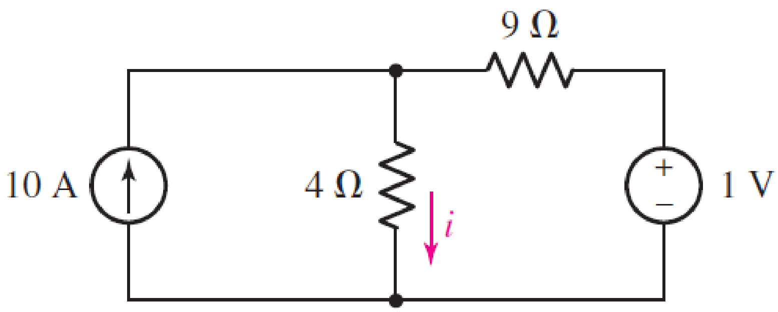
Basic Electronics (ECE113)

Tutorial 3

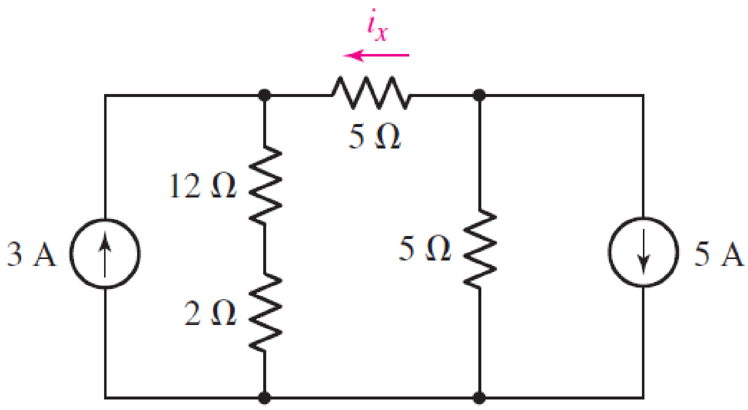
Q1.

(a) Employ superposition to determine the current labelled *i* in the circuit shown below.
(b) Express the contribution the 1 V source makes to the total current *i* in terms of a percentage.
(c) Changing only the value of the 10 A source, adjust the circuit shown below so that the two sources contribute equally to the current *i*.



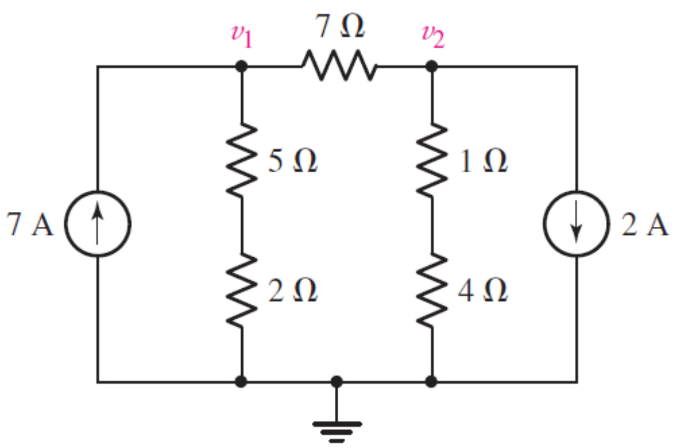
Q2.

(a) Employ superposition to obtain the individual contributions each of the two sources in Fig. shown below, makes to the current labelled i_x.
(b) Adjusting only the value of the rightmost current source, alter the circuit so that the two sources contribute equally to i_x.

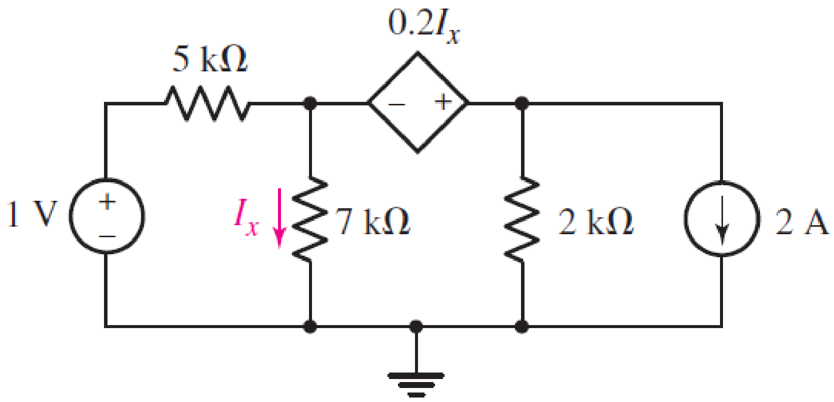


Q3.

(a) Determine the individual contributions of each of the two current sources shown in Fig. shown below to the nodal voltage labelled v_2.
(b) Instead of performing two separate ltspice simulations, verify your answer by using a single dc sweep.



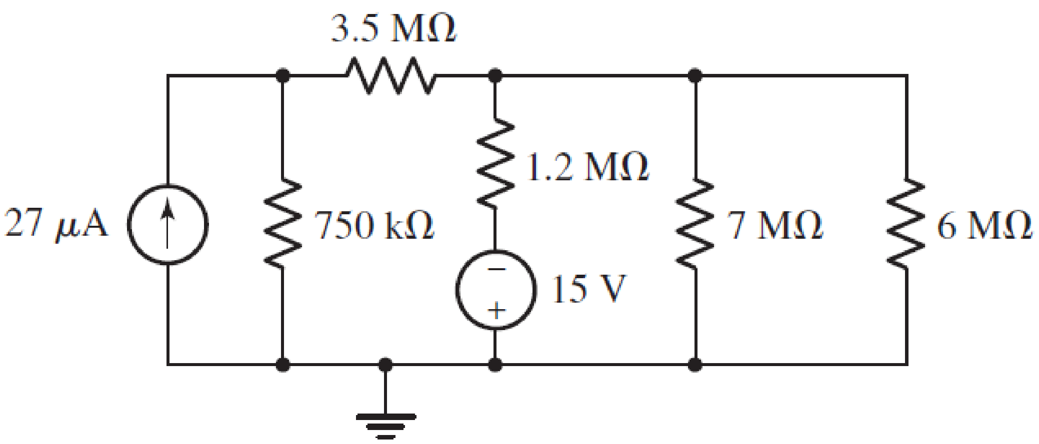
Q4. Employ superposition principles to obtain a value for the current I_x as labelled in Fig. shown below



Q5.

(a) Using repeated source transformations, reduce the circuit of Fig. shown below to a voltage source in series with a resistor, both of which are in series with the 6 M*Ω* resistor.

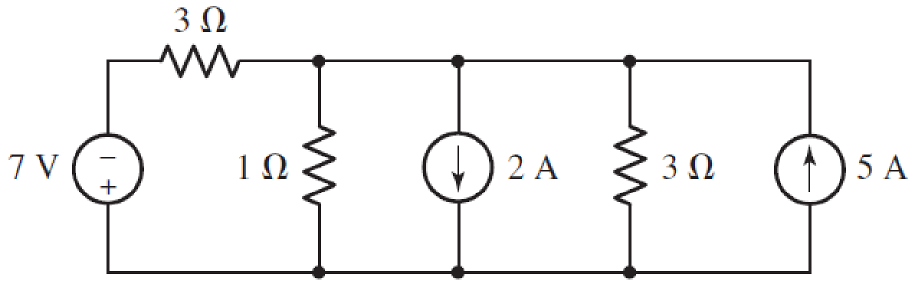
(b) Calculate the power dissipated by the 6 M*Ω* resistor using your simplified circuit.



Q6.

(*a*) Using as many source transformations and element combination techniques as required, simplify the circuit shown below so that it contains only the 7 V source, a single resistor, and one other voltage source.

(*b*) Verify that the 7 V source delivers the same amount of power in both circuits.

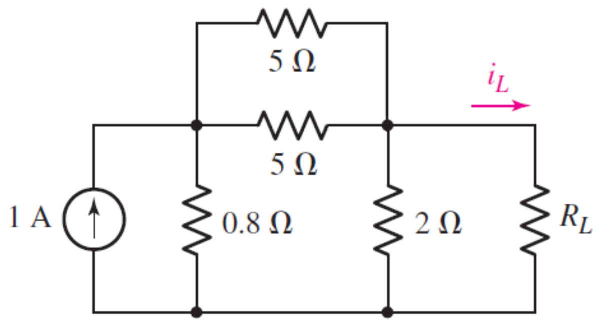


Q7.

(a) Obtain the Norton equivalent of the network connected to R_L in Fig. shown below

(b) Obtain the Thévenin equivalent of the same network.

(c) Use either to calculate i_L for R_L = 0 Ω, 1 Ω, 4.923 Ω, and 8.107 Ω.



Q8.

(a) Employ Thevenin's theorem to obtain a simple two-component equivalent of the circuit shown in Fig. shown below.

(b) Use your equivalent circuit to determine the power delivered to a 100 Ω resistor connected to the open terminals.

(c) Verify your solution by analyzing the original circuit with the same 100 Ω resistor connected across the open terminals.