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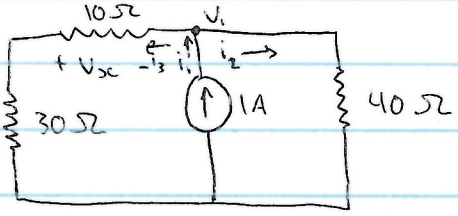
10/05/2017

4655 4192

EECS 215 HW4

7.



$V_x = 1$

$1 - V_1/40 - V_1/40 = 0$

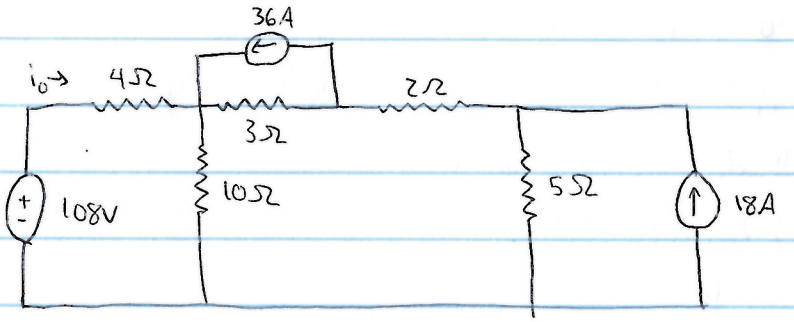
$V_1 = 20V$

$i_1 = i_2 + i_3 = 1 = 2i_2$

$i_2 = i_3 = 0.5\ A$

$V = IR = 0.5\ (10) = \boxed{5V}$

16.



$i_0 = i_v + i_1 + i_2$

Just voltage source: $V = 108\ V$, $R_{eq} = 9\Omega$ $\therefore i_v = 11.11A$

Just 36A current source: $\left(\frac{1}{4} + \frac{1}{10}\right)^{-1} = \frac{20}{7}$

$\frac{20}{7} + 2 + 5 = \frac{69}{7}\ \Omega$

$i = \frac{3 \cdot 36}{3 - 69/7} = \frac{42}{5}\ A$

$i_1 = \frac{-10/14 \cdot 42}{5} = -6A$

Just 18A current source:

$\frac{20}{7} + 3 + 2 = \frac{55}{7}\ \Omega$

$$i = \frac{5 \cdot 18}{5 - 55/7} = 7A$$

$$i_2 = \frac{-10}{2} \cdot 7/1 = -5A$$

$$i_0 = i_v + i_1 + i_2 = 11.11 - 5 - 6 = \boxed{0.11A}$$

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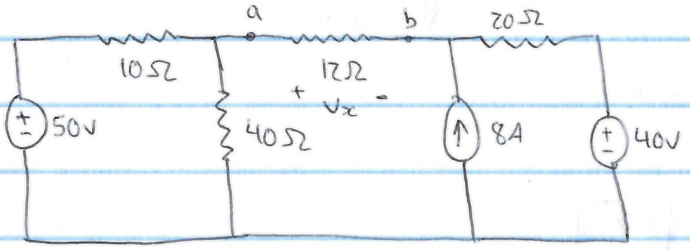


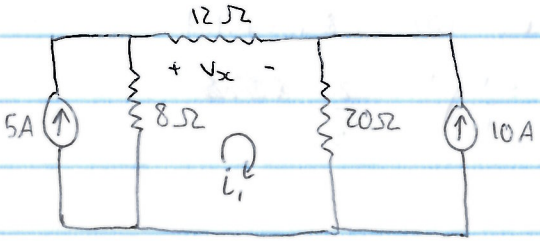
40V and 20Ω to current source

$R_{TH} = 20$; $I = 40/20 = 2A$

50V and 10Ω to current source

$R_{TH} = 10$; $I = 50/10 = 5A$

equivalent circuit is:



$$i_1 \cdot 12 + (i_1 + 10)(20) + 8(i_1 - 5) = 0$$

$$i_1 = -4A$$

$$v_x = -4 \cdot 12 = \boxed{-48V}$$

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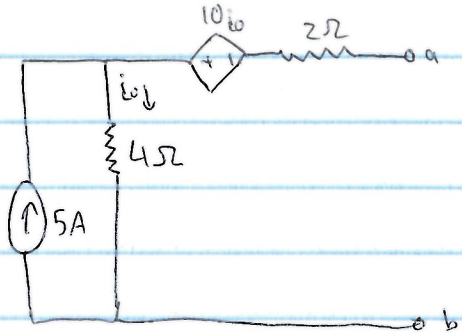


$$I_N = V_{TH}/R_{TH} = I_{sc}$$

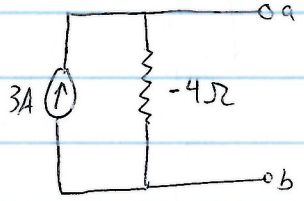
$$R_{TH} = 4i_0 + v_{ba} + 2i_0 - 10i_0 = 0$$

$$\frac{V_{ab}}{i_0} = -4\Omega$$

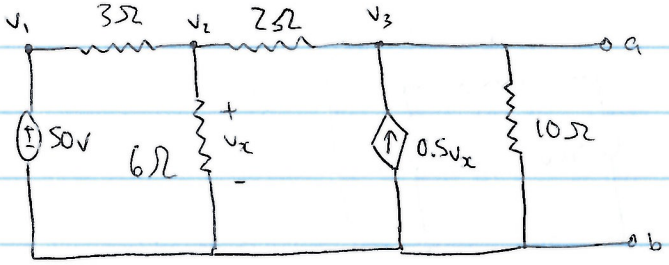
$$2I_{sc} + 4(I_{sc} - 2) + 10i_0 = 0$$

$$I_{sc} = 3A$$

∴ Norton equivalency is:



57.



$V_1 = 50V$

$$\frac{V_2 - V_1}{3} + \frac{V_2}{6} + \frac{V_2 - V_3}{2} = 0$$

$$\frac{V_2 - V_3}{2} + 0.5V_x - \frac{V_2}{10} = 0 \quad \text{where } V_x = V_2$$

$$\therefore V_3 = \frac{500}{3} = V_{TH}$$

Assume $V_{ab} = 1$

$$\frac{V_x}{3} + \frac{V_x}{6} + \frac{V_x - 1}{2} = 0$$

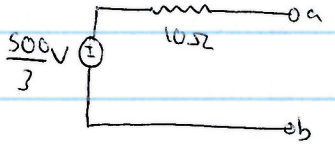
$V_x = 0.5V$

$$\frac{V_x - 1}{2} + 0.5x + i_{ab} = 1/10$$

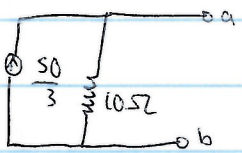
$i_{ab} = 0.1A$

$R_{TH} = V/I = 1/0.1 = 10\Omega$

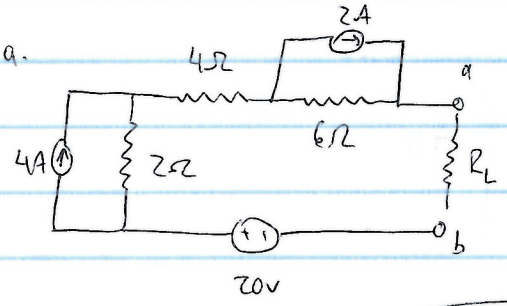
Thevenin ~~Equation~~ Equivalency:



Norton Equivalency:



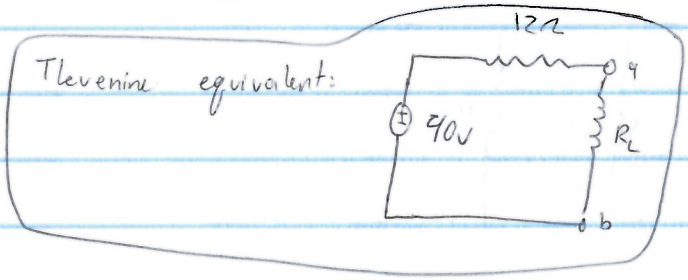
72. a.



$R_{TH} = 6 + 4 + 2 = 12\ \Omega$

$V_{TH} = 20 + 4 \cdot 2 + 2 \cdot 6 = 40V$

Thevenin equivalent:



b. $R_L = 13\ \Omega$; $R_{eq} = 25\ \Omega$

$I = 40/25 = \boxed{1.6A}$

c. Max power : $R_L = R_{TH} = \boxed{12\ \Omega}$

d. Max power for R_L = $\dfrac{V^2}{(R_L + R_{TH})^2}$ $P(R_L) = \boxed{33.3\ W}$

88 a. $R_{eq} = (1/20 + 1/5)^{-1} + 10 + 30 = 44\ k\Omega$

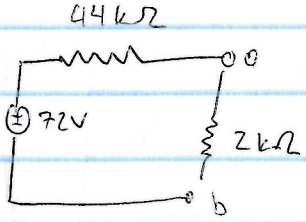
source transformation: $V = 120V$

source transformation: $i = V/R = 0.012A$

source transformation : $V = 12 \cdot 4 = 48V$

$\therefore V_{TH} = 72V$

Thevenin equivalent circuit:



$R_i = 500\ \Omega$ $\therefore R_{eq} = 46500\ \Omega$

$i = V/R = \boxed{0.00154A}$

b. $R_i = 0\ \Omega$ $\therefore R_{eq} = 46000\ \Omega$

$i = V/R = \boxed{0.00156A}$