ELEC273 Winter 20115-16 BASIC CIRCUIT ANALYSIS
Tutorial Quiz 1 Week of Jan. 25

Q #1: The charge Q entering an element varies as shown in Figure 1. Draw, in Figure 2, the corresponding curve for the current I entering the element, showing relevant values.

$I = \frac{dq}{dt}$

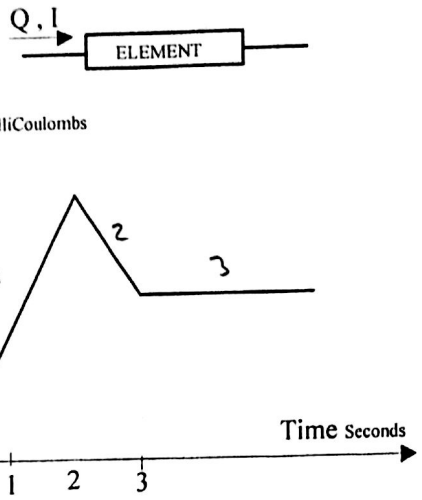


FIGURE 1

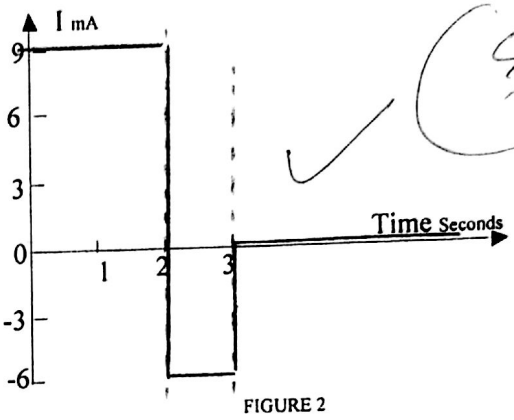


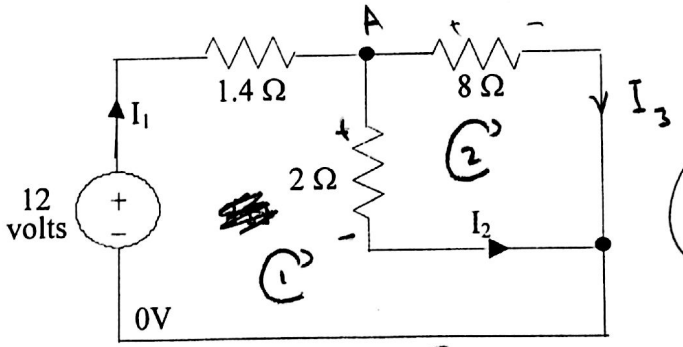
FIGURE 2

$m_1 = \frac{18-0}{2-0} = 9$

$m_2 = \frac{12-18}{3-2} = -6$

$m_3 = 0$

Q #2: In the circuit shown, find the currents I_1 & I_2, using KCL, KVL and/or Ohm's Law.



Solution:

KVL for loop 1 CW:

$-12 + 1.4 I_1 + 2 I_2 = 0$

KVL for loop 2 CW

$-2 I_2 + 8 I_3 = 0$

KCL at node A

$I_1 = I_2 + I_3$

We obtain the system of equations

$$\begin{cases} 1.4\,I_1 + 2\,I_2 = 12 \\ -2\,I_2 + 8\,I_3 = 0 \\ I_1 = I_2 + I_3 \end{cases} \longrightarrow \begin{cases} 1.4\,I_1 + 2\,I_2 = 12 \\ -2\,I_2 + 8(I_1 - I_2) = 0 \\ I_3 = I_1 - I_2 \end{cases}$$

$$\longrightarrow \begin{cases} 1.4\,I_1 + 2\,I_2 = 12 \\ 8I_1 - 10\,I_2 = 0 \end{cases} \longrightarrow \begin{cases} I_2 = 6 - 0.7\,I_1 \\ 8I_1 - 10(6 - 0.7I_1) = 0 \end{cases}$$

$\longrightarrow$ ~~$15.8\,I_1 = 60$~~

~~$I_1 = 3.8\,A$~~

$\longrightarrow$ Is $I_1 = 4$ $\longrightarrow$ $I_1 = \boxed{4\,A}$

$I_2 = 6 - 0.7\,I_1 = 6 - 0.7(4) = \boxed{3.2\,A}$

$I_3 = I_1 - I_2 = 0.8\,A$