MASSACHVSETTS INSTITVTE OF TECHNOLOGY
Department of Electrical Engineering and Computer Science

6.002 – Electronic Circuits
Fall 2001

Problem Set 2

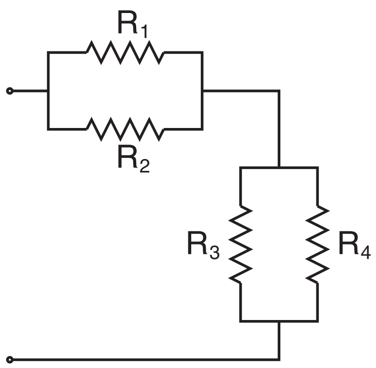
Issued: September 13, 2001 Due: September 21, 2001

Reading:

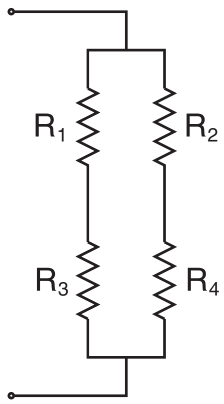
- A&L Sections 2.6, 3.3.3, 7.1, 7.2 for Tuesday, September 18
- A&L Sections 6.6, 7.3, 7.4, 7.8, 7.9 for Thursday, September 20

Problems:

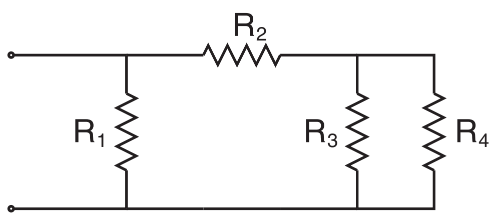
Problem 2-1. Calculate the Thévenin equivalent resistance at the indicated port for each of the networks shown below.



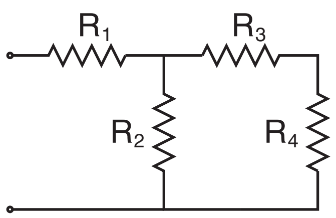
(i)



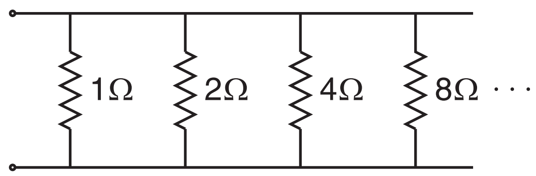
(ii)



(iii)

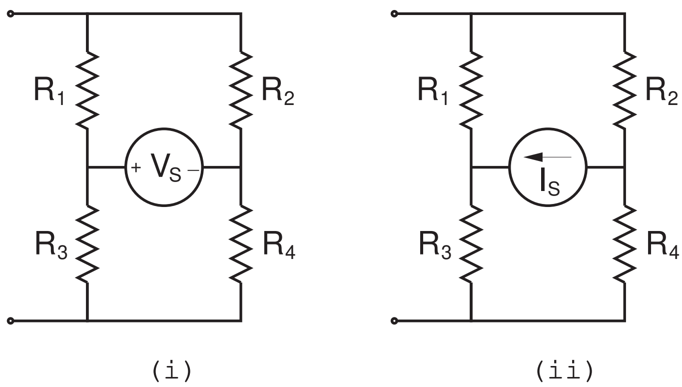


(iv)

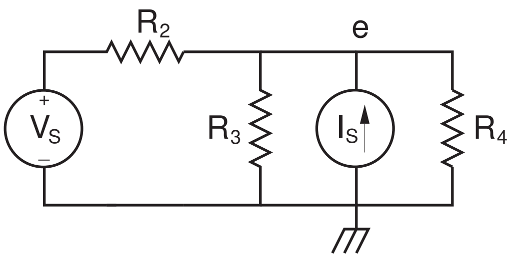


(v)

Problem 2-2. Find both Thévenin and Norton equivalent circuits at the indicated ports for the two networks shown below. Note that the results from Problem 2-1 may be useful in calculating R_T, while voltage and current divider relations are useful in finding V_T or I_N.



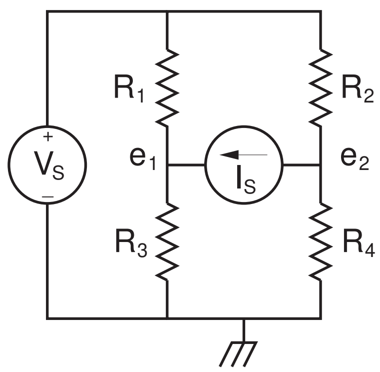
Problem 2-3. Refer to the network shown below for parts (a) and (b).



(a) Write and solve a node equation determining the node voltage e.

(b) Find the node voltage e using superposition, i.e., determine e due to each source acting alone and adding the results. Compare with the answer found in part (a).

Refer to the network shown below for parts (c) and (d).

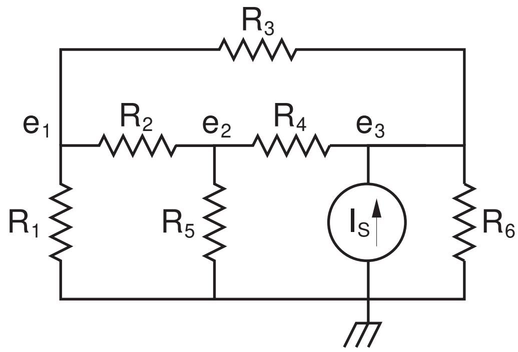


(c) Write and solve node equations determining the two node voltages e_1 and e_2.

(d) Solve for e_1 and e_2 using superposition and compare your results with those from part (c).

Notice that shortcut methods (series-parallel reductions, voltage-current divider relations) can often be used when the method of superposition is applied.

Problem 2-4. Refer to the network shown below.



(a) Write a set of node equations for the node-to-datum voltages e_1, e_2 and e_3 in the above network. Put the equations in matrix form:

$$G \cdot [e] = [s]$$

where G is a 3X3 matrix of conductance terms, e is a vector containing the three node voltages e_1, e_2 and e_3, and s is a vector containing source values.

(b) Solve these equations for the special case $G_1 = G_2 = G_3 \ldots = G_6 = 1 mho$.

(c) For the values of the G's given in (b), what is the current in R_2?