Solution

EE101 Quiz 6 February 19, 2019

Name_____ Student ID No._____

Problem (10 points)

5.16 Determine the voltages across the two capacitors in the circuit of Fig. P5.16 under dc conditions.

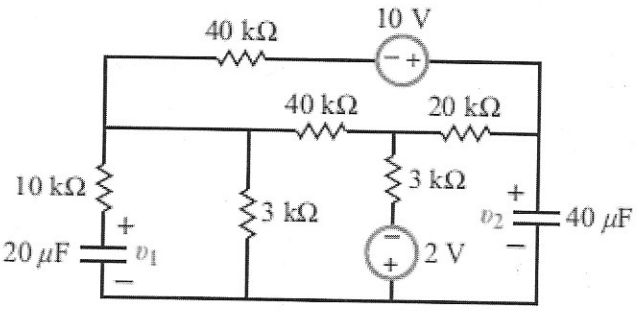
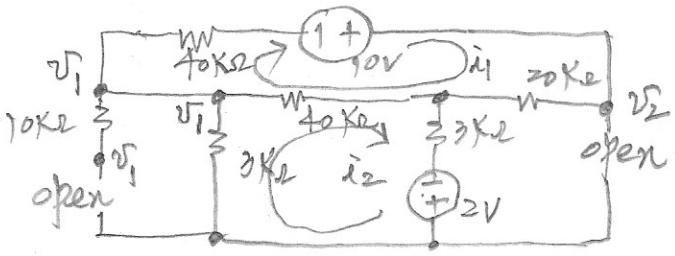


Figure P5.16: Circuit for Problem 5.16.

Part 1 (2 points) Draw a simplified circuit diagram under dc conditions.



Part 2 (8 points) Use mesh analysis to find branch currents from which you can find v_1 and v_2.

Part 2a (4 points) Write down two equations using KVL

Mesh 1: $-10 + i_1 \cdot 20K + (i_1 - i_2)40K + i_1 \cdot 40K\Omega = 0$

$\Rightarrow \boxed{100K \cdot i_1 - 40K \cdot i_2 = 10}$ (1)

Mesh 2: $3K \cdot i_2 + 40K(i_2 - i_1) + 3K \cdot i_2 - 2 = 0$

$\boxed{-40K\, i_1 + 46K\, i_2 = 2}$ (2)

Part 2b (4 points) Solve for two mesh currents, and then find v_1 and v_2.

(1) + 2.5×(2) ⇒ $100K\, i_1 - 40K\, i_2 = 10$

$-100K\, i_1 + 46K(2.5) i_2 = 5$

$0 + (115-40)K\, i_2 = 15$

$i_2 = \frac{15}{75} \times 10^{-3} = 0.2\,mA$

From (1) & $i_2 = 0.2$, $100K\, i_1 - 40K(0.2mA) = 10$

$i_1 = \frac{18}{100K} = 0.18\,mA$

$v_1 = -3K(i_2) = -0.6\,V$

$v_2 = 3K \cdot i_2 - 2 + 20K \cdot i_1 = 0.6 - 2 + 3.6 = 2.2$