EEE 31 Problem Set 1
Due: 23 January 2013, in class, at the start of the class

1. The terminal voltage and terminal current were measured on the device shown in Fig. 1(a), and the values of *v* and *i* are plotted in Fig. 1(b).

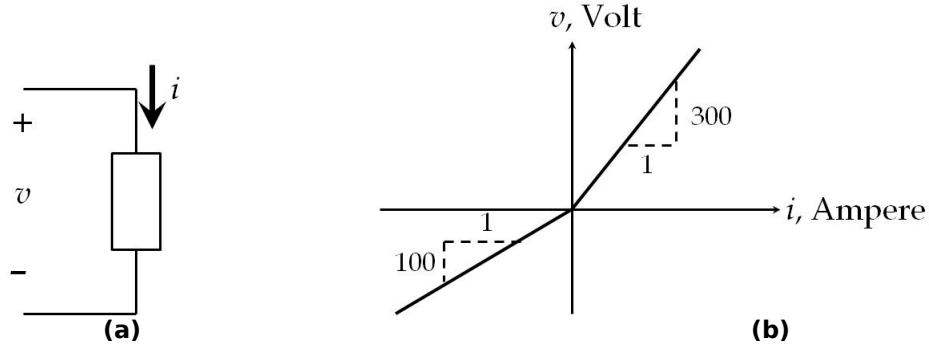

Figure 1. (a) Device and (b) its voltage-current plot

   a. The voltage shown in Fig. 2 is applied to the device. Sketch the current versus time plot for $0 \le t \le 4$s.

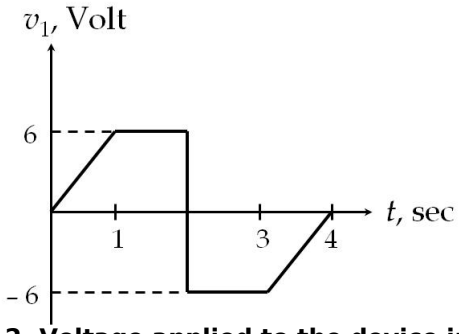

Figure 2. Voltage applied to the device in Fig. 1

   b. Sketch the power versus time plot for $0 \le t \le 4$s.
   c. Calculate the energy absorbed by the device over the time interval $0 \le t \le 4$s.

2. For the given circuit in Fig. 3, the sources are supplying power with the 5-V voltage source supplying 17.5 W.

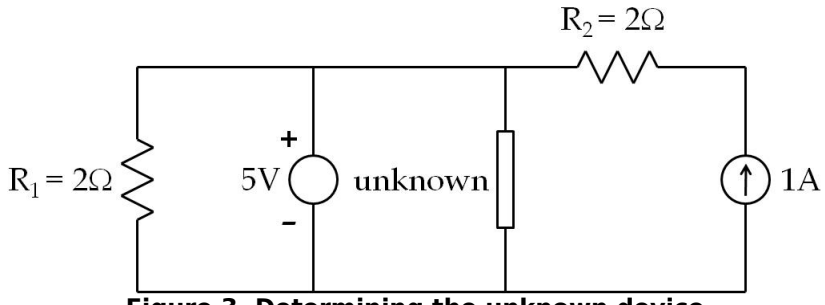

Figure 3. Determining the unknown device

   a. Calculate the power being absorbed by R_1 and R_2.
   b. Calculate the power being supplied by the 1-A current source.
   c. Is the unknown device absorbing or supplying power?

d. Identify two possible circuit elements for the unknown device.

3. Using nodal analysis, determine the power generated/absorbed by each of the sources in the circuit illustrated in Fig 4.

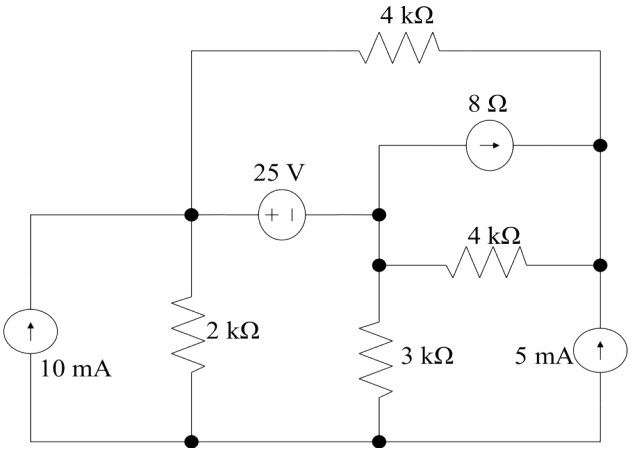

Figure 4. Using nodal analysis to determine the power generated

4. Express V_A and V_B as a function of your input V_{IN}.

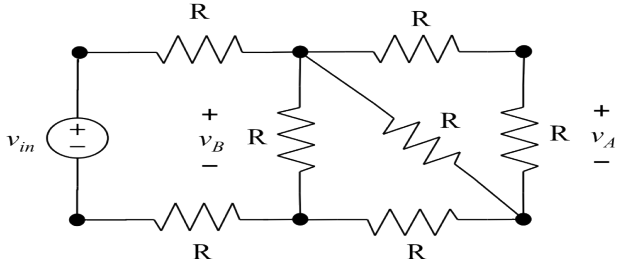

Figure 5. Expressing output functions

5. Determine the power generated by the 10V source.

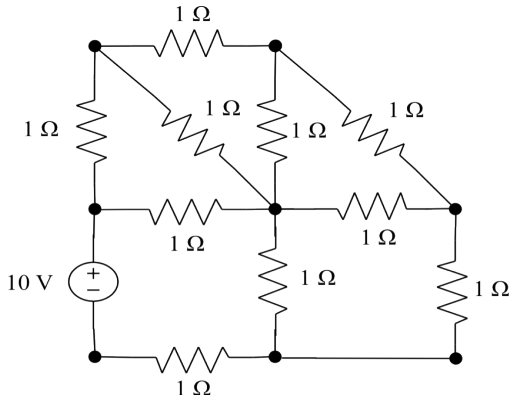

Figure 6. Computing power

6. Use the mesh-current method to find the total power being supplied in the circuit in Fig. 8.

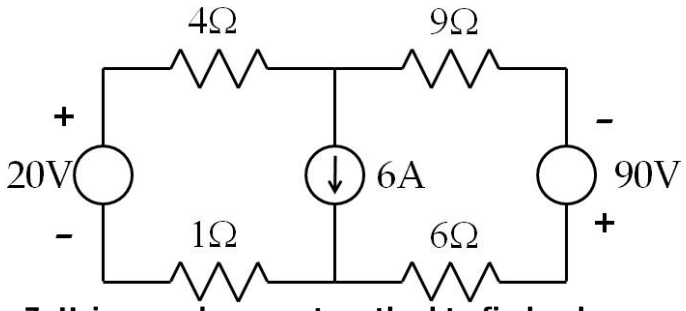

Figure 7. Using mesh-current method to find unknown power

7. (a) Use the mesh-current method to find v_0 in the circuit in Fig. 9.
   (b) Calculate the power being delivered by the dependent source.

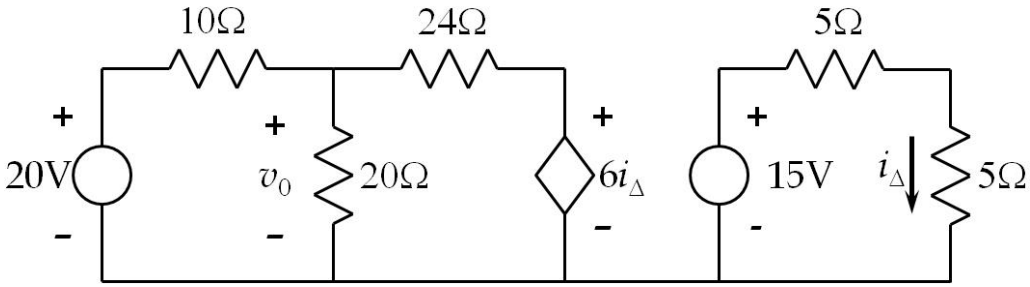

Figure 8. Using mesh-current method to find v_0

8. Using nodal analysis, find V_o and I_o in this circuit.

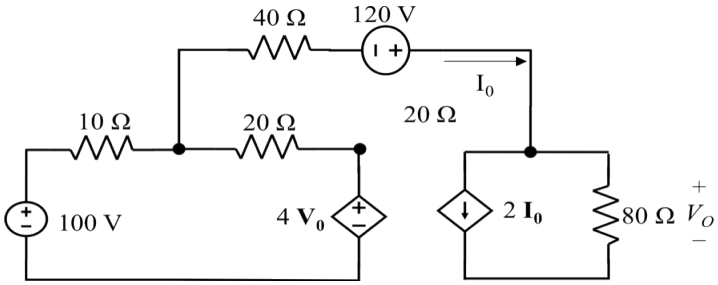

Figure 9. Using nodal analysis to find the unknown parameters