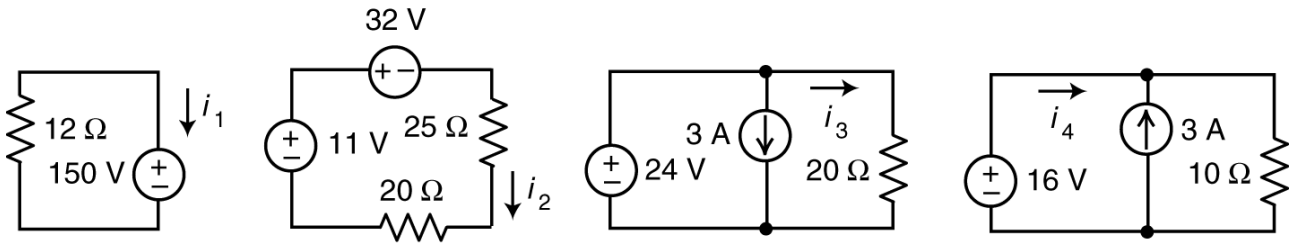
ES 250 1st Midterm Exam - Fall 2013

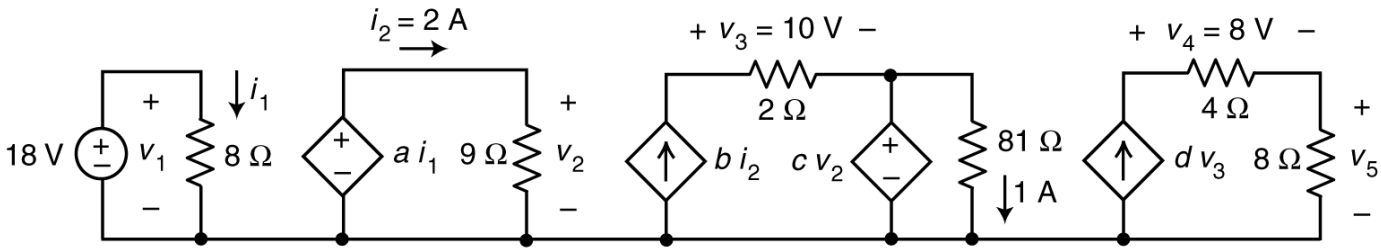
Name _____ _____ Student #_____

1. Here are 4 separate circuits. Determine the values of i_1, i_2, i_3 and i_4.



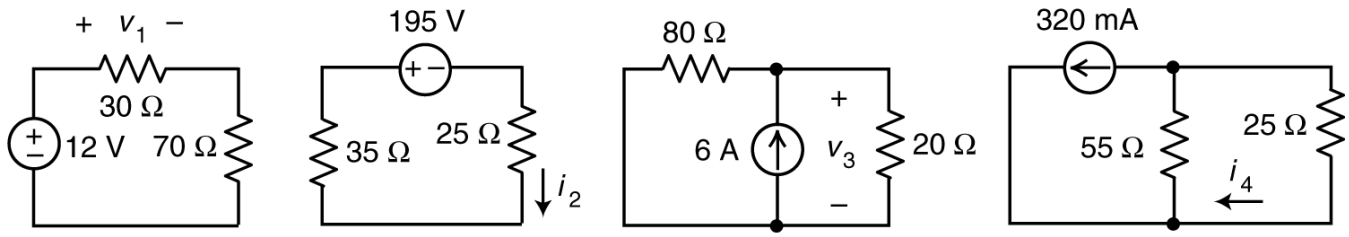
i_1 = ___−12.5____ A, i_2 = ___−0.4667____ A, i_3 = ___1.2____ A and i_4 = ___−1.4____ A.

2. Determine the values of the gains of the dependent sources.



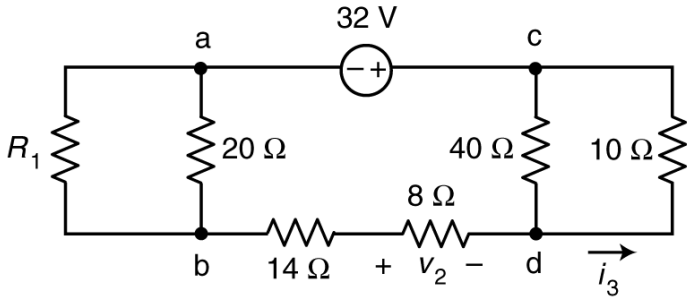
a = _____8____ V/A, b = ____2.5___A/A, c = ___4.5____V/V and d = ___0.2____A/V.

3. Here are 4 separate circuits. Determine the values of v_1, i_2, v_3 and i_4.

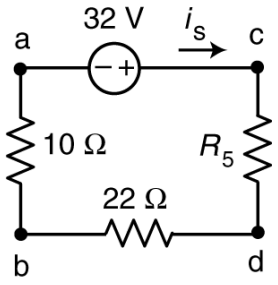


v_1 = ___3.6____ V, i_2 = ___–3.25____ A, v_3 = ___96____ V and i_4 = ___–220____ mA.

4.



original circuit

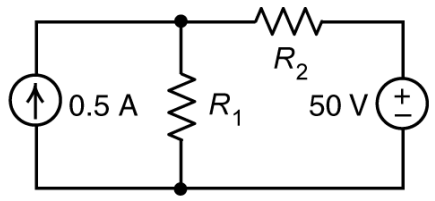


equivalent circuit

The equivalent circuit on the right is obtained from the original circuit on the left by replacing parallel combinations of resistors by equivalent resistors. The value of the current in the equivalent circuit is i_s = 0.8 A. Determine the values of the following:

R_1 = ____20___ Ω, R_5 = ____8____ Ω, v_2 = ____–6.4___ V, and i_3 = ___–0.64____ A.

5.

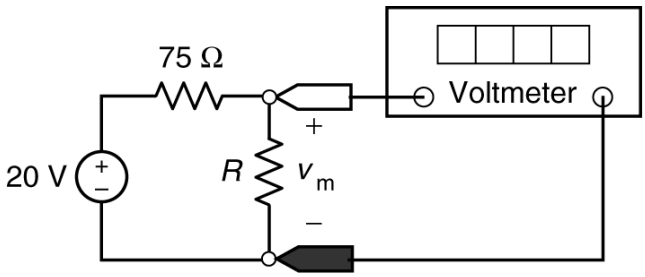


The voltage source supplies 40 W of power and the current source supplies 13 W of power. Determine the values of the resistances.

R_1 = ____20_____ Ω and R_2 = ____30____ Ω

6. Consider this voltage divider circuit. The vertical resistor represents a temperature sensor. Suppose the resistance R, in Ω, is related to the temperature T, in °C, by the equation

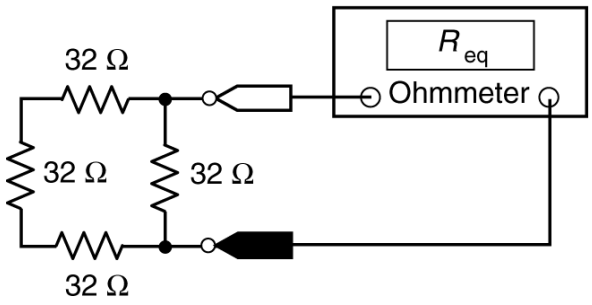
$$R = 50 + 1.5T$$

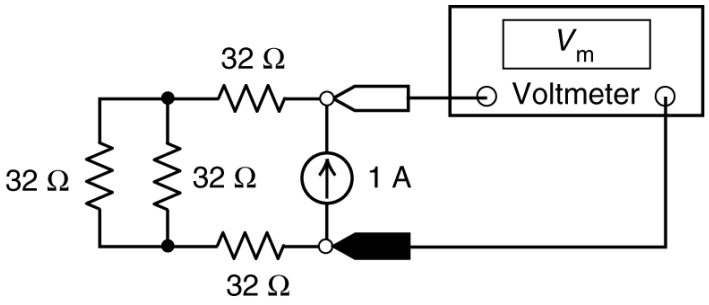


(a) Suppose the temperature is T = 80 °C. The voltage measured by the meter will be v_m = __13.9__V.

(b) Suppose instead that v_m = 10.5 V. The corresponding temperature is T = __21.93__ °C.

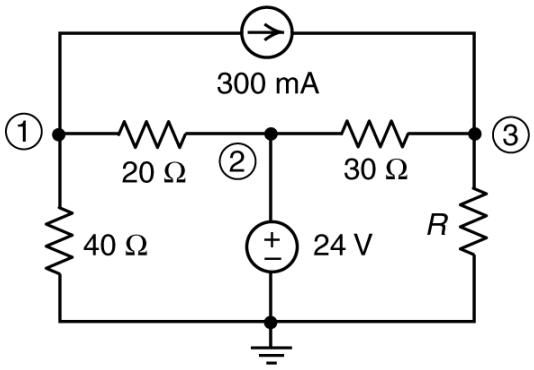
7. Here are two ways to measure equivalent resistance. Determine the value of the resistance R_{eq} measured by the Ohmmeter and of the voltage V_m measured by the voltmeter.





R_{eq} = ____24____ Ω and V_m = ____80____ V

8.



Encircled numbers are node numbers. The corresponding node voltages are:

$$v_1 = 12 \text{ V},\ v_2 = 24 \text{ V and } v_3 = 19.8 \text{ V}$$

The resistance of the resistor at the right of the circuit is

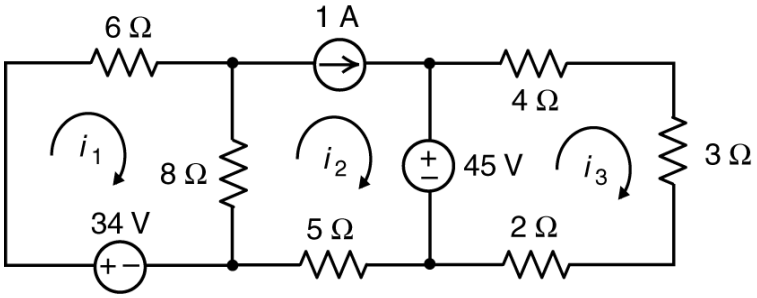
$$R = \text{\_\_\_45\_\_\_\_\_}\ \Omega.$$

The power **received** by the 40-Ω resistor is ___3.6___W

The power supplied by the independent voltage source is ____17.76___W.

The power supplied by the independent current source is ____2.34___W.

9.



The mesh currents in this circuit are:

$$i_1 = 3 \text{ A},\quad i_2 = 1 \text{ A}$$

and $$i_3 = 5 \text{ A}$$

Determine the following powers:

The 34-V voltage source supplies ____102___W.

The 45-V voltage source supplies ____180___W.

The 8-Ω resistor receives ____32___W.

The 5-Ω resistor receives ____5____W.