EC2015 Electric Circuits and Networks - Tutorial 6

September 20, 2019

***Topics covered*— Superposition theorem, Source transformation theorem, Thevenin theorem, Norton theorem**

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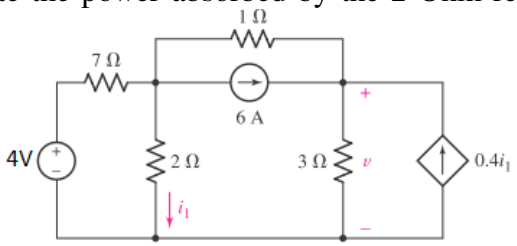
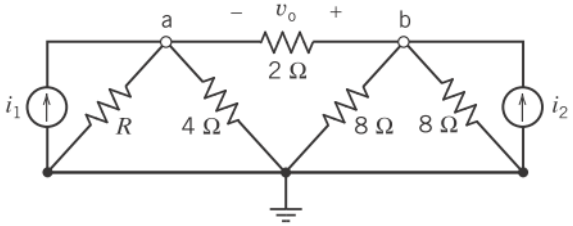
1. Employ superposition to determine the individual contribution from each independent source to the voltage v and i_1 as labeled in the circuit. Compute the power absorbed by the 2 Ohm resistor.

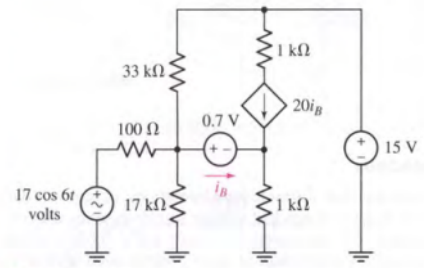


2. For the following circuit, the current source i_2 is used to adjust the relationship between the input and output. Determine values of the current i_2 and the resistance R, that cause the output to be related to the input by the equation

$$v_o = -0.5i_1 + 4$$

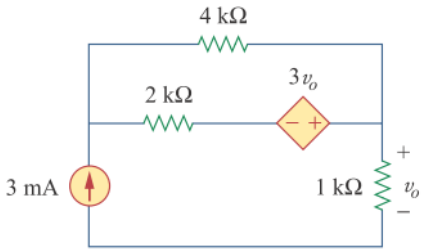


3. The following circuit is a commonly used as a model for bipolar junction transistor amplifier. Find the value of base current i_B using superposition theorem.

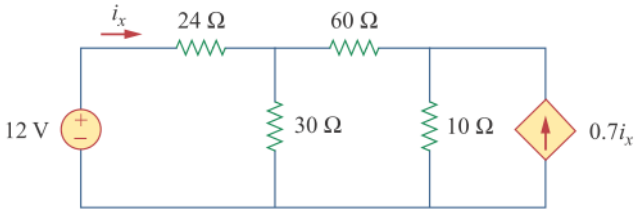


4. For the given circuits here, compute the voltage v_0 (in the 1st circuit) and i_x (in the 2nd circuit) using source transformation technique.

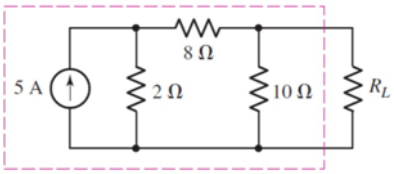
a.

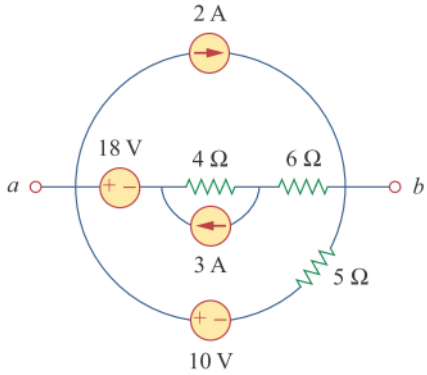


b.



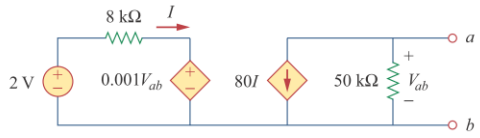
5. Using repeated source transformations, determine the Thevenin and Norton equivalent (i) for the highlighted portion of 1st the network given below and (ii) across the terminals a and b of the 2nd network.



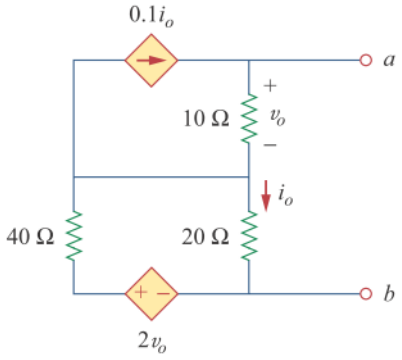


6. Find all possible (Thevenin and Norton) equivalent circuits for the following networks across the marked terminals:

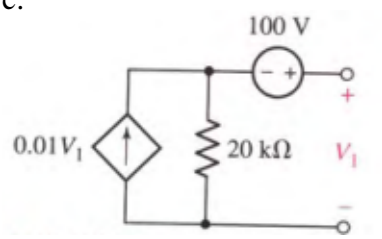
a.



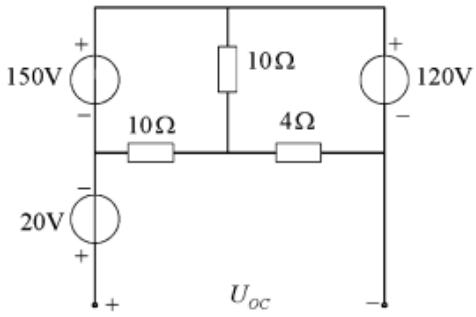
b.



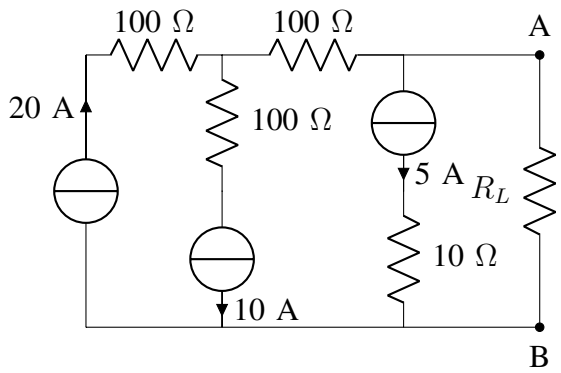
c.



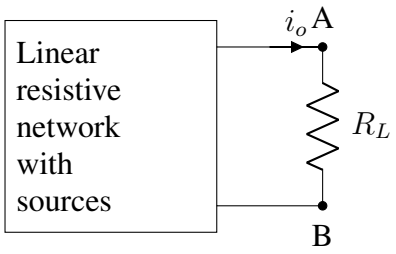
d.



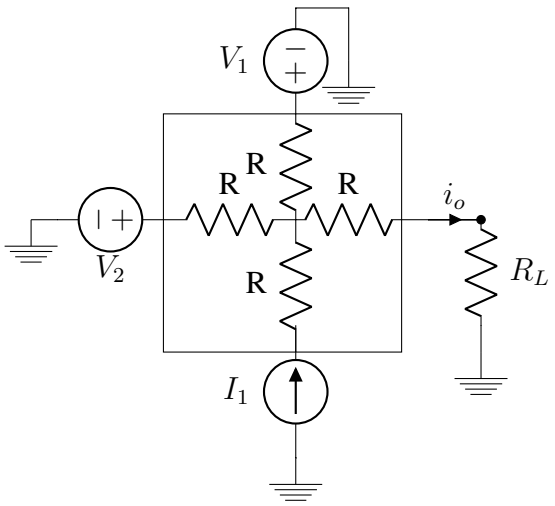
e.



7. The following box consist of linear resistive circuit with sources. It gives a current $i_o = 2A$ when $R_L = 3\Omega$ and current $i_o = 1A$ when $R_L = 8\Omega$. Find the value of i_o when $R_L = 5\Omega$.



8. Find the generalized equivalent circuit for the following network seen from load resistance R_L and solve the following problems.
(a) Find the value of i_o when $R_L = 5\Omega$, $R = 10\Omega$, $I_1 = 5A$,$V_1 = 10V$ and $V_2 = 5V$.
(b) Find the value of i_o when $R_L = 5\Omega$, $R = 10\Omega$, $I_1 = 5A$,$V_1 = 0V$ and $V_2 = 5V$.



9. In an industry three DC generators are connected in parallel to supply electrical power to the load as shown below. Draw the equivalent source seen by load R_L.