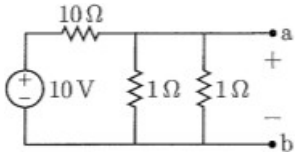
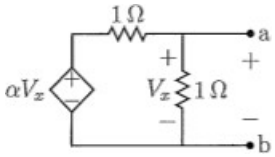
Thevenin and Norton

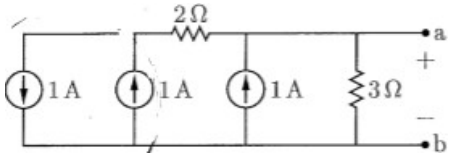
1. Calculate the Norton current at the terminals ab for the circuit below:



2. Calculate the Thevenin resistance at the port ab: (Hint: answer is in terms of α)



3. Calculate Thevenin voltage at the port ab:

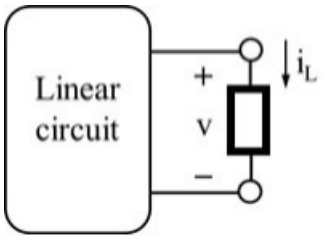


4. The linear circuit below consists of resistors and sources only. Experiments were performedto evaluate circuit parameters. Two current/voltage relationships were found to be:

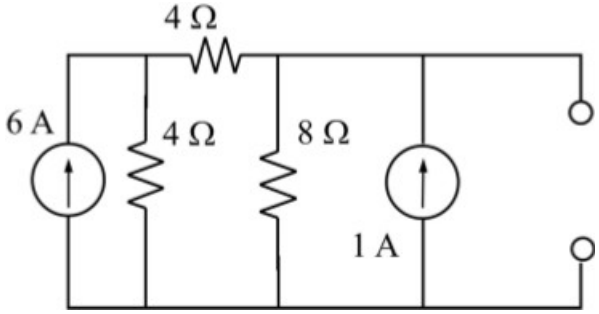
v = 10 V, iL = 0 A

v = -10 V, iL = 2 A.

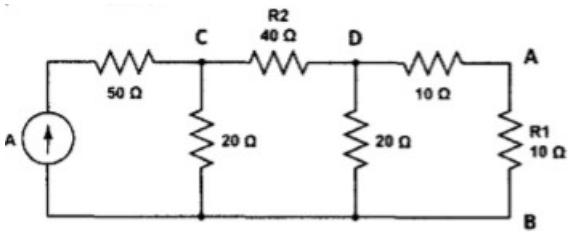
Find the value of the Thevenin equivalent resistance, RTH, for the linear circuit.



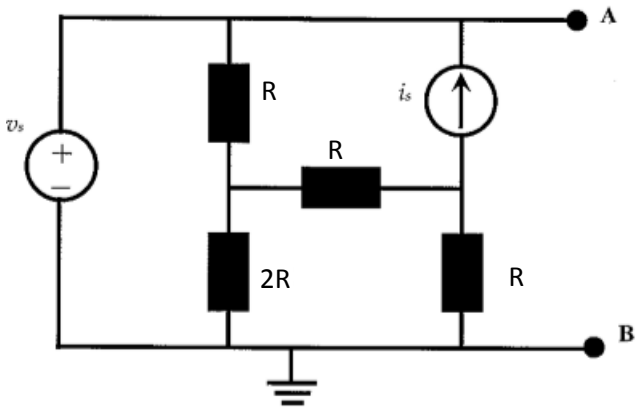
5. Using source transformations or any other analysis technique, find the value of the Norton Equivalent current source (in A) for the circuit below.



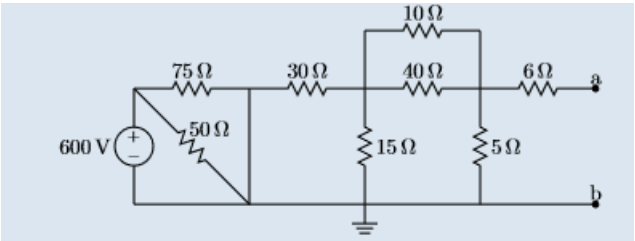
6. Find the Thevenin Equivalent Resistance with R1 as the load (between A and B)



7. From the previous question, Find the Norton Equivalent Resistance with RZ as the load (between C and D).
8. For the sake of this question consider the black boxes to be resistances. Find the equivalent Thevenin resistance and voltage.



9. Find the Thevenin equivalent circuits at port a-b.



10. Find the Norton equivalent circuit at port a-b for he above circuit

Answers:

1. 1 A
2. 1/(2-α)
3. 3V
4. 10 Ω
5. In =4A
6. 25 Ω
7. 30 Ω
8. Rth = 0. Vth = Vs
9. Page 171 of textbook Example 4.6.1
10. Page 171 of textbook

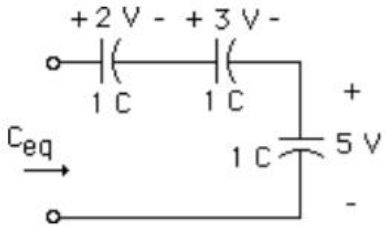
First Order RC and RL circuits

Question 1: 1998 Exam 2 Spring

On the series capacitor circuit below the voltages and charges are as indicated. Notice that 1 C (coulomb) of charge is stored in each capacitor. The equivalent capacitance is:

(1) 0.3 F (2) –3 F (3) 13 F (4) 10 F

(5) –3.3 F (6) none of the above



Answer: none of the above, 0.1F

Question 2: 1998 Spring Exam 2

Workout Problem. The circuit below has two sources and two switches. Switch S1 opens at t = 0 seconds and switch S2 opens at t = 1 second. You are to determine the capacitor voltage for t ≥ 0 as per the questions below.

(a) (8 pts) Draw an equivalent circuit valid for t < 0 and then compute $v_C(0-)$.

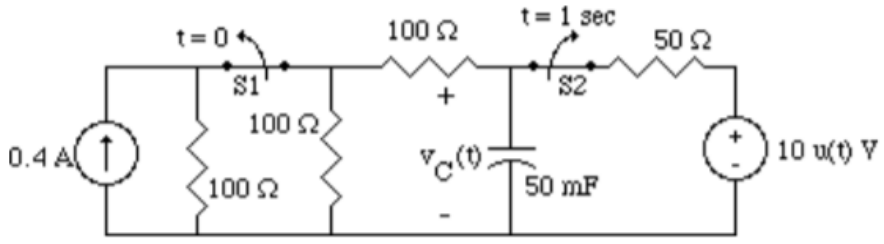
(b) (3 pts) Find $v_C(0+)$. Explain/justify.

(c) (16 pts) Draw the equivalent circuit which includes the capacitor, valid for 0 < t < 1, and compute $v_C(t)$ for 0 < t < 1. Indicate the formula for the capacitor voltage and give the numerical values for the quantities in the formula.

(d) (3 pts) Find $v_C(1-)$ and $v_C(1+)$.

(e) (8 pts) Draw the equivalent circuit which includes the capacitor, valid for t ≥ 1, and compute $v_C(t)$ for t ≥ 1. Again you must specify a formula and the various numerical quantities in the formula.

(f) (2 pts) Provide a rough sketch of the response for t ≥ 0.



Answers: