Name: Solution (please print)

Signature: _____

ECE 2201 – Quiz #1
September 13, 2016

Keep this quiz closed and face up until you are told to begin.

1. This quiz is closed book, closed notes. You may use one 8.5" x 11" crib sheet, or its equivalent.
2. Show all work on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. It is assumed that your work will begin on the same page as the problem statement. If you choose to begin your work on another page, you must indicate this on the page with the problem statement, with a clear indication of where the work can be found. **If your work continues on to another page, indicate clearly where your work can be found. Failure to indicate this clearly will result in a loss of credit.**
4. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
5. Do not use red ink. Do not use red pencil.
6. You will have 30 minutes to work on this quiz.

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Six devices are connected together as shown in Figure 1. $i_Q(t)$, $v_X(t)$ and $v_W(t)$ are shown in Figures 2, 3 and 4. In addition $i_S(t)$ and $v_Z(t)$ are given as follows:

$$v_Z(t) = 40e^{(0.1[s^{-1}]t)}[V]; \quad for\ t \geq 0$$

$$i_S(t) = 65\left[\frac{\mu A}{ms}\right]t; \quad for\ t \geq 0.$$

a) At t= 3[ms], Device D is absorbing power. Which way are the electrons moving through Device D at t=3[ms] ?

b) Find the power delivered by Device F at t= 3[s].

c) How much energy is absorbed by Device A between 2[ms] and 6[ms]?

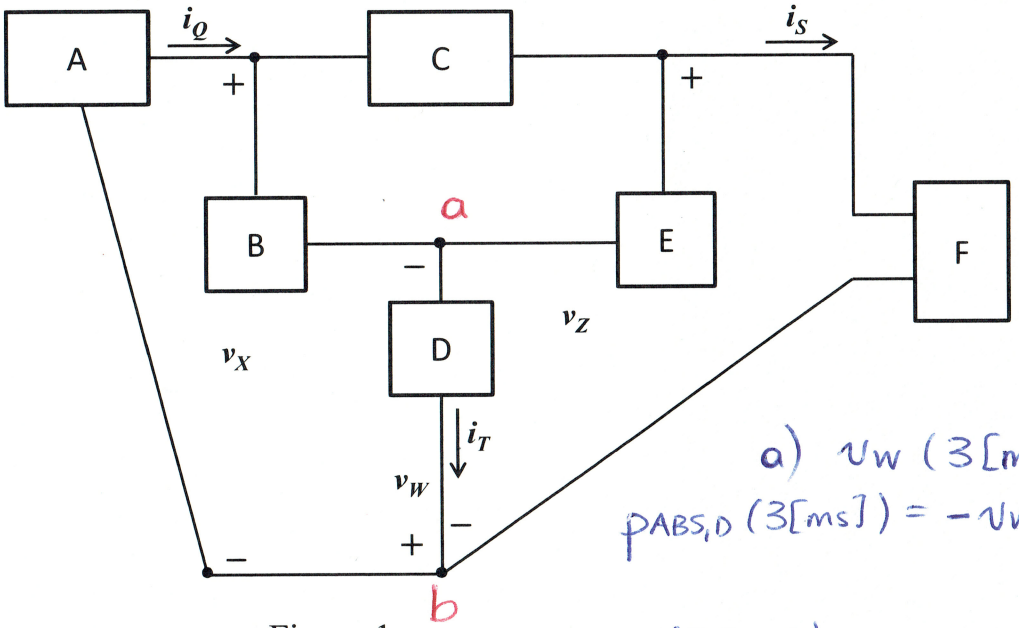


Figure 1

a) $v_W(3[ms]) < 0$ (Fig 4)

$p_{ABS,D}(3[ms]) = -v_W(3[ms]) \times i_T(3[ms])$

$p_{ABS,D}(3[ms]) > 0$ since Device D is absorbing power @ t = 3[ms]

Then $i_T(3[ms]) > 0$ must be satisfied.

⇒ e⁻s are moving from b to a, when flowing through Device D @ t = 3[ms].

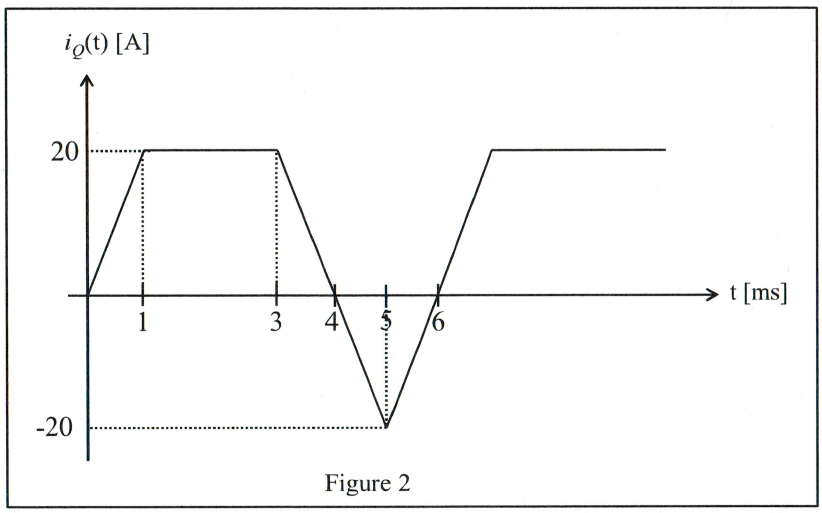


Figure 2

b) $p_{DEL,F}(3[s]) =$

$-v_Z(3[s]) \times i_S(3[s])$

Using the equations given,

$p_{DEL,F}(3[s]) =$

$-53.99[V] \cdot 195[mA]$

$= -10.52[W]$

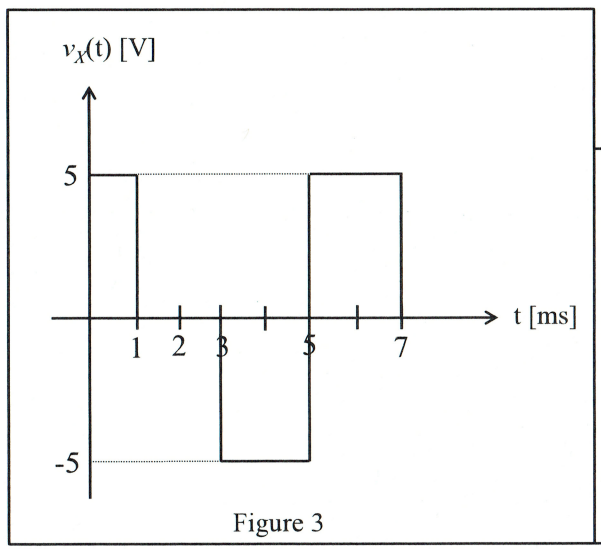


Figure 3

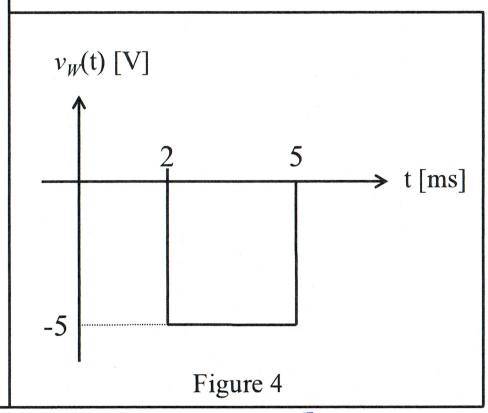
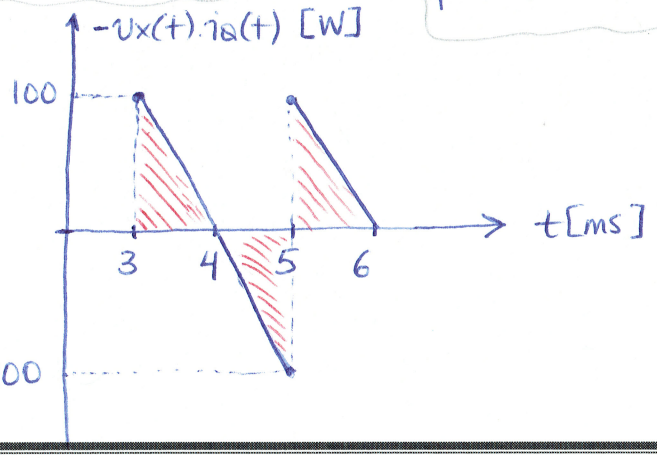


Figure 4

c) $W_{ABS,A} = \int_{2[ms]}^{6[ms]} -v_X(t) \cdot i_Q(t)\,dt = \int_{3[ms]}^{6[ms]} -v_X(t) \cdot i_Q(t)\,dt$ since $v_X(t) = 0$ for $2[ms] < t < 3[ms]$

If you plot $-v_X(t) \cdot i_Q(t)$ using the graphs provided, from 3[ms] to 6[ms], you get:



$W_{ABS,A} = \frac{100 \cdot 1[ms]}{2} = 50[mJ]$