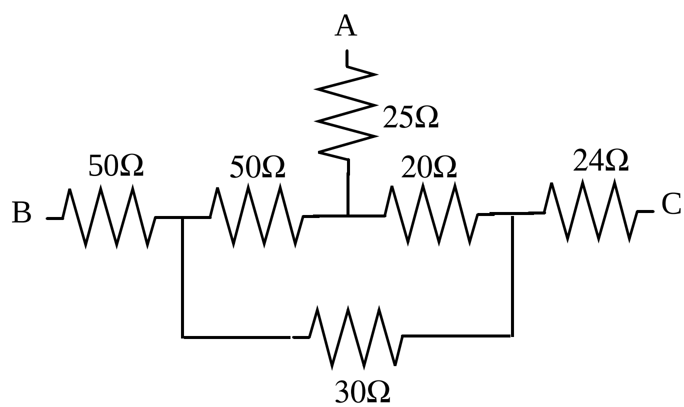
CHAPTER 4

CHAPTER 4: PROBLEMS

4.1 Determine the value of resistance of the network shown below that would be measured between:.

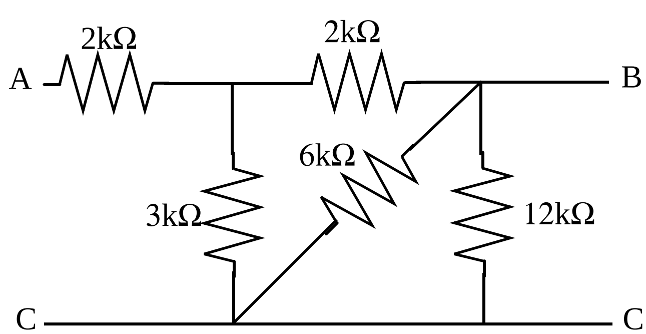


(a) terminals A and B (terminal C is open)

(b) terminals B and C (terminal A is open)

(c) terminals A and C (terminal B is open)

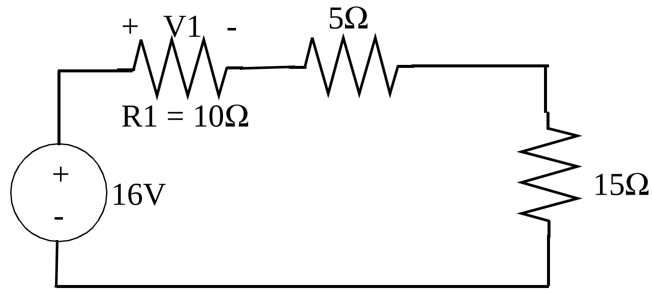
4.2 Determine the value of resistance of the network below that you would measre between:



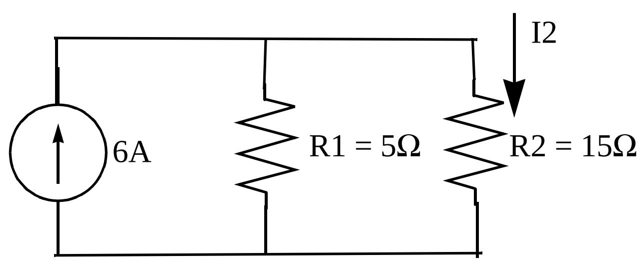
(a) terminals A and C

(b) terminals B and C

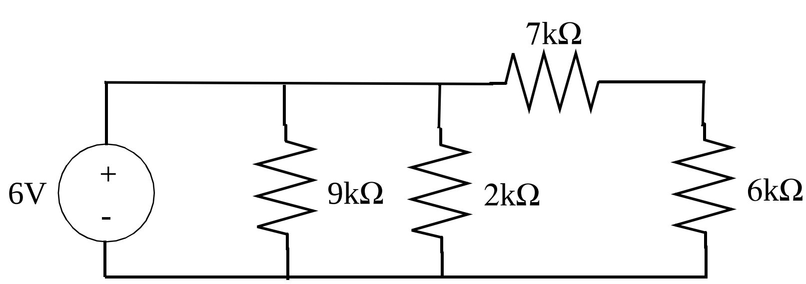
4.3 Find the voltage, V1, across resistor R1 below.



4.4 Find the current, I2, through resitor R2 below.



4.5 Consider the circuit shown below.



(a) Find the voltage across the 2kΩ resistor.

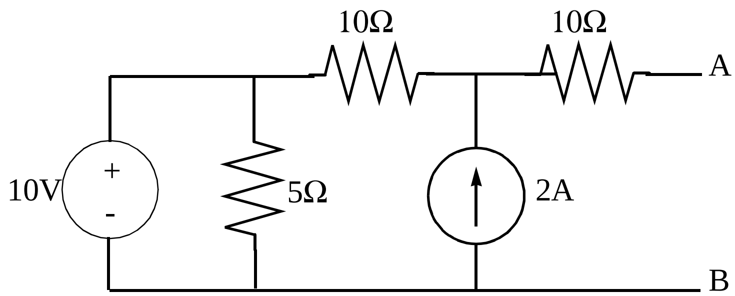
(b) Find the voltage across the 6kΩ resistor.

(c) Find the current flowing through the 6kΩ resistor.

(d) Find the equivalent resistance obtained by combining all 4 resistors as shown in the above circuit into one resistor connected across the 6V supply.

(e) Redraw the circuit and show where you would place an ammeter in this circuit to measure the current flowing the 9kΩ resistor.

4.6 Consider the following circuit.

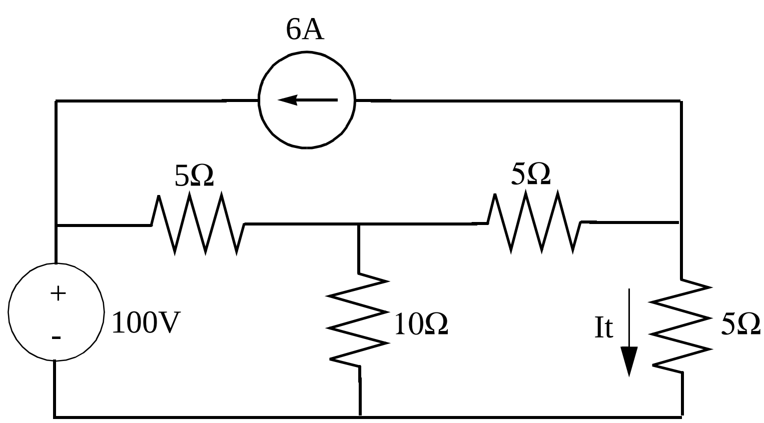


(a) Find Voc, the open circuit voltage between A and B.

(b) Find Isc, the value of the current between A and B when terminals A and B are shorted together.

(c) Find and draw the Thevenin equivalent circuit from the viewpoint of terminals A and B. Be sure to label your drawings.

4.7 In this problem you will use superposition to find It.

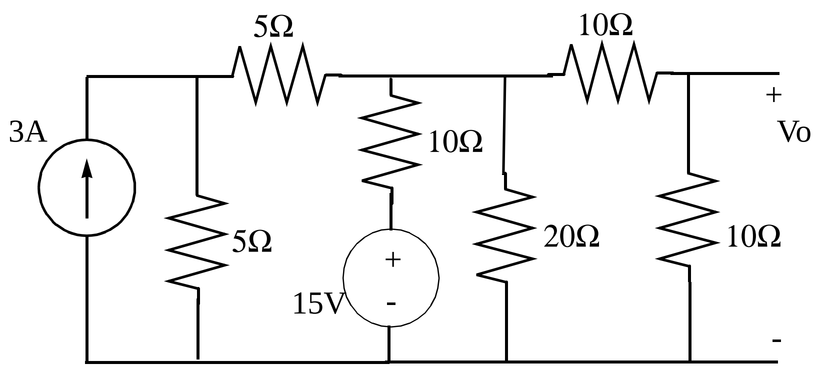


(a) Find Iv, the contribution to It in this circuit from the voltage source.

(b) Find Is, the contribution to It in this circuit fromt he current source.

(c) Using the principle of superposition, determine It.

4.8 For the circuit shown below, use superposition to solve for Vo by solving for Vov and Vot, the contributions to Vo from the independent voltage and current sources. (Hint: this problem is easier to solve using equivaltent resistances than nodal analysis, though either will work.)



4.9 For the resistive voltage divider circuit shown in Fig. P4.1 please answer the following questions:

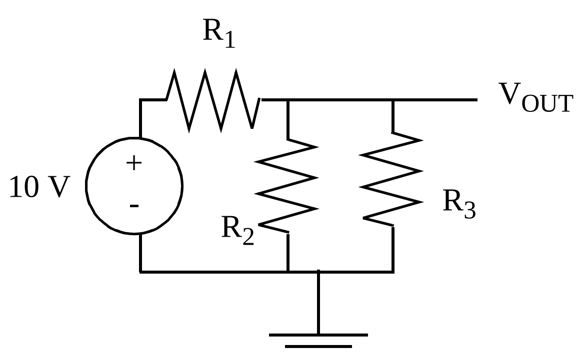


Figure P4.1 Resistive voltage divider circuit.

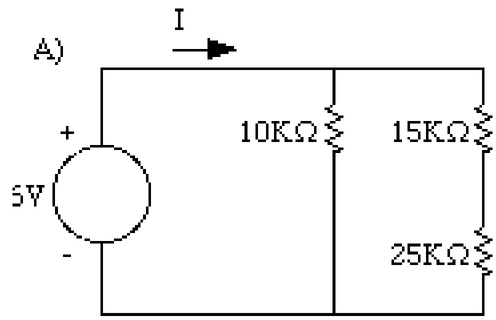
(a) If R_1= 1000Ω, R_2= 1000Ω, and R_3= 1000Ω, what is the value of V_{OUT}?

(b) How much power is dissipated in R_3 under the conditions described in Part (a) of this problem?

(c) Resistors are typically available with the following power dissipation ratings: 1/4 Watt, 1/2 Watt, 1 Watt, and 2 Watt. The higher its power dissipation rating, the larger and more costly the resistor is. If you wanted to minimize the cost of the circuit, but not have any resistor dissipating more power than its maximum power dissipation rating, what would you choose for the power dissipation rating for R_1, R_2, and R_3, when operating under the conditions described in Part (a) of this problem?

4.10 For the circuit shown in Fig. P4.1 you are asked to change the value for component R_3 in order to make V_{OUT} = 2V. The values of the other resistors are unchanged: R_1= 1kΩ, R_2= 1kΩ. What value would you pick for R_3?

4.11 Determine the current, I, for both circuits shown in Fig. P4.2.



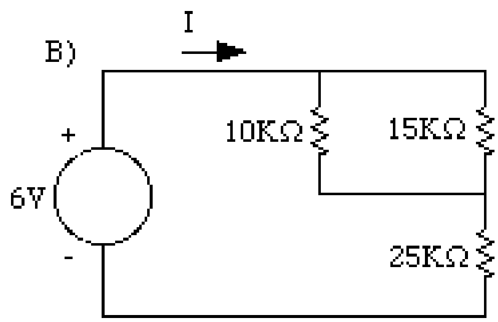


Figure P4.2 Two series parallel resistor circuits

4.12 Determine the voltage across the terminals, V_0, for the circuit shown in Fig. P4.3.

4.13 Determine the voltage across the terminals, V_0, for the circuit shown in Fig. P4.4.

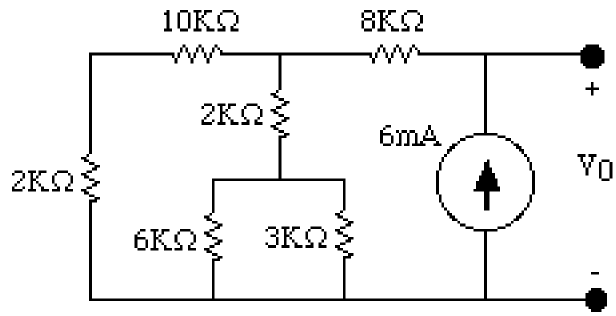


Figure P4.3 Circuit for analysis.

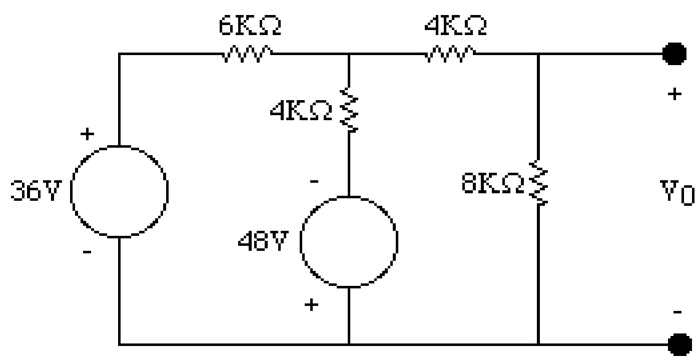


Figure P4.4 Circuit for analysis.

4.14 Find the Thevenin and Norton equivalent circuit representations for the circuit shown in Fig. P4.5 for the case where Vs=60V, R1=20Ω, R2=4Ω, R3=10Ω.

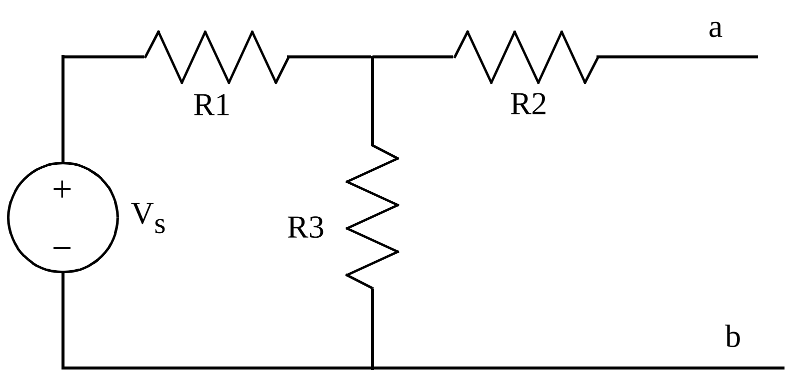


Figure P4.5 Two terminal circuit for analysis.

4.15 Using linear superposition, find Vo for the circuit shown in Fig. P4.6 assuming that Vs=5V, Is=1.2A, R1=16Ω, R2=20Ω, R3=6Ω.

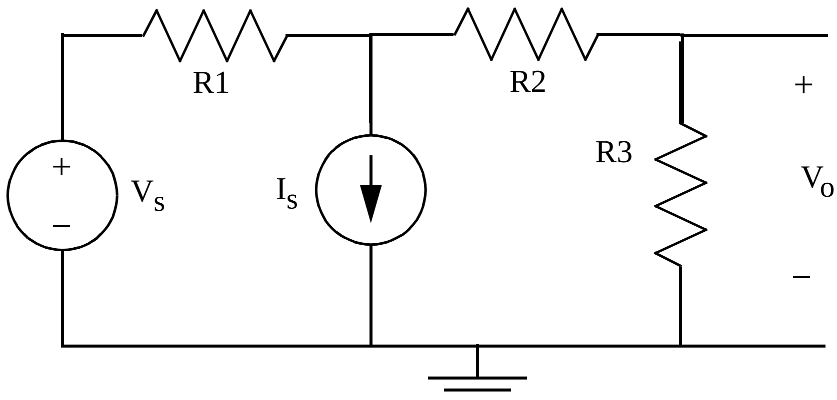


Figure P4.6 Circuit with voltage source, current source and resistors.

4.16 Assume that you are given a speaker that can be modelled as an 8Ω resistor and high impedance headphone can be modelled as a 2KΩ resistor. Assume that your audio amplifier can be modelled as a voltage source with a value of 4V (you should ignore the fact that audio signals actually vary with time and just assume that the output of the amplifier is constant like a battery).

(a) How much power would be dissipated in the speaker and the headphone if they were connected to the amplifier in series?

(b) How much power would be dissipated in the speaker and the headphone if they were connected to the amplifier in parallel?

4.17 For the circuit shown in Fig. P4.7 the component values are R_1= 1000Ω, R_2= 1000Ω, and R_3= 1000Ω. Please answer the following questions.

(a) Please draw the Thevenin equivalent circuit and indicate the values for the voltage source and the resistor.

(b) Please draw the Norton equivalent circuit and indicate the values for the current source and the resistor.

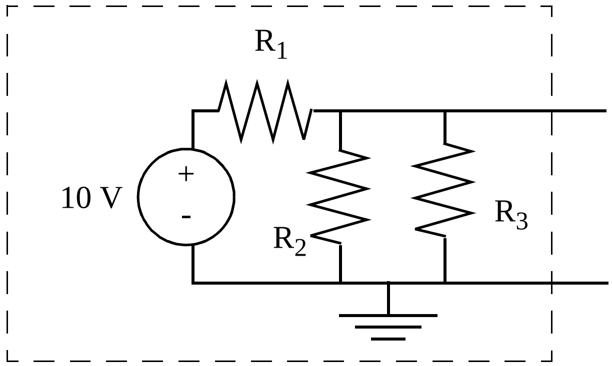


Figure P4.7 Voltage source and resistor divider circuit.

4.18 For the circuit shown in Fig. P4.8 the component values are R_1= 1000Ω, R_2= 1000Ω, and R_3= 1000Ω. Please answer the following questions.

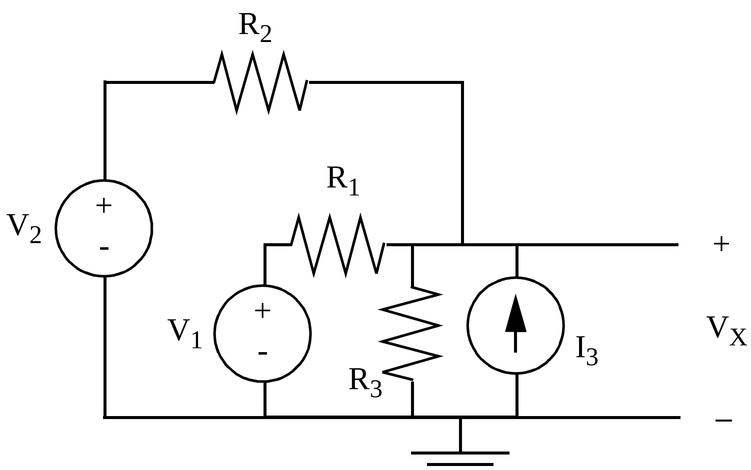


Figure P4.8 Resistive voltage divider circuit.

(a) Please solve for V_X as a function of V_1 under the assumption that $V_2 = 0$ and $I_3 = 0$.

(b) Please solve for V_X as a function of V_2 under the assumption that $V_1 = 0$ and $I_3 = 0$.

(c) Please solve for V_X as a function of I_3 under the assumption that $V_1 = 0$ and $V_2 = 0$.Please solve for V_X as a function of I_3, V_1 and V_2 simultaneously using the node method.

4.19 For the circuit shown in Fig. P4.9 determine V_X as a function of V_S. The component values are $R_1 = 1000\Omega$, $R_2 = 1000\Omega$, and $R_3 = 1000\Omega$. HINT: remember the voltage divider.

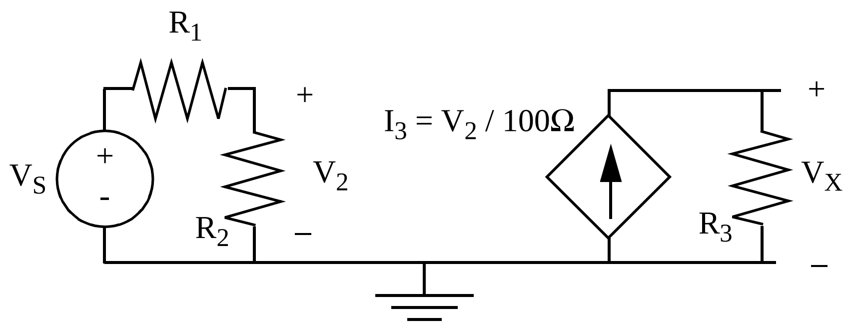


Figure P4.9 Circuit with a voltage dependent current source.

4.20 Please answer the following questions concerning the circuit shown in Fig. P4.10. Note, this circuit contains a current-controlled current source: I_X.

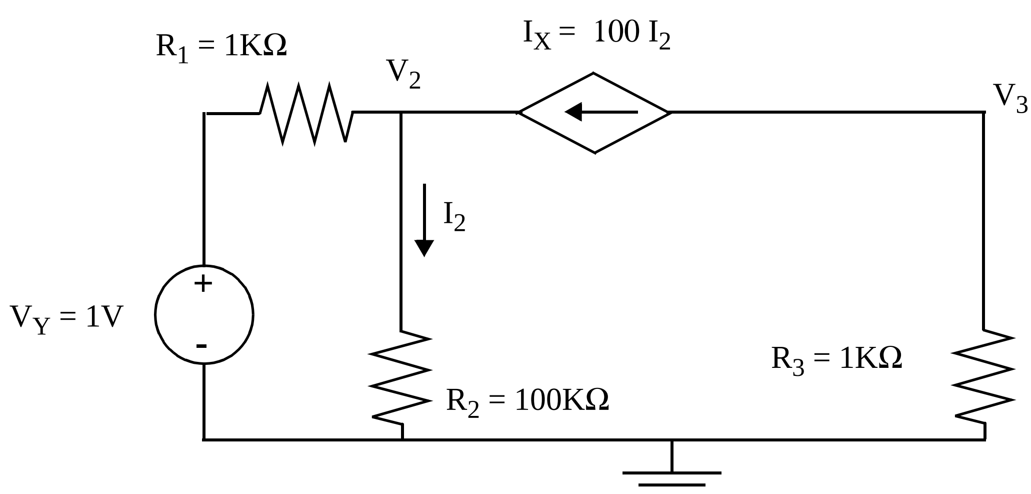


Figure P4.10 Circuit with a current dependent current source.

(a) What is the value of the controlling current I_2?

(b) What is the value of the internal voltage, V_2?

(c) What is the value of the output voltage, V_3?

4.21 Determine the Thevenin and Norton equivalent circuits for the network shown in Fig. P4.11 between terminals A and B.

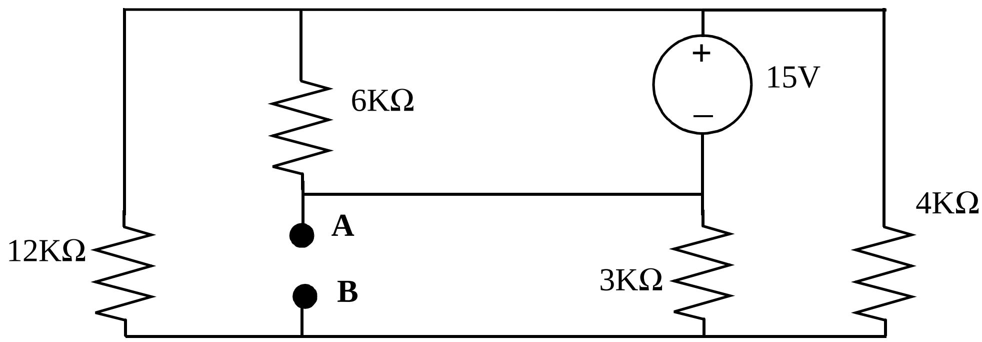


Figure P4.11 Circuit for two-terminal element.