

ECE203 DC Circuits

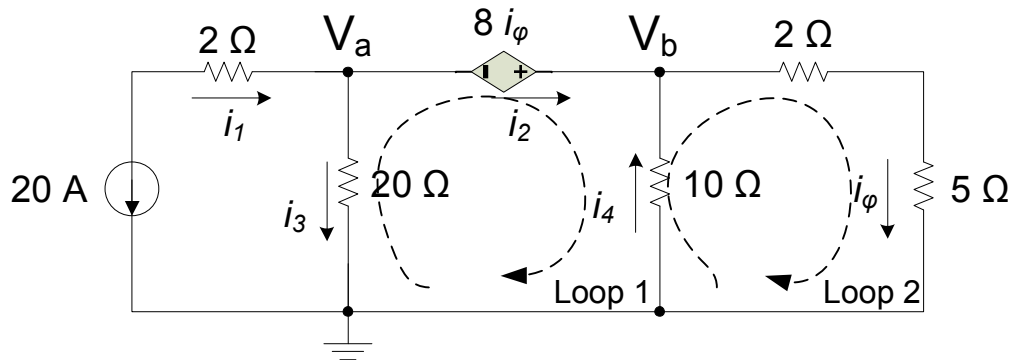
Midterm Exam 1A 9/22/2009

NAME: Selected Answers

- **NO PARTIAL CREDIT WILL BE GIVEN** without a full explanation of the procedure followed to arrive at your solution.
- An 8 ½ x11 inch formula sheet may be used. Laptops may not be used.
- Time allowed : 50 minutes.
- Put a box around your solution. **DON'T FORGET UNITS AND CONDITIONS ON VALIDITY.**
- You may use both sides of this sheet of paper for your answer. Please use the back of the previous page.

Question #	Possible Points	Awarded Points
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

Consider the following network:



a) Write KCL equations at nodes V_a and V_b in terms of the branch currents defined above.

Node 'a' $-i_1 + i_3 + i_2 = 0$ where $i_1 = -20$ A

Node 'b' $-i_2 - i_4 + i_\phi = 0$

b) Write KVL equations for loops 1, 2 and 3 in terms of the branch currents defined above.

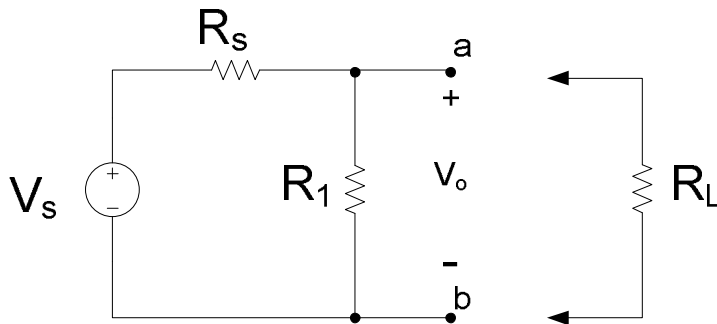
Loop 1 $-8i_\phi - 10i_4 - 20i_3 = 0$

Loop 1 $7i_\phi + 10i_4 = 0$

c) Write an equation for i_ϕ in terms of node-voltages V_a and V_b .

$$i_\phi = \frac{V_b}{7}$$

For the following circuit:



a) Find R_s in terms of V_s , R_1 and V_o assuming the load resistor (R_L) is not connected.

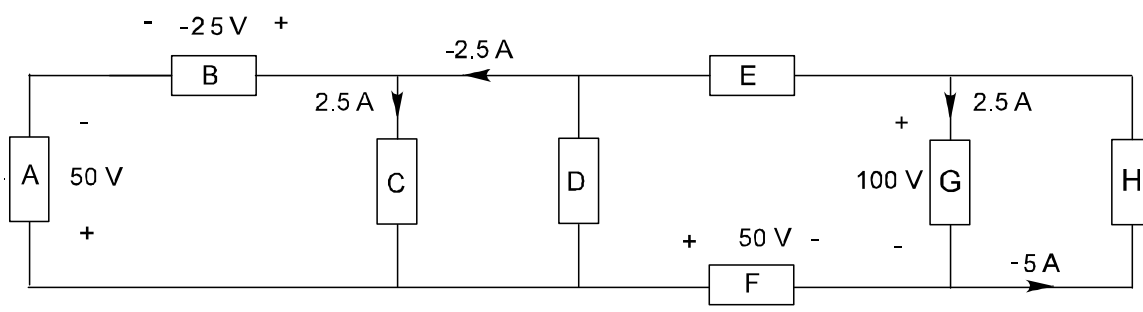
b) Assume that the load resistor (R_L) is connected to terminal a-b, and V_o drops from 100 V to 60 V when R_L is connected. Given that $R_L = 8\text{k}\Omega$, $R_1 = 8\text{k}\Omega$, find the value of V_s and R_s .

$$R_s = 16 \text{ k}\Omega$$

$$V_s = 300 \text{ V}$$

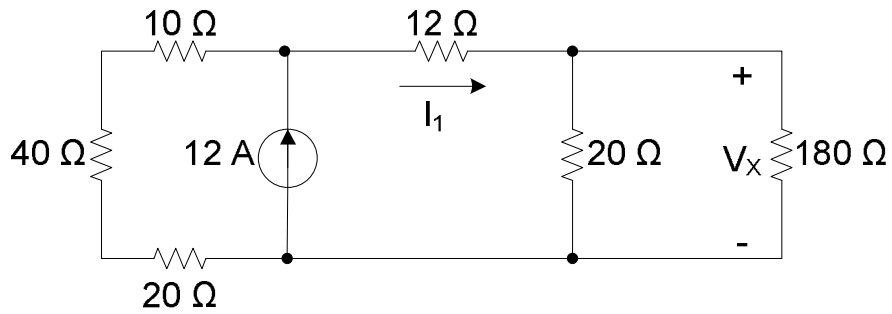
3a

Complete the table below. Just state the magnitude of the power dissipated in each element and state whether it is being consumed or produced..



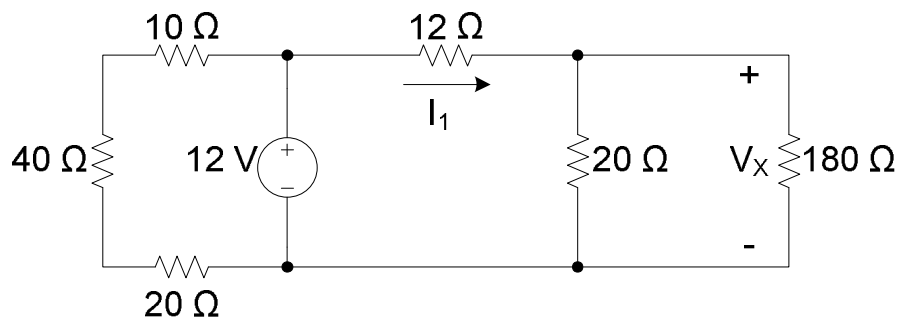
Element	Voltage	Current	Power	Consumed/ Produced?
A	0		0	-
B		5		C
C	25		-62.5	
D		2.5	+125	
E	75			P
F		7.5	-375	
G	100			C
H		5	+500	

a) Given the following circuit, find the value of I_1 using current divider.



$$I_1 = 8.4\ \text{A}$$

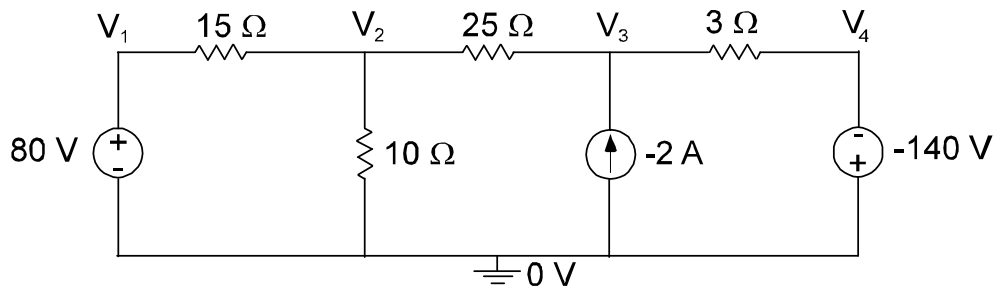
b) Suppose the current source has been changed into a $12\ \text{V}$ voltage source, find V_X using voltage divider.



$$V_X = 7.2\ \text{V}$$

5_a

Use KCL and/or KVL to derive 2 equations in 2 unknowns for the following circuit and then solve for all nodal voltages.



$$V_1 = 80 \text{ V} \quad V_2 = 50 \text{ V} \quad V_3 = 125 \text{ V} \quad V_4 = +140 \text{ V}$$