EE 100 HOMEWORK SET 3 Fall 2004

Issued: September 13, 2004 Due: September 20, 2004

1. Do Problem 2.12.

2. Do Problem 2.15.

3. Do Problem 2.24.

4. Do Problem 2.25.

5. Do Problem 2.31.

The above problems are from the textbook(Rizzoni).

6. In the circuits shown in Fig. P1.24, let v_k and i_k be the branch voltage and current in circuit A and $\hat{v}_k$ and $\hat{i}_k$ be the branch voltage and current in circuit B. The following measurements have been obtained:

$$i_s = 1\text{ A} \qquad \hat{v}_s = 3\text{ V} \qquad v_L = 2\text{ V}$$

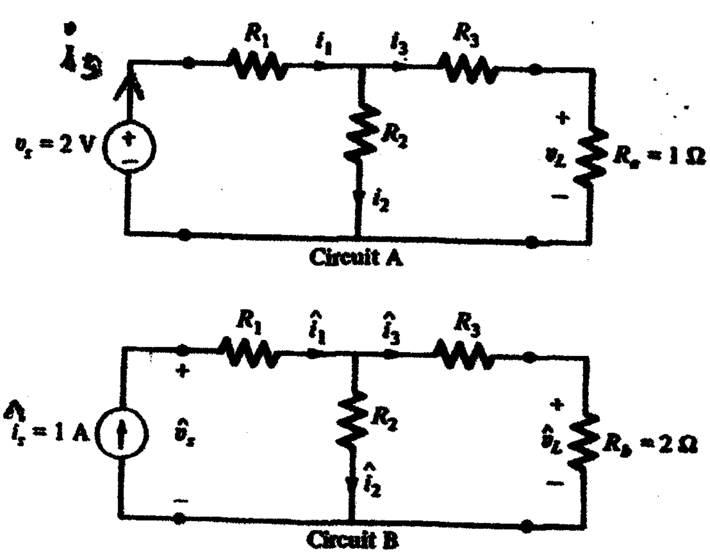

Figure P1.24

Use Tellegen's theorem to determine $\hat{v}_L$, where R_1, R_2, and R_3 are unknown resistors satisfying Ohm's law.

Hint: Apply Tellegen's Theorem to Circuit A and Circuit B twice and subtracting the results. All elements, including the sources, must use Associated Reference current direction and voltage polarity

2.12 For the circuit shown in Figure P2.12:

a. Determine which components are absorbing power and which are delivering power.

b. Is conservation of power satisfied? Explain your answer.

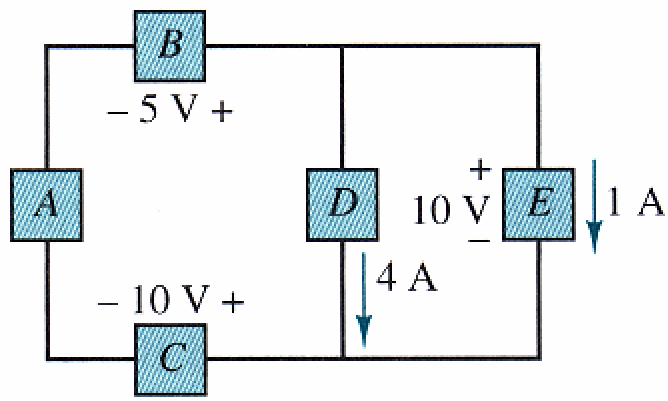

Figure P2.12

2.15 For the circuit shown in Figure P2.15, determine the power absorbed by the variable resistor R, ranging from 0 to 20 Ω. Plot the power absorption as a function of R.

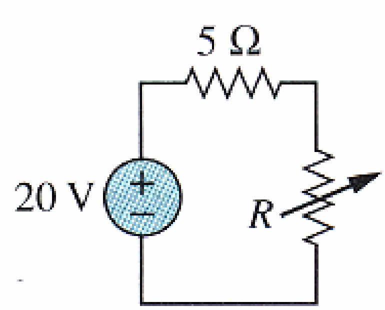

Figure P2.15

2.24 For the circuit shown in Figure P2.24, find

a. The currents i_1 and i_2.

b. The power delivered by the 3-A current source and by the 12-V voltage source.

c. The total power dissipated by the circuit.

Let $R_1 = 25\ \Omega$, $R_2 = 10\ \Omega$, $R_3 = 5\ \Omega$, $R_4 = 7\ \Omega$, and express i_1 and i_2 as functions of v. (*Hint:* Apply KCL at the node between R_1 and R_3.)

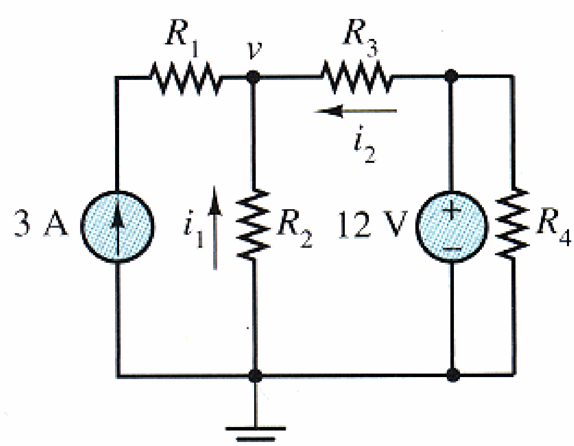

Figure P2.24

2.25 Determine the power delivered by the dependent source in the circuit of Figure P2.25.

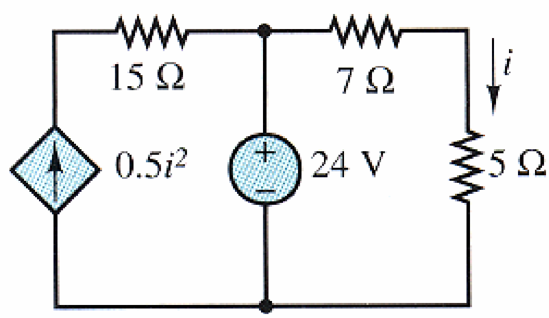

Figure P2.25

2.31 Use Kirchhoff's current law and Ohm's law to determine the current in each of the resistors R_4, R_5, and R_6 in the circuit of Figure P2.31. $V_S = 10$ V, $R_1 = 20\ \Omega$, $R_2 = 40\ \Omega$, $R_3 = 10\ \Omega$, $R_4 = R_5 = R_6 = 15\ \Omega$.

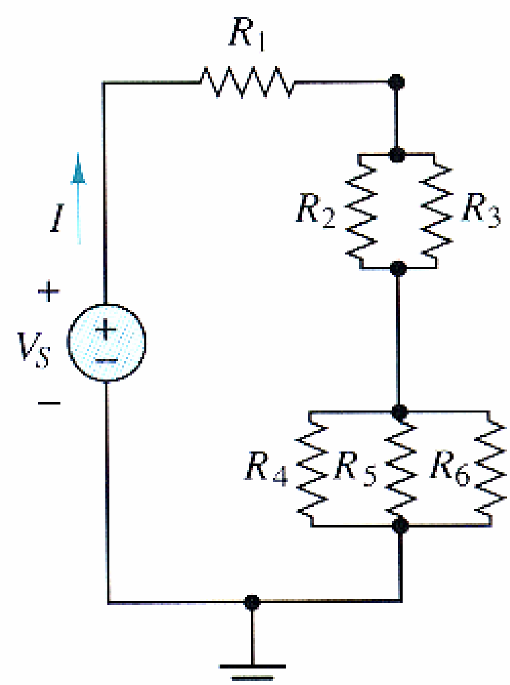

Figure P2.31