The University of Texas at Arlington
Department of Electrical Engineering

EE 2415 — Dr. H.T. Russell, Jr.
Circuit Analysis I — Summer 2013
July 3, 2013

MID-TERM EXAMINATION No. 1
(Open-book, two hours, four problems)

INSTRUCTIONS: Write your last name and initials clearly in the spaces provided at the bottom of this page. **WORK ALL PROBLEMS INCLUDED WITH THIS PAGE.** For each problem, include all of your work on the problem sheet and on blank pages you provide. State clearly any assumptions you make and any theorems you use. You may use both sides of each sheet of paper if necessary. You must return **ALL** of the exam sheets and your work when you are finished in order to receive a grade on the exam.

GRADE:

1._____

2._____

3._____

4._____

TOTAL: _____

LAST NAME: _____ **INITIALS:**_____

1. (30%) *Network variable map generation*. The network shown in Figure 1 contains two batteries and two dc current sources along with a collection of resistors. Apply the four network laws on the variables shown to complete the voltage, current and power map for the network as indicated in Table 1. Use the values in this table to calculate the total power dissipated (P_{diss}) and delivered (P_{del}) in the network. Write these totals below Table 1 where shown. Label the positive polarities of all voltages and currents on the schematic.

   Show all of your work, and explain in detail any and all assumptions you make.

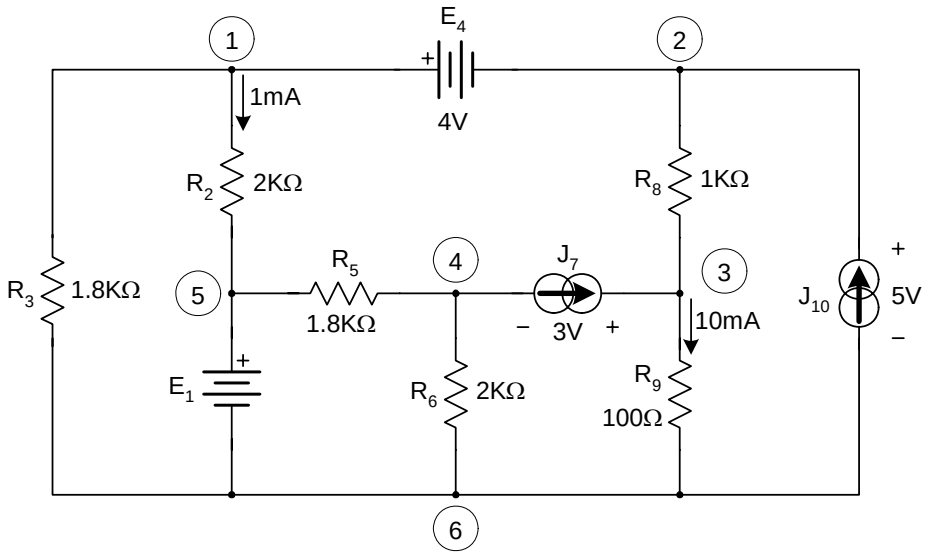

Figure 1
Resistive network with sources

Table 1 Voltage, current and power map				
Component	Value	Voltage (V)	Current (A)	Power (W)
E_1				
R_2	2KΩ		1m	
R_3	1.8KΩ			
E_4	4V	4		
R_5	1.8KΩ			
R_6	2KΩ			
J_7		3		
R_8	1KΩ			
R_9	100Ω		10m	
J_{10}		5		

P_{diss} =

P_{del} =

2. (30%) The resistive network shown below in Figure 2 contains a pair of dependent sources. The orientations of the mesh currents are as shown. Write out fully the *mesh-analysis matrix equation* (MAME) for the network. Express all matrices and vectors (except the mesh-current vector) in numerical form. Solve for the mesh currents I_{m1} through I_{m4}.

   Show all of your work, and explain in detail any and all assumptions you make.

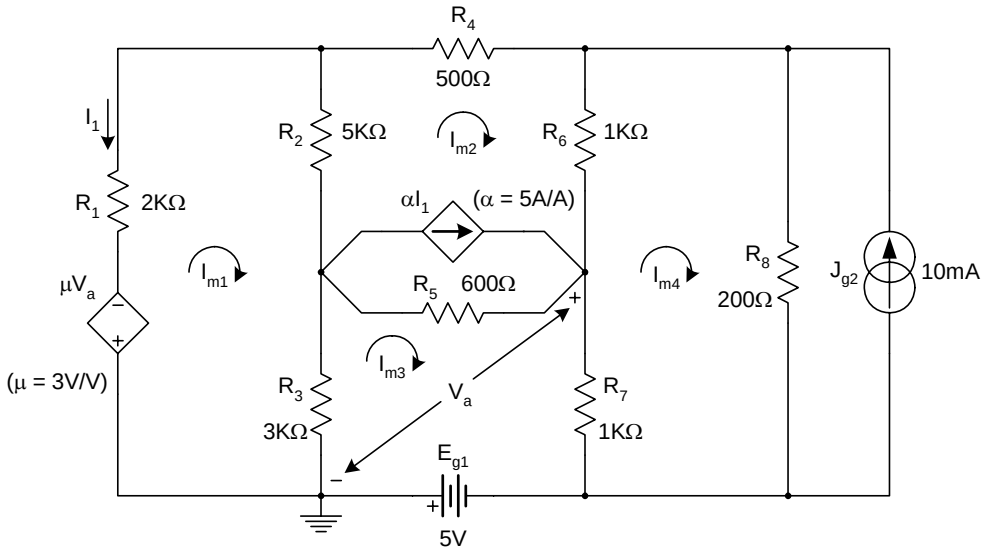

Figure 2
Resistive network

3. (20%) The network shown in Figure 3 contains a collection of resistors in series and parallel connections. The network is connected to a 5mA current source J_G. Apply *current division* to calculate the values of currents I_2 and I_5.

   Show all of your work, and explain in detail any and all assumptions you make.

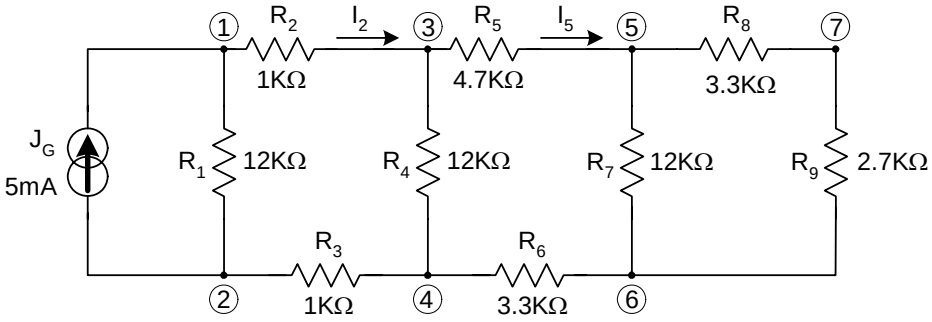

Figure 3
Resistive network

4. (20%) The network shown in Figure 4(a) consists of a collection of resistors, batteries, and current sources. Use *source and resistor operations* to reduce this network to the equivalent at terminals 1-2 as shown in Figure 4(b). Calculate values for J_{eq} and R_{eq} in the equivalent.

   Show all of your work, and explain in detail any and all assumptions you make.

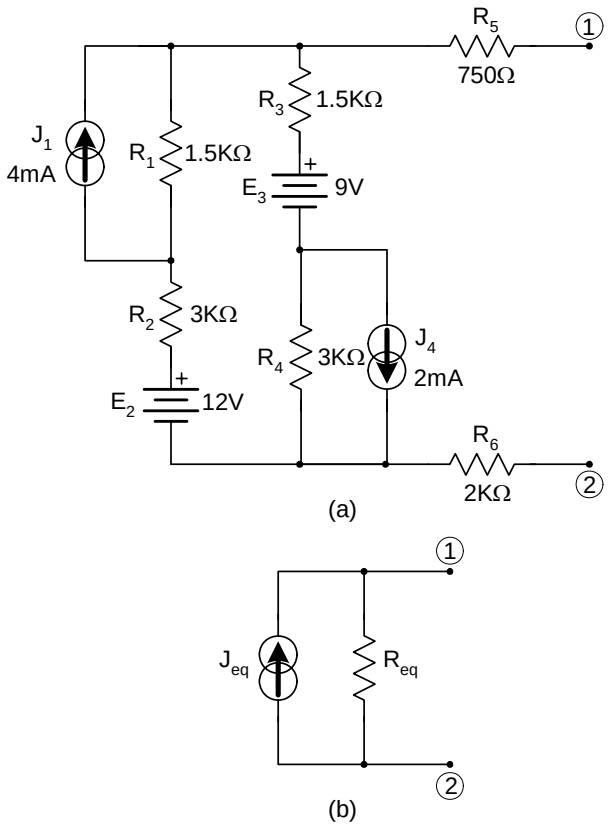

Figure 4
(a) Resistive network with sources
(b) Equivalent network