**ECE 2201 – Circuit Analysis**

**Homework #5**

1. a) Find the power delivered by the source in this circuit.

Next slide

 b) Find the voltage *vX*.

 (PWA Problem 1 in Module 2)



2. A device can be modeled using a voltage source in series with a resistance. That device is shown in Figure P3.2.

a. Draw the circuit elements inside the device

A set of resistors was connected to the terminals of the device, one at a time, and the voltage at the device terminals, vt, was measured in each case. The results are shown in Table P3.1, where *R* is the resistor value attached to the device. Then, a 10[Ω] resistor was connected to the terminals of the device.

1. Using KVL and Ohm’s law write an equation that includes *vT* and *iT*
2. Find the power absorbed by this 10[Ω] resistor, when it is connected to the device terminals.

(PWA Problem 4 in Module 1)

|  |
| --- |
| **Table P3.1** |
| *R* in [Ω] | *vt* in [V] |
| 5 | -3.32 |
| 15 | -24.2 |
| 20 | -113 |



3. A device can be modeled using a current source in parallel with a resistor. This device was connected to a 5[V] voltage source, as shown in Figure P3.3 a), and a current *i5* of 0.93[A] resulted. The same device was then connected to a 4[A] current source as shown in
Figure P3.3 b), and a voltage *v4*of –34[V] resulted.

Find the voltage *v3* if a 3[Ω] resistor, as shown in Figure P3.3 c), is connected to the same device.

(PWA Problem 5 in Module 1)

 



4. A device can be modeled by a voltage source in series with a resistance. This device has the relationship between voltage *vD* and current *iD* shown in Figure P3.4a, using the reference polarities shown in Figure P3.4b. This relationship holds for all values of *vD* and *iD*. When this device is connected to a 12[V] voltage source as shown in Figure P3.4c, find the power absorbed by the device.

 

5. A device, shown in Figure P3.5a, can be modeled by a current source in parallel with a resistance. The relationship between the current through the device, *iX*, and the voltage across the device, *vX*, is given in the plot in Figure P3.5b.

a) Find a model for the device that would be valid when current is in the range

1[mA] < *iX* < 5[mA]. This model must have numerical values for the current and resistance, and the polarities with respect to *vX* and *iX* should be shown in a diagram.

b) A voltage source is applied across the device so that *vX* = 10[V]. Find the power delivered by the device in this situation.

 

6. There is a group of devices, called Koevidors, that all behave the same way. Each device can be modeled as a current source in parallel with a resistance. When one of the Koevidors is connected to a resistor with a value of 330[], that Koevidor delivers 1.52[W] to that resistor. When one of the Koevidors is connected to a resistor with a value of 470[], that Koevidor delivers 4.18[W] to that resistor.

a) Find a model for the Koevidor, and draw it, labeling the components with numerical values. There is more than one valid answer. Give any valid answer.

b) Three of the Koevidors are connected in parallel, and also in parallel with a 560[] resistor. Find the power absorbed by the 560[] resistor in this circuit. There is more than one valid answer. Give any valid answer.

7. A device can be modeled using a voltage source in series with a resistance of value 25[Ω]. This device is connected to a circuit, as shown in Figure 1, and the voltage across the device, *vX* is measured as 8[V]. Two identical versions of this device are connected to a circuit using terminals **a** and **b** to show the polarity, as shown in Figure 2.

a) Draw the complete model of the device showing terminals **a** and **b**, and the numerical values of the components.

b) Find *iX*.



 Figure 1



 Figure 2

Numerical Solutions

1. a) 30.51[mW]

 b) 5.61[V]

2. *pabs,10/* *Ω /* = 8.851 [W]

3. *v3* = -0.6481 [V]

4. Solution omitted

5. Solution omitted

6. a) Solution omitted

 b) 8.0015[W], or 889[mW]

7. a) Solution omitted

 b) -83.8[mA]