Midterm 1
EE40
Fall 2014

NAME:_ _____

Instructions

Read all of the instructions and all of the questions before beginning the exam.

There are 4 problems in this exam. The total score is 100 points. Points are given next to each problem to help you allocate time. Do not spend all your time on one problem.

IMPORTANT

- If you do not put your answers within the boxes labeled 'Solution' THEY WILL NOT BE COUNTED (no matter how correct they may be in the bottom left back corner of the third to last page of the exam.)

- If you have more than one solution in the box, that box will be given zero points.

Unless otherwise noted on a particular problem, you must show your work in the space provided, on the back of the exam pages or in the extra pages provided at the back of the exam.
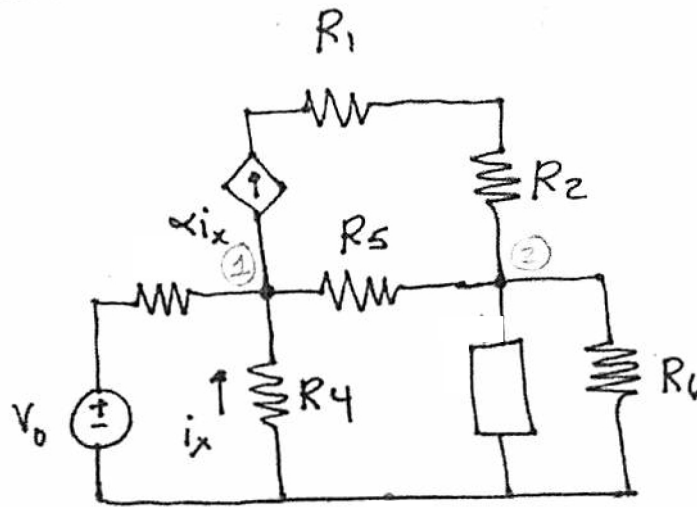
Be sure to provide units where necessary.

GOOD LUCK!

| PROBLEM	POINTS	MAX
1		30
2		20 5
3		25 0
4		25

Problem 1 *Warm-up (30 points)*

a) Consider the circuit below.

All R's = 1 Ω; α = 10 A/A.

We know:
- for V_0 = 1 V the node voltages are V_1 = (-3/5) V and V_2 = (16/5) V.
- for V_0 = 2 V the node voltages are V_1 = -1 V and V_2 = 5 V.

a) Part of the circuit is reproduced below. What is the symbol for the device in the box? Draw the device into the partial circuit below and provide the numeric value of the device in the box below the circuit. *(10 points)*
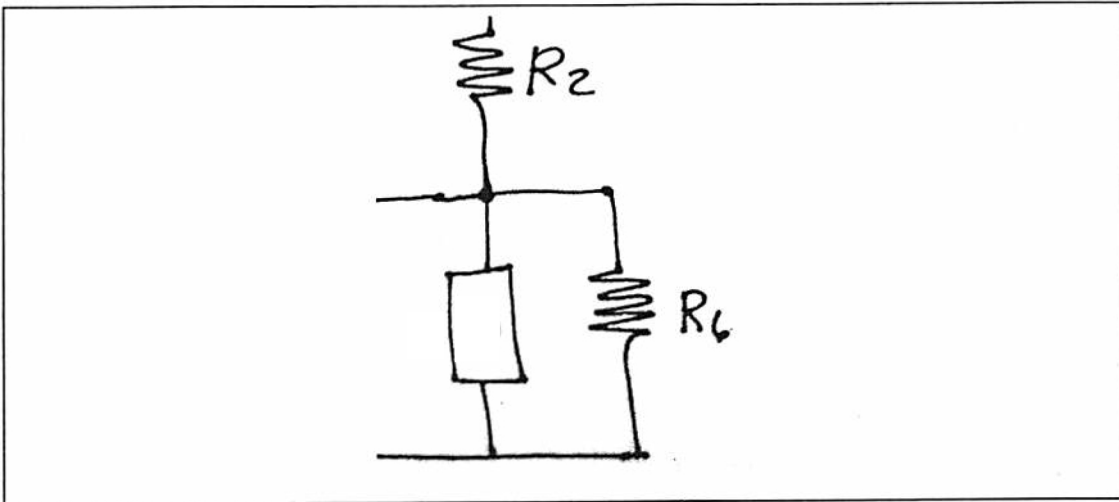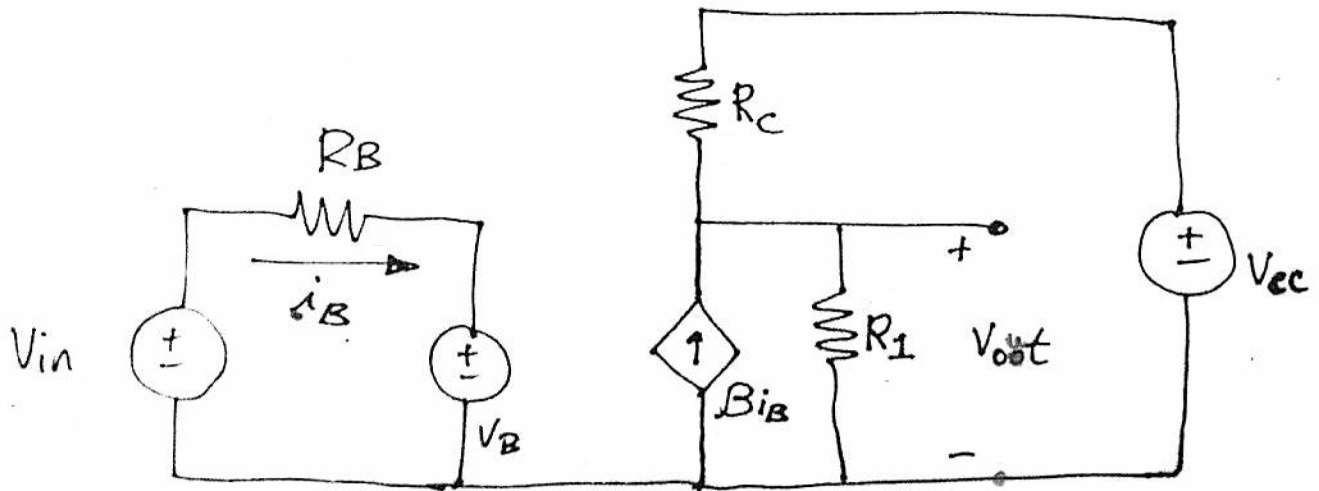

Value of Device (include units):

b) Is it consuming or producing power (circle one)? *(5 points)*

Consuming   Producing

Consider the circuit below.

c) What is the Thevenin voltage of the Thevenin equivalent of this circuit when seen across the V_{out} terminals? *(5 points)*

Solution

d) What is the Thevenin resistance of the Thevenin equivalent of this circuit when seen across the V_{out} terminals? *(5 points)*
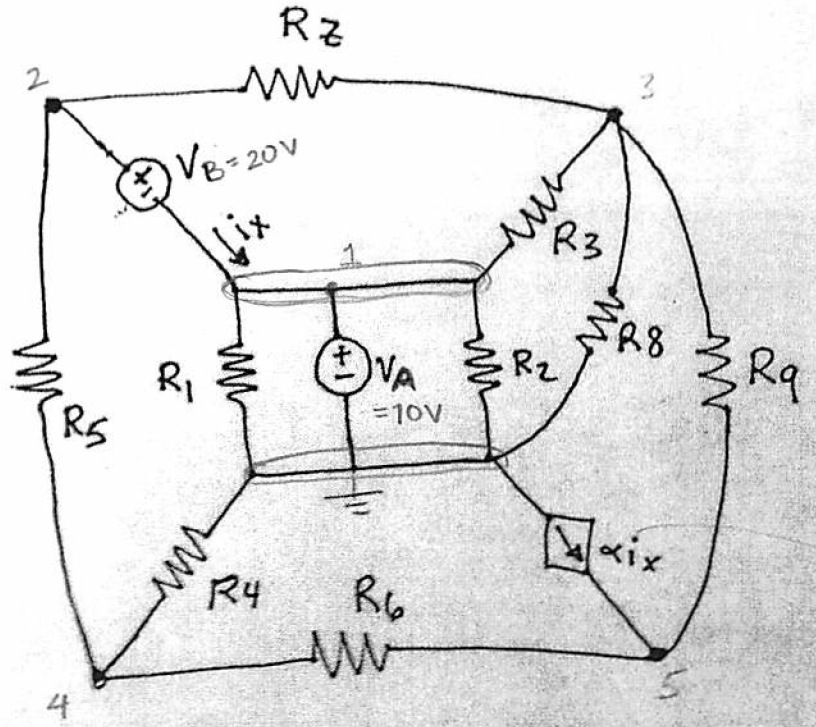
Solution

e) Draw the Thevenin circuit below and label the components (values and units). *(5 points)*

Problem 3 (20 points)

Consider the circuit below.
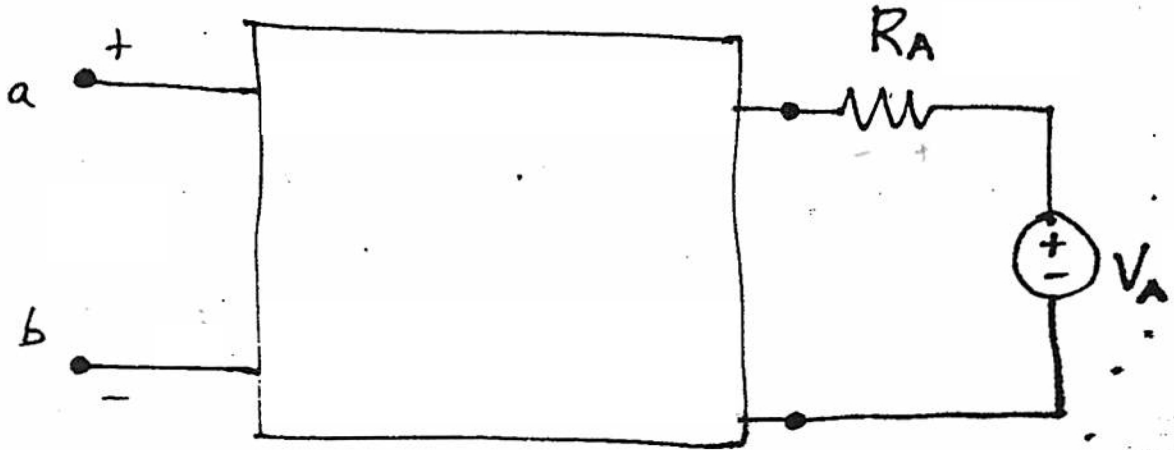
The open circuit voltage across terminals a,b is 5V.
The short circuit current from terminal a to b is 2.5 A.

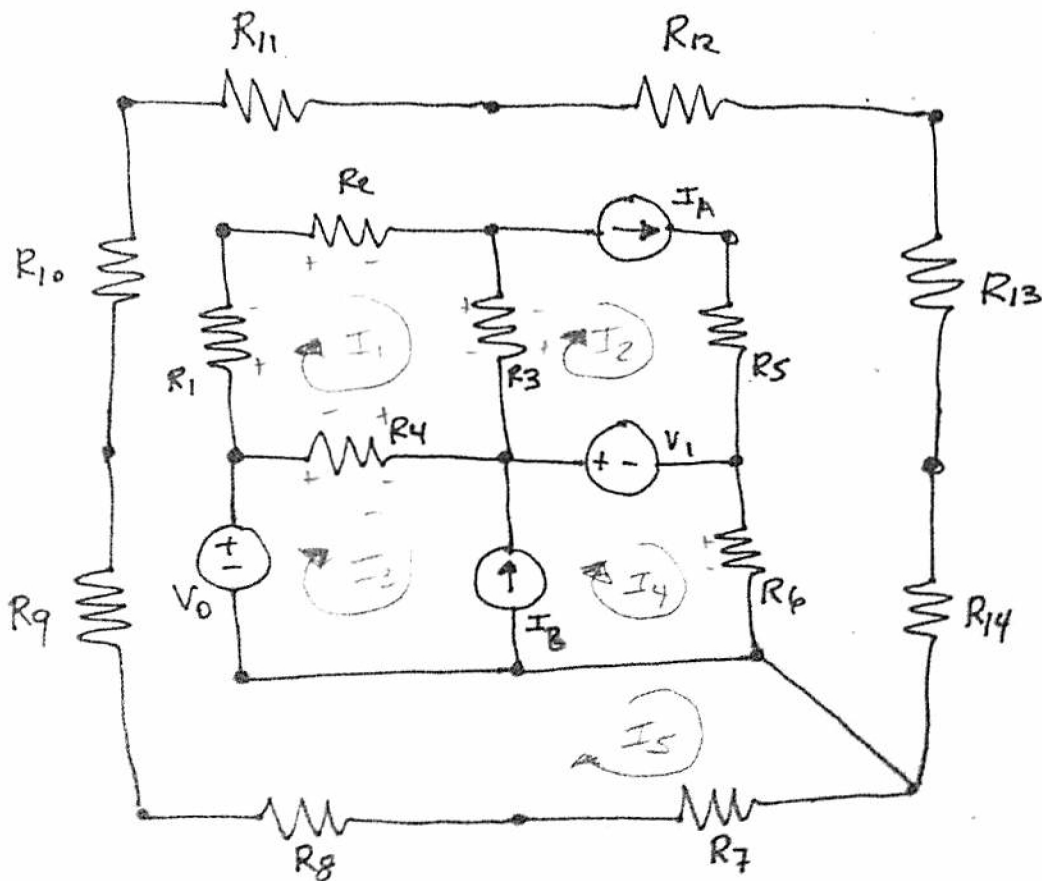a) Draw the circuit element into the circuit above with appropriate connections *(10 points)*

b) What is the value of the circuit element in the box? *(10 points)*

Solution:

Problem 4 (25 points)
Consider the circuit below.

$V_0 = V_1 = 0.5$ V;
$I_A = I_B = 1$ A;
$R_1 = 10 \ \Omega$;
$R_2 = R_3 = 1 \ k\Omega$;
$R_4 = R_5 = R_6 = 10 \ k\Omega$;
R_7 thru $R_{14} = 1 \ \Omega$

SHOW YOUR WORK CLEARLY (INCLUDING SYMBOLIC EQUATIONS) since mistakes are likely!

a) What is the current I_1 *(20 points)*?

Solution:

b) What is the current I_5? *(5 points)*

Solution: