Name _____

EE/EET 2240

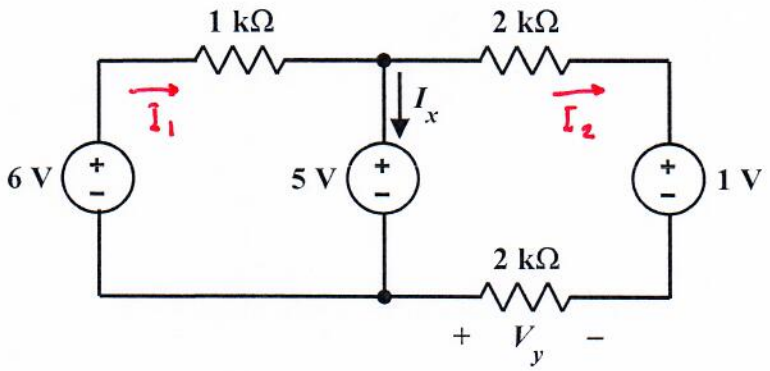
**Exam #1**

Thursday, September 20, 2018

LIBR B03 and TAB 115, 9:30AM – 10:45AM

[closed book – one one-sided 8½"×11" page of notes and calculator allowed, nothing else]

1. Determine the numerical values of $I_x$ and $V_y$. **SHOW YOUR WORK, and include units and proper signs with your answers.**



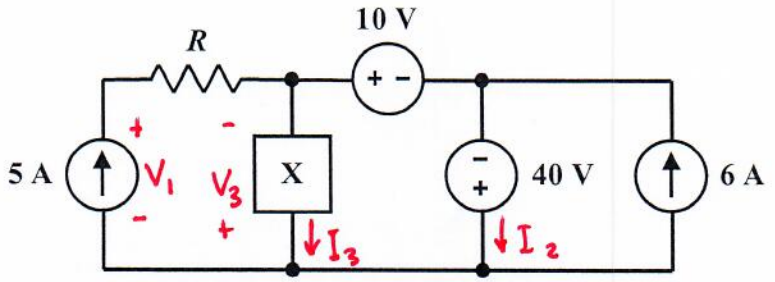

$I_1 = (6V - 5V)/1k\Omega = 1mA$

$I_2 = (5V - 1V)/(2k\Omega + 2k\Omega) = 1mA$

$I_x = I_1 - I_2 = 0A$

$V_y = -(2k\Omega)(I_2) = -2V$

2. The 5A current source is delivering 25W, and the 40V source is delivering 80W.




(a) Determine the value of resistor $R$. **SHOW YOUR WORK, and include units with your answer.**

$$V_1 = \frac{25W}{5A} = 5V$$

$$(V_1 + 40V - 10V)/R = 5A$$

$$\Rightarrow R = \frac{V_1 + 40V - 10V}{5A} = 7\Omega$$

(b) Is component $X$ absorbing power or delivering power? How much? **SHOW YOUR WORK, and include units with your answer.**

$$I_2 = \frac{80W}{40V} = 2A$$

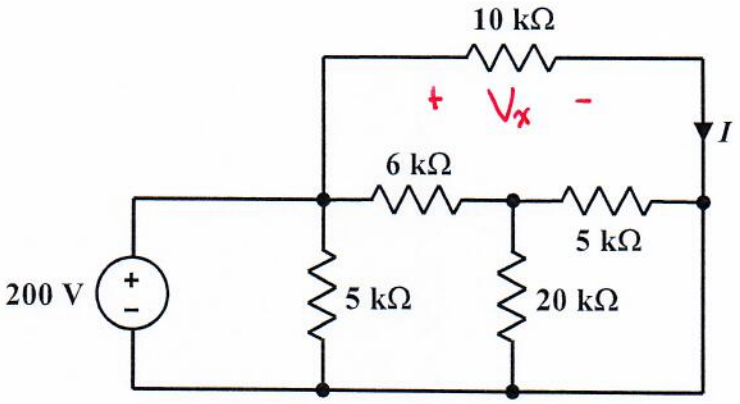
$$I_3 = 5A - I_2 + 6A = 9A$$

$$V_3 = 40V - 10V = 30V$$

Since $V_3$ and $I_3$ do not satisfy the PSC, component X delivers

$$(30V)(9A) = 270W$$

3. Determine the numerical value of the current $I$. **SHOW YOUR WORK, and include units and proper sign with your answer.**

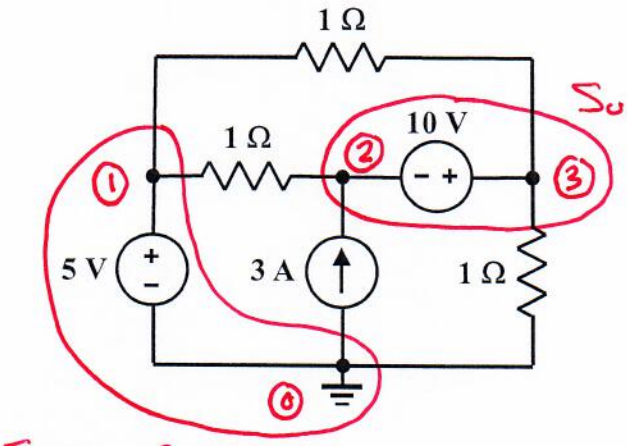



$V_x = 200\ V$

$I = \frac{V_x}{10k\Omega} = 20\ mA$

4. Use the nodal analysis method to formulate a system of simultaneous linear equations representing the circuit shown below. Express the equations in the matrix form discussed in class. **SHOW YOUR WORK.**

***Do not attempt to solve the equations.***




$V_1 = 5\,V$ (constraint)

$V_3 - V_2 = 10\,V$ (constraint)

$$\frac{V_2 - V_1}{1\,\Omega} - 3A + \frac{V_3}{1\,\Omega} + \frac{V_3 - V_1}{1\,\Omega} = 0$$ (KCL for Supernode #2)

In matrix form:

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 1 \\ -2 & 1 & 2 \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} = \begin{bmatrix} 5 \\ 10 \\ 3 \end{bmatrix}$$