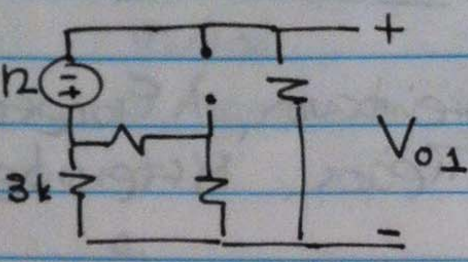
EEE 202 HW 2 SOLUTIONS

S.23 1) $I_s = 0$



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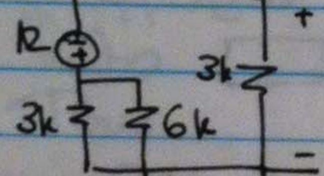

$3k \parallel 6k = 2k$

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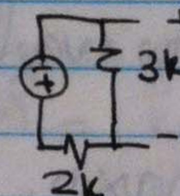
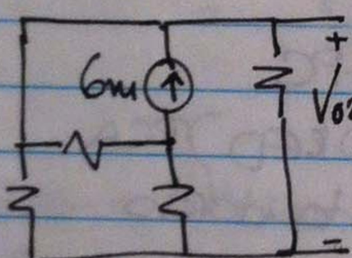


Voltage division

$V_{o1} = -\frac{3k}{5k} \cdot 12$

$= -36/5$ (V)

2). $V_s = 0$



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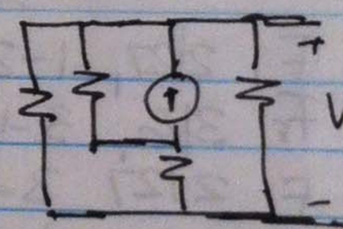

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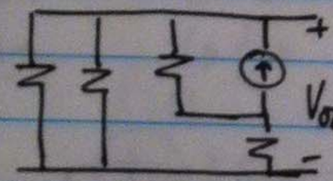
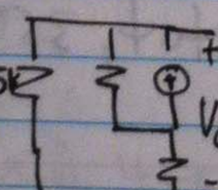


$3k \parallel 3k = 1.5k$

$=$



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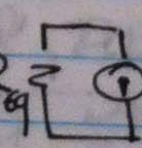


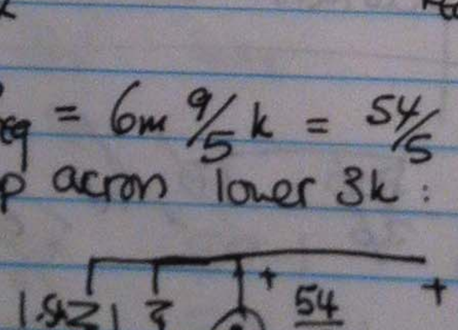
$R_{eq} = (1.5k + 3k) \parallel 3k$

$= 9/5\ k(\Omega)$

$\Rightarrow V_s = I_s R_{eq} = 6m \cdot 9/5\ k = 54/5$ (V) voltage across ⊕

$\Rightarrow$ Voltage drop across lower 3k : $\frac{54}{5} \cdot \frac{3k}{3k + 1.5k} = \frac{36}{5}$ (V)

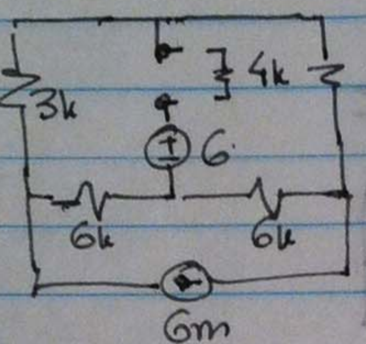
$\therefore$ we have

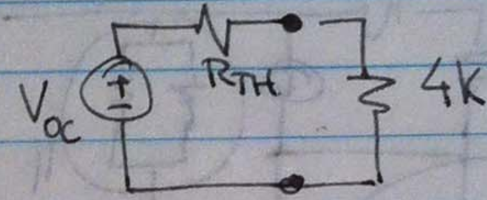


KVL: $-V_{o2} + \frac{54}{5} - \frac{36}{5} = 0 \Rightarrow V_{o2} = 18/5$ (V)

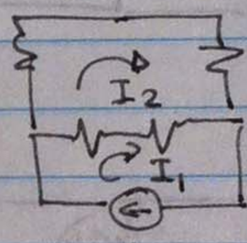
$\Rightarrow V_o = V_{o1} + V_{o2} = -36/5 + 18/5 = -18/5 = \boxed{-3.6\ (V)}$

5,35. To apply Thevenin, remove the "LOAD" resistor and find V_{oc} and R_{TH}.





1). V_{oc} : Two loop currents



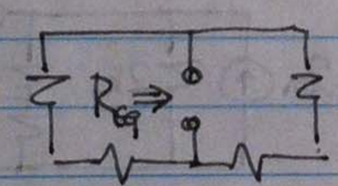
$I_1 = 6m\ (A)$

$I_2(3k+3k) + (I_2 - I_1)(6k+6k) = 0 \Rightarrow I_2 = 4m\ (A)$

KVL: $-V_{oc} - 6 + I_2(3k) + (I_2 - I_1)6k$

$\Rightarrow V_{oc} = -6 + 12 + (-2)6 = -6\ (V)$

2). R_{TH}. Replace V_s by short, I_s by open.



$\Rightarrow R_{TH} = (3k+6k) \| (3k+6k)$

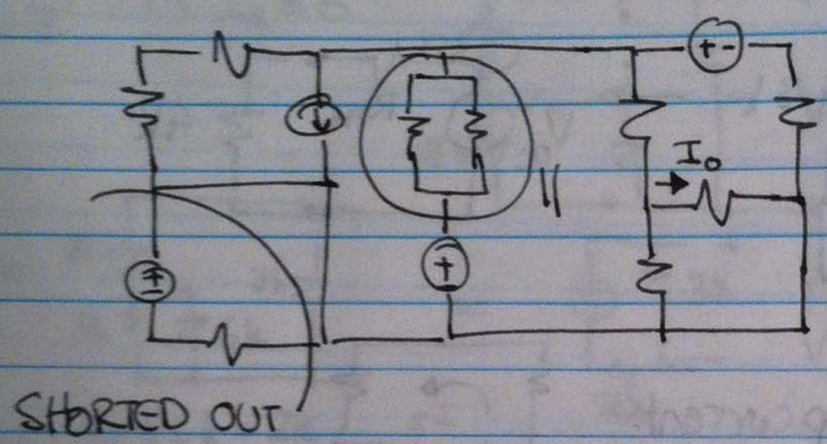
$= 4.5k\ (\Omega)$

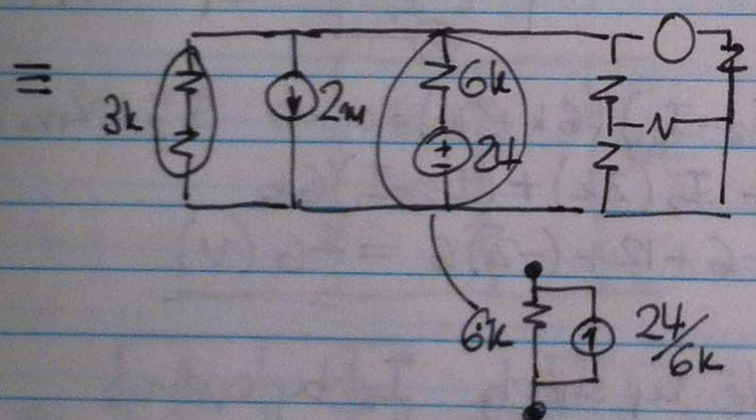
∴ Voltage division on equivalent circuit:

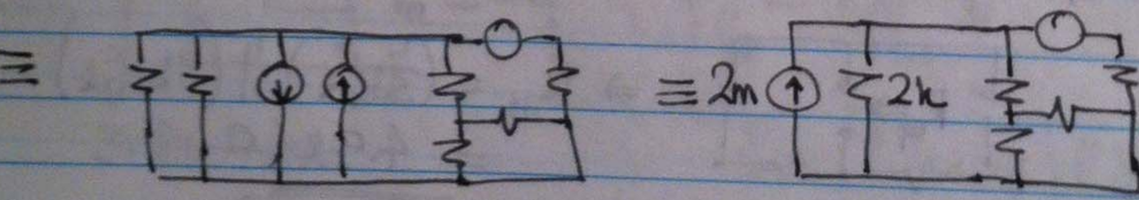
$$V_o = V_{oc} \cdot \frac{4k}{R_{TH}+4k} = (-6)\frac{4k}{4.5k+4k} = -\frac{48}{17}$$

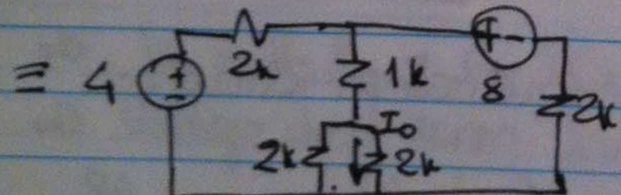
$= -2.82\ (V)$

5.95 Keep applying source transformations and element reduction steps:









At this point we need to reduce the 2k resistors so the information on I_o will be lost and must be recovered later. Probably the easiest approach here is a loop analysis to compute the total current thru the middle branch.

$$-4 + 2kI_1 + (I_1 - I_2)(1k + 1k) = 0$$
$$8 + 2kI_2 + (I_2 - I_1)(1k + 1k) = 0$$
$$I_o = \frac{1}{2}(I_1 - I_2)$$

$\Rightarrow$ $I_o = 1m\,(A)$