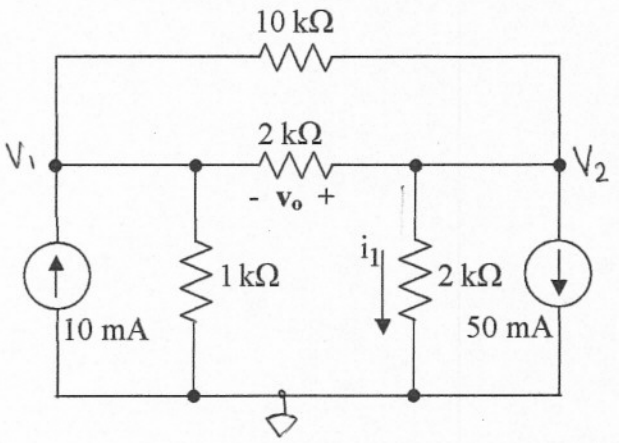
UNIVERSITY OF UTAH
ELECTRICAL AND COMPUTER ENGINEERING DEPARTMENT

ECE 1270 HOMEWORK #3 Spring 2008

1. Use node-voltage method to find i_1 and v_o.



$V_o = (V_2 - V_1) = -52.86 + 13.6 = \boxed{-39.26\text{V}}$

$i_1 = \frac{V_2}{2k} = \frac{-52.86}{2K} = \boxed{-26.4\text{mA}}$

$$-10\text{mA} + \frac{V_1}{1K} + \frac{(V_1 - V_2)}{2K} + \frac{(V_1 - V_2)}{10K} = 0$$

$$V_1\left(\frac{1}{1K} + \frac{1}{2K} + \frac{1}{10K}\right) - V_2\left(\frac{1}{2K} + \frac{1}{10K}\right) - 10m = 0$$

$$V_1\left(\frac{10}{10K} + \frac{5}{10K} + \frac{1}{10K}\right) - V_2\left(\frac{5}{10K} + \frac{1}{10K}\right) - 10m = 0$$

$$V_1\left(\frac{16}{10K}\right) - V_2\left(\frac{6}{10K}\right) - 10m = 0 \Rightarrow V_1 = \frac{\left[+10m + V_2\left(\frac{6}{10K}\right)\right]10K}{16} = -13.6$$

$$+50m + \frac{V_2}{2K} + \frac{(V_2 - V_1)}{2K} + \frac{(V_2 - V_1)}{10K} = 0$$

$$+50m + V_2\left(\frac{1}{2K} + \frac{1}{2K} + \frac{1}{10K}\right) - V_1\left(\frac{1}{2K} + \frac{1}{10K}\right) = 0$$

$$+50m + V_2\left(\frac{5}{10K} + \frac{5}{10K} + \frac{1}{10K}\right) - V_1\left(\frac{5}{10K} + \frac{1}{10K}\right) = 0$$

$$+50m + V_2\left(\frac{11}{10K}\right) - V_1\left(\frac{6}{10K}\right) = 0$$

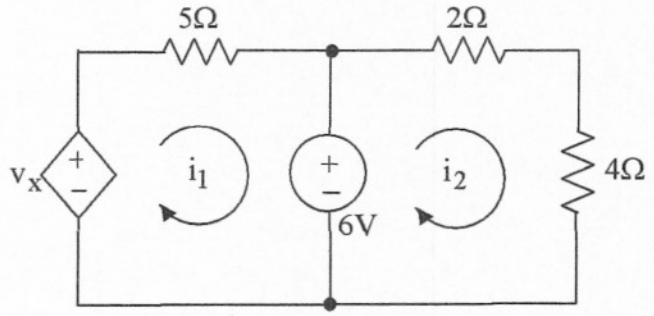
$$+50m + V_2\left(\frac{11}{10K}\right) - \frac{100}{16}\left(\frac{6}{10K}\right) - V_2\left(\frac{6}{16}\cdot\frac{6}{10K}\right) = 0$$

$$V_2\left(\frac{11(16)}{10K(16)} - \frac{6\cdot 6}{(16)10K}\right) = -50m + \frac{100}{16}\left(\frac{6}{10K}\right)$$

$$V_2\left(\frac{176 - 36}{16\cdot 10K}\right) = -50m + \left(\frac{600}{16(10K)}\right)$$

$$V_2 = \frac{-0.046875}{8.75\times 10^{-4}} = -52.86$$

4. a. Use the mesh-current method to find i_1 and i_2. Use $Vx=0.5i_2$.
   b. Find the power dissipated by the dependent current source.



$+V_x - i_1(5) - 6 = 0$

$0.5i_2 - 5i_1 - 6 = 0$

$i_2 = \frac{5i_1 + 6}{0.5} = 10i_1 + 12$

$+6 - i_2(2) - i_2(4) = 0$

$i_2(6) = 6$

$\boxed{i_2 = 1A}$

$1 = 10i_1 + 12$

$1 - 12 = 10i_1$

$\boxed{\frac{-11}{10} = i_1}$

power $= V_x(-i_1) = 0.5i_2(-i_1)$

$= 0.5(1)(+\frac{11}{10}) = \boxed{0.55W}$ absorbing power