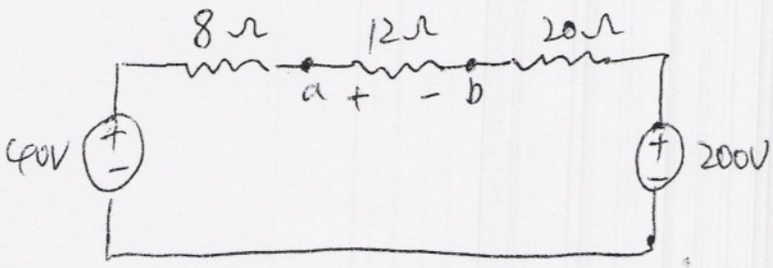
②



③



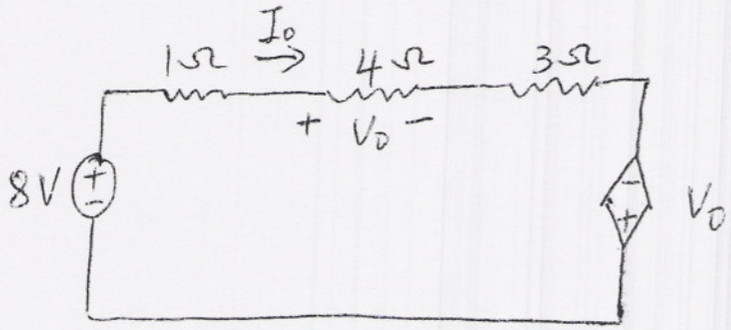
④



KVL:

$$V_{ab} = \frac{12}{8+12+20}(40-200) = \boxed{-48\,V}$$

28.



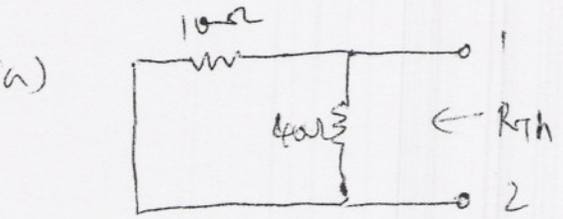
$$V_o = 4I_o$$

KVL:

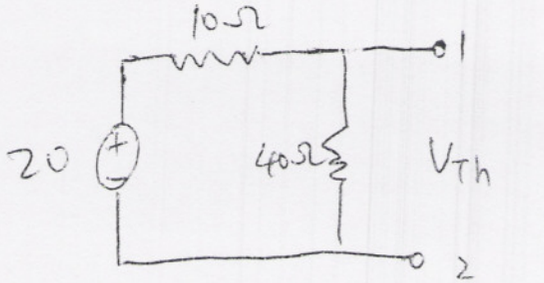
$$8 - I_o - 4I_o - 3I_o + 4I_o = 0$$

$$\boxed{I_o = 2A}$$

33. (a)

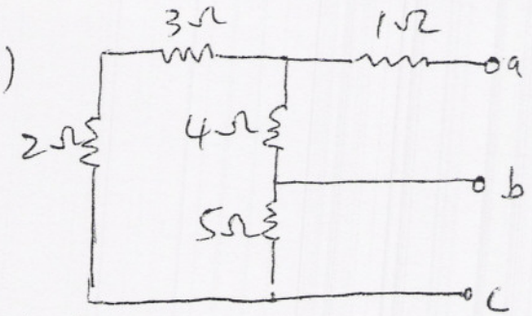


$$R_{Th} = \frac{10 \times 40}{10+40} = \boxed{8\,\Omega}$$



$$V_{Th} = \frac{40}{10+40} \times 20 = \boxed{16\,V}$$

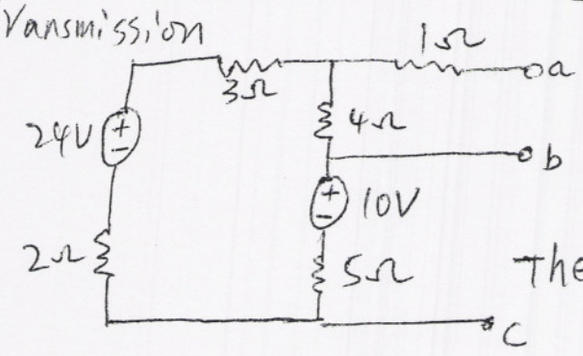
44. (a)



$R_{Th} = R_{2+3+5} \,||\, R_4 + R_1$

$= 3\Omega$

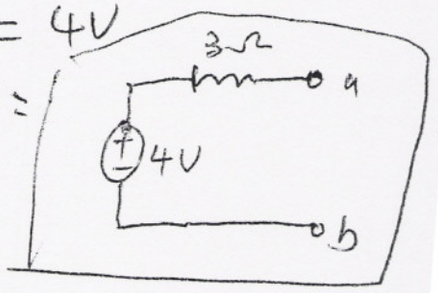
Source Transmission



$V_{Th} = V_{ab} = (24-10) \cdot \frac{4}{3+4+5+2}$

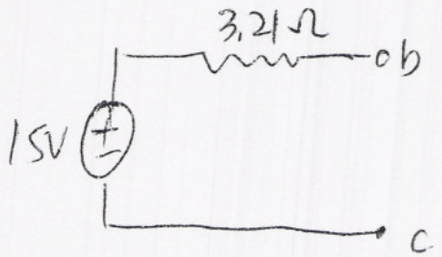
$= 4V$

Thevenin equivalent =

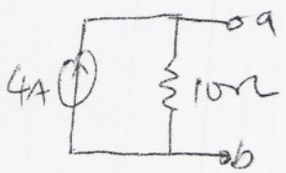


(b) $R_{Th} = R_{bc} = R_{2+3+4} \,||\, R_5 = 3.21\Omega$

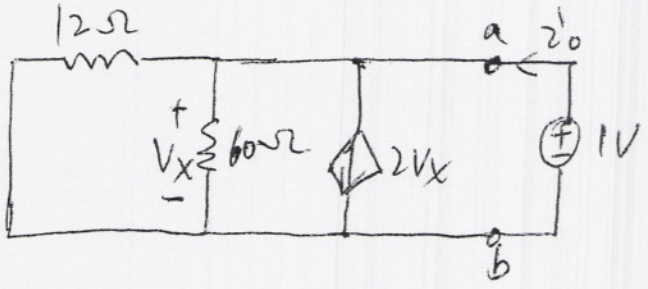
$V_{Th} = V_{bc} = (24-10)\left(\frac{5}{3+4+5+2}\right) + 10 = 15V$

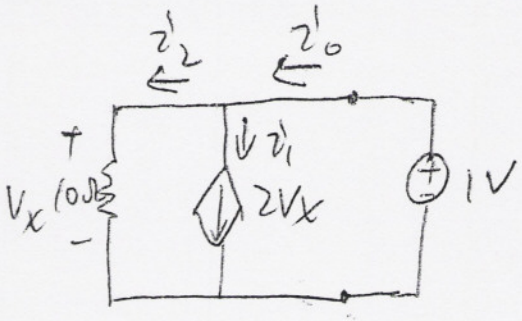


46. $R_N = (10+10) \,||\, 20 = 10\Omega$



47

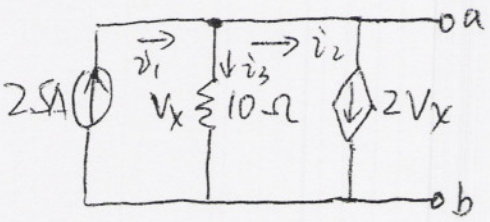




$V_x = 1\,V, \quad i'_1 = 2V_x = 2A, \quad i'_0 = i'_1 + i'_2 = 2.1\,A$

$i'_2 = \frac{V_x}{10} = 0.1A$

$R_{Th} = R_N = \frac{1}{2.1} = \boxed{476.2\ m\Omega}$



$i'_1 = 2.5 \cdot \quad i'_2 = 2V_x$

$i'_3 = i'_1 - i'_2 = 2.5 - 2V_x$

$V_x = 10\,i'_3 \cdot \quad V_x = \frac{25}{21} = \boxed{1.19\,V}$

$V_{Th} = V_x = 1.19V$

$I_N = \frac{V_{Th}}{R_{Th}} = \boxed{2.5\,A}$