Recitation 6 – 10/7/2014

Q4.45 Can use 3 equations for current loop to solve problem. $i_4 = 2A$.
Relationship between common current wires. **SUPER MESH!**

Q5.4 a) ① short circuit the voltage source and find i_x'
② open circuit the current source and find i_x''

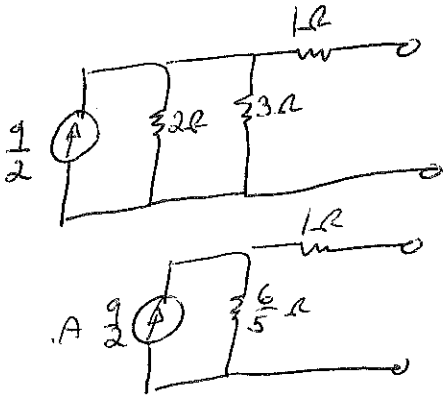
b) relationship of $i_x' + i_x''$

c) change current source to match i_x''

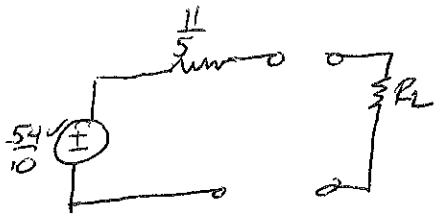
Q5.17 ① convert to all voltage sources
② Perform KVL, mesh analysis + solve simultaneous equations
③ simulate both circuits in LTspice

Q5.18 ① Follow steps from lecture

Q5.26



$\frac{2 \times 3}{5} = \frac{6}{5}\Omega$



Can plot in MATLAB

Range R_L from 0 to 5Ω

$$P[R_L] = \frac{\left[\frac{54}{10}\left[\frac{R_L}{R_L + \frac{11}{5}}\right]\right]^2}{R_L}$$

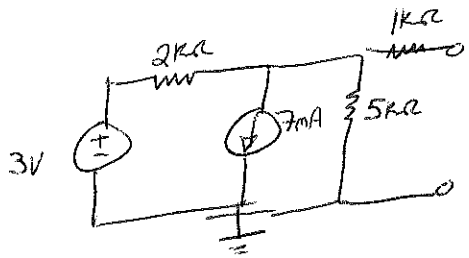
Q5.32

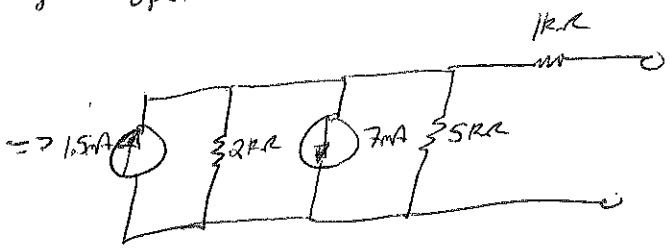
current meshes

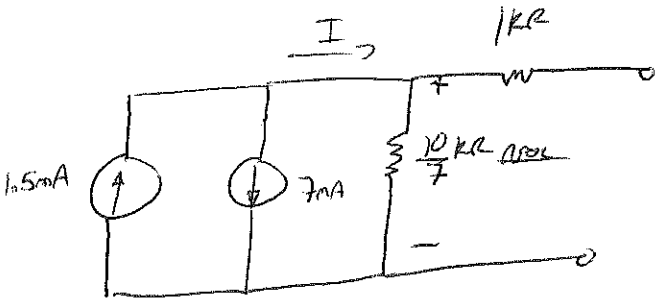
$i_2 \rightarrow$ find $v_x = v_{oc}$

find R_{TH} by shorting voltages + open circuit current sources

PRACTICE 5.7







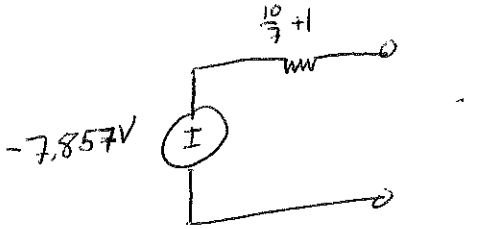
$v_{oc} = -5.5\text{mA} \times \frac{10}{7}\text{k}\Omega$

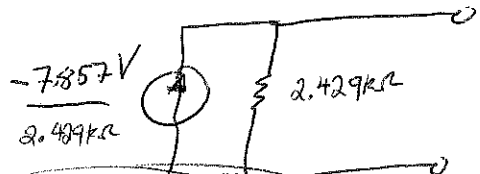
$= -7.857\text{ V}$

$I = 1.5\text{mA} - 7\text{mA} = -5.5\text{mA} = I$

$\frac{10}{7}+1\Omega$

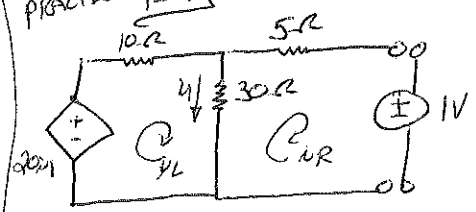
$R_{TH} = 2.429\text{k}\Omega$





$I_{sc} = -3.235\text{mA}$

PRACTICE 1.59



$-20i_1 + 10i_L + 30i_L - 30i_R = 0$

$30i_R - 30i_L + 5i_R + 1 = 0$

$i_1 = i_L - i_R$

$-20i_1 + 40i_L - 30i_R = 0$

$-30i_L + 35i_R = -1$

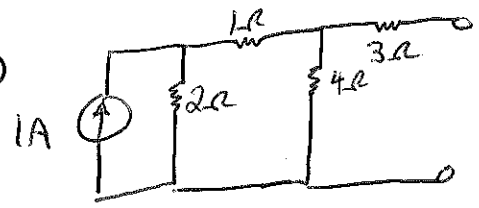
$-i_1 + i_L - i_R = 0$

$i_R = -50\text{mA}$

$-i_R$ flows out of the 1V source such that $R_{TH} = \frac{1}{-(i_R)} = \frac{1}{50\text{mA}} = 20\Omega = R_{TH}$

Q5.36

a)



① current won't flow across 3Ω resistor, so

$i_{4\Omega} = 1 \times \left(\frac{2}{2+5}\right) = \boxed{\frac{2}{7}\,A = I_{4\Omega}}$

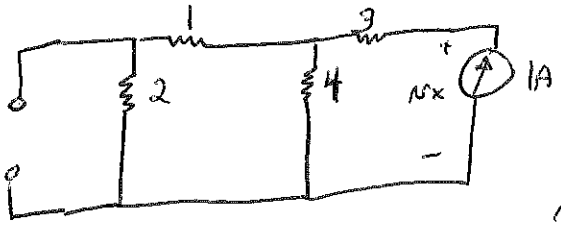
$\therefore v_{oc} = v_{4\Omega} = 4 \times \frac{2}{7} = \frac{8}{7} = \boxed{1.143V = v_{oc}}$

$i_{sc} = 4\|3 = \frac{12}{7}\,\Omega$ $i_{4\Omega} = 1A \times \frac{2}{2+1+\frac{12}{7}} = 424.24$ between 3+4

$\therefore \times \frac{4}{7} = \boxed{242.42mA = I_{sc}}$

$\therefore R_{TH} = \frac{v_{oc}}{I_{sc}} = \frac{1.143V}{242.42mA} = 4.715\,\Omega$

b)

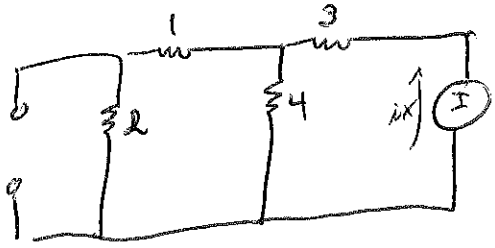


Ingored $2+1=3$

$3\|4 = \frac{12}{7} + 3 = \frac{33}{7} = 4.715\Omega$

$v_x = 1A \times 3+4\|3 = 4.714V \Rightarrow R_{TH} = 4.715\Omega$

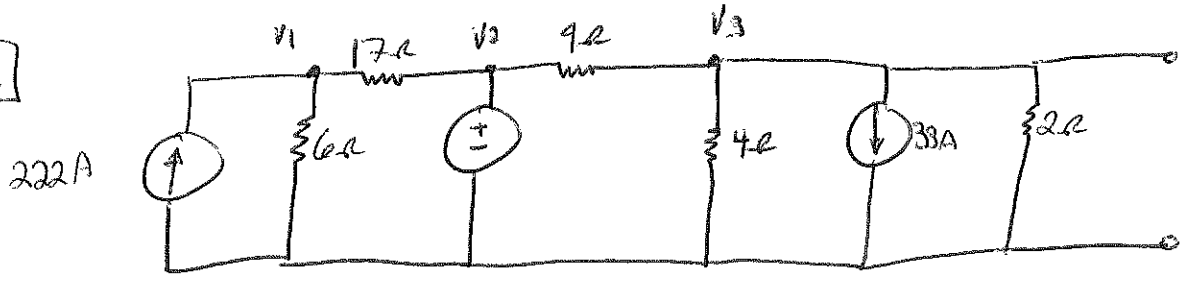
c)



$i_x = \frac{V}{R} = \frac{1V}{3\|4+3} = \frac{7}{33} = i_x$

$\therefore R_{TH} = \frac{1V}{\frac{7}{33}} = \boxed{\frac{33}{7}\Omega \Rightarrow R_{TH}}$

Q5. 37.



$0 = -222 + \frac{V1}{6} + \frac{V1-V2}{17}$

$V3 = 20V$

$0 = \frac{V3-V2}{9} + \frac{V3}{4} + \frac{V3}{2} + 33$

solve for $V3 = -35.74V$

$= V_{OC} = -35.74$

short terminals + solve i_{SC}

$R_{TH} = 6 + 7 \quad 9 \| 4 \| 2 = 1.61\Omega$