UNIVERSITY OF CALIFORNIA
College of Engineering
Department of Electrical Engineering
and Computer Sciences

Professor Oldham — Fall 2000

EECS 40 — MIDTERM #1

2 October 2000

Name: ________________________________ **Student ID:** _________
Last, First

Signature: ______________________________

TA: ❑ Ben
❑ Warren
❑ Naratip

Guidelines:

1. Closed book and notes except 1 page of formulas.
2. You may use a calculator.
3. Do not unstaple the exam.
4. Show ***all your work and reasoning on the exam*** in order to receive full or partial credit.
5. This exam contains 8 problems and corresponding worksheets plus the cover page.

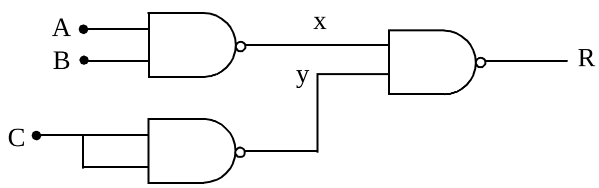
Problem	Points Possible	Your Score
1	15	
2	15	
3	12	
4	10	
5	15	
6	10	
7	11	
8	12	
Total	**100**	

$f = 10^{-15}$
$p = 10^{-12}$
$n = 10^{-9}$
$\mu = 10^{-6}$
$m = 10^{-3}$
$K = 10^{3}$
$M = 10^{6}$

Problem 1 (15 points)

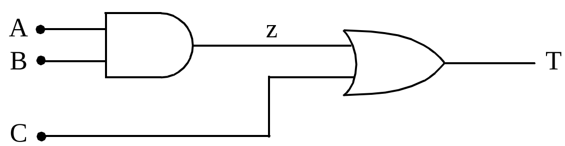
What is the value of the unknown node voltage in each of the following circuits? Assume diodes are perfect rectifiers.

(a)



A	B	C	x	y	R

(b)



A	B	C	z	T

(c) Is R = T for all possible inputs?

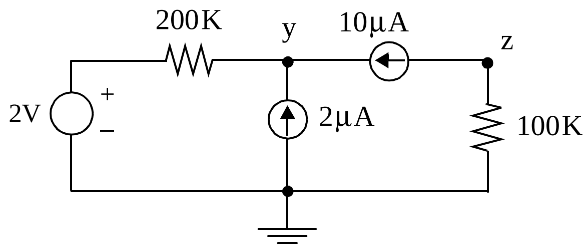
☐ YES

☐ NO

(WARNING: You must fill out truth tables in this problem to receive credit.)

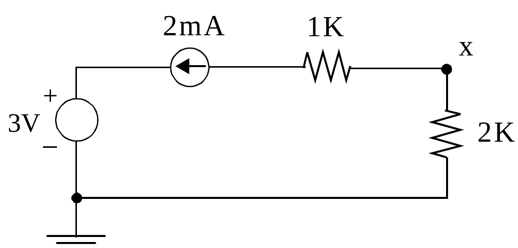
Prob. 1 Worksheet

Problem 2 (15 points)



(a) Find V_y.

$V_y =$



(b) Find V_x.

$V_x =$

(c) Find power delivered by the voltage source.

$P_3 =$

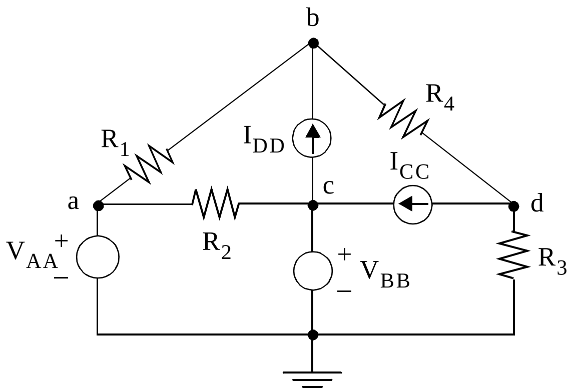
Prob. 2 Worksheet

Problem 3 (12 points)

For the circuit below:

(a) Identify known and unknown node voltages, and

(b) Write sufficient nodal equations to solve for the unknown node voltages (do not solve).



(a.1) known node voltages:

____

(a.2) unknown node voltages:

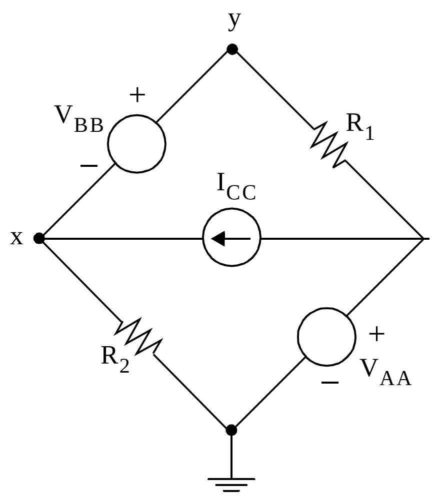
____

Nodal Equations:

Prob. 3 Worksheet

Problem 4 (10 points)

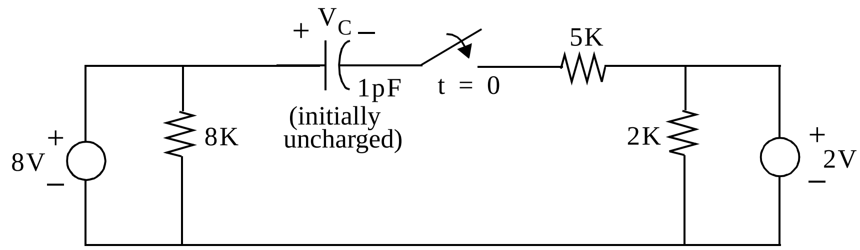
For the circuit below, using nodal analysis write sufficient equations to find V_x and V_y. Do not solve.



Equations:

Prob. 4 Worksheet

Problem 5 (15 points)



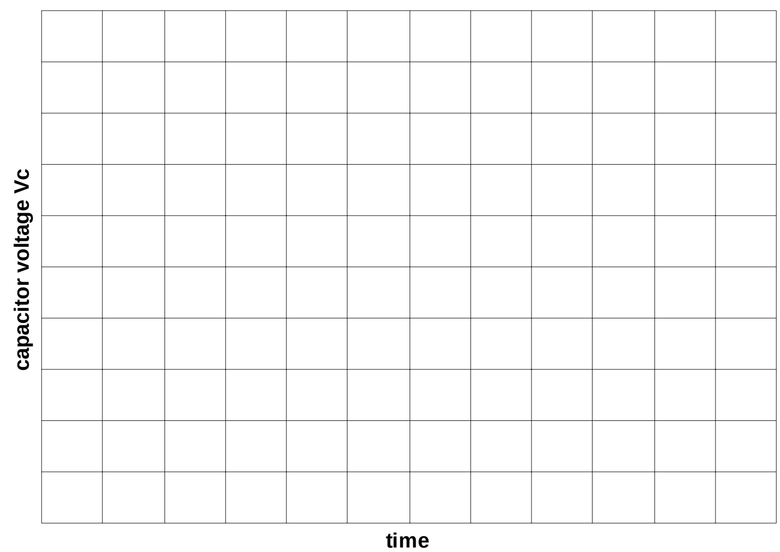
For the circuit above, the capacitor is initially uncharged. The switch closes at $t = 0$.

(a) Find V_C for $t = 0^+$ and $t \to \infty$.

$V_C(t = 0^+) =$ ___________

$V_C(t \to \infty) =$ ___________

(b) Sketch (very neatly and accurately!) V_C vs. t on the graph below. You **must** label the axes.



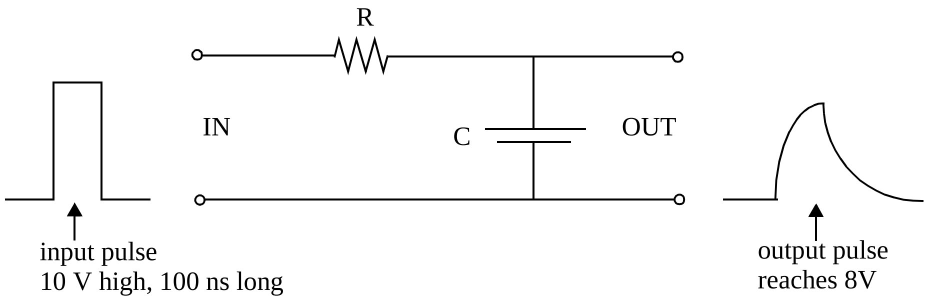
(c) Write an equation for $V_C(t)$.

$V_C(t) =$

Prob. 5 Worksheet

Problem 6 (10 points)

In the lab on RC circuits, you measure the pulse response of the circuit below.



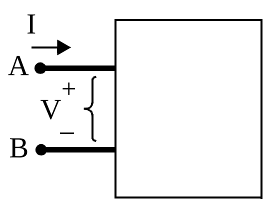
You know R is $2K\Omega$. What is the value of C?

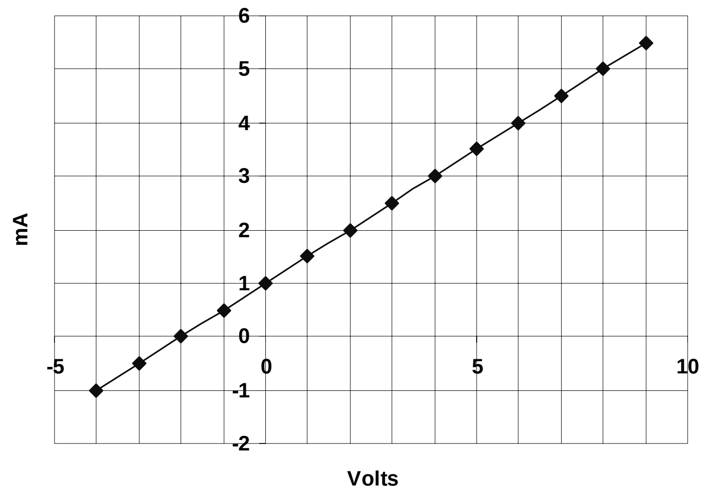
C = ___________

Prob. 6 Worksheet

Problem 7 (11 points)

You measure the I-V graph of a circuit in a “black box” in the lab.



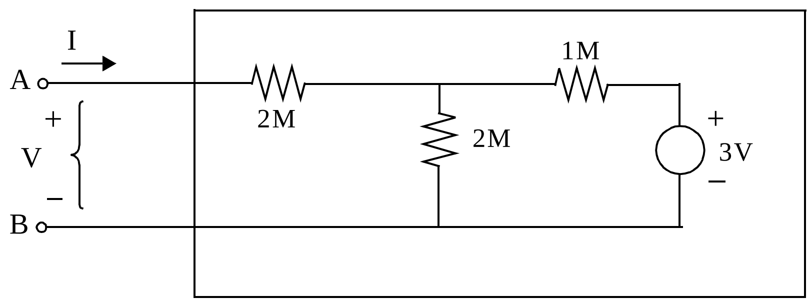


What is a possible circuit that is in the box? Draw here ↓ .

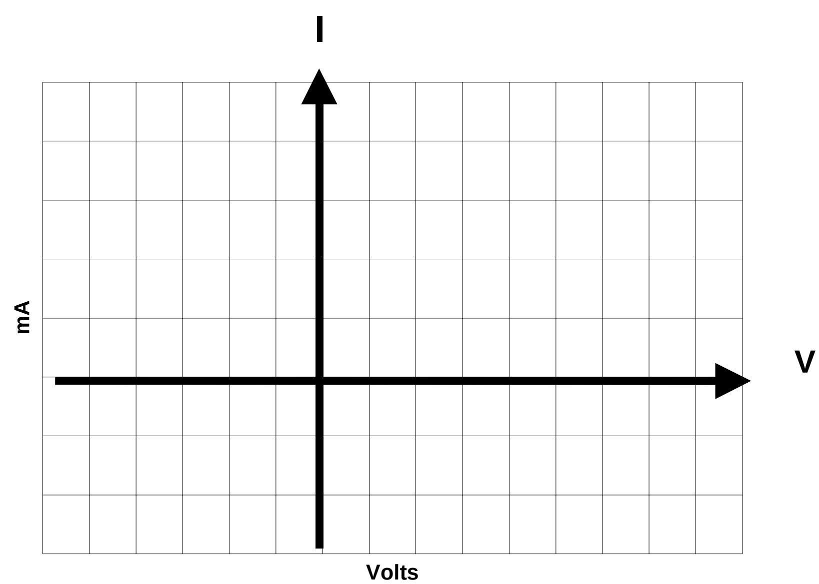
Prob. 7 Worksheet

Problem 8 (12 points)

In this experiment you "peek," i.e., you open the box before testing it. You see the following circuit:



What will be the I-V graph you will measure for this circuit? (You must label axes for credit.)



Prob. 8 Worksheet