EE2110 Quiz 3, Spring 2012

Show your work for full credit!

1. Use the node voltage method to find the coefficients for \( V_1 \) and \( V_2 \) in the network below.

\[
\begin{align*}
7V_1 + \frac{1}{2}V_2 - \frac{60}{2} &= 0 \\
7V_1 - 4V_2 &= 120 \\
V_2(\frac{1}{2} + \frac{1}{10}) - \frac{V_1}{2} - \frac{60}{10} - \frac{3}{4}(60 - V_1) &= 0 \\
I_0 &= \frac{60 - V_1}{4} \\
12V_2 + 5V_1 &= 5(180) + 120 \\
V_1 &= 53.08V \\
V_2 &= 61.9V \\
\text{not necessary for credit}
\end{align*}
\]

\[\begin{align*}
(7\ V_1 + (- 1\ )V_2 &= 120 \\
( 5\ )V_1 + ( 1\ )V_2 &= 1020
\end{align*}\]

2. Write the 4 mesh equations for the network below and reduce them to a 2-by-2 set of equations (involving only the middle 2 meshes).

\[
\begin{align*}
\lambda_1 &= -1 \\
\lambda_2 &= -12
\end{align*}
\]

\[
\begin{align*}
12 + 20k\ i_2 - 6k\ i_3 + 24 &= 0 \\
-12 - 6k\ i_2 + 33k\ i_3 + 180 &= 0
\end{align*}
\]

\[
\begin{align*}
20k\ i_2 - 6k\ i_3 &= -76 \\
-6k\ i_2 + 33k\ i_3 &= -192
\end{align*}
\] \[
\Rightarrow \begin{align*}
\hat{i}_2 &= -3.75\ A \\
\hat{i}_3 &= -6.5\ A
\end{align*}
\] \[
\text{not necessary for credit}
\]