**UNIVERSITY OF CALIFORNIA, BERKELEY**
**Department of Electrical Engineering and Computer Sciences**

EE 100/EE 42 Summer 2005
Intro. To Electronics Engineering Bharath "Bart Simpson" Muthuswamy

**FINAL**
**August 12th 2005**
**Time Allotted: 3 hours**

**NAME: _____ , _____**
**(print) Last First**

**STUDENT ID#:_____**

**I WILL NOT CHEAT ON THIS EXAM. Signature:_____**

**Note(s):**

1. **You will receive [3 pts] for filling out the information above.**
2. **MAKE SURE THE EXAM HAS 10 NUMBERED PAGES.**
3. **This is a CLOSED BOOK exam. However, you may use THREE 8.5 x 11'' of notes (both sides) and a calculator.**
4. **SHOW YOUR WORK on this exam. MAKE YOUR METHODS CLEAR TO THE GRADER so you can receive partial credit.**
5. **WRITE ANSWERS CLEARLY IN THE SPACES (lines or boxes) PROVIDED.**
6. **Remember to specify units on answers whenever appropriate.**
7. **If you are asked to setup equation(s) only, do NOT attempt to solve the equation(s).**

**SCORE: This page: _____ / 3**

**1:_____/ 22**

**2:_____/ 25**

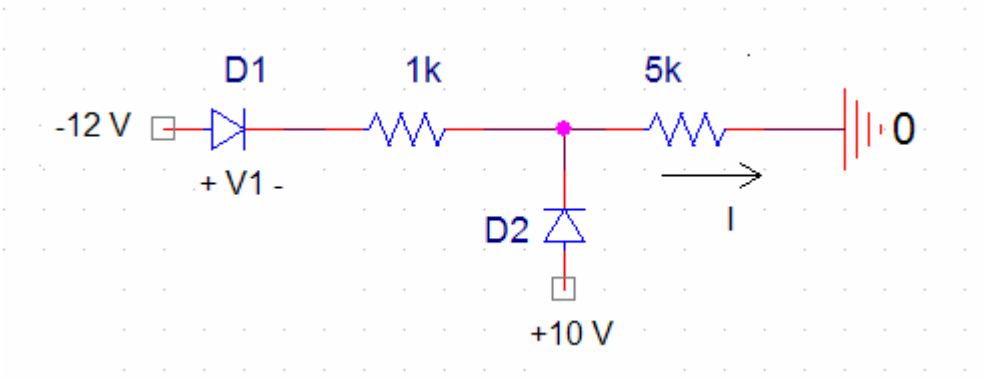
**3:_____/ 25**

**4:_____/25**

**TOTAL:_____/ 100**

**Problem 1 Diodes (22 points)**

In the circuit below, assume both diodes are ideal. Find I and V1.



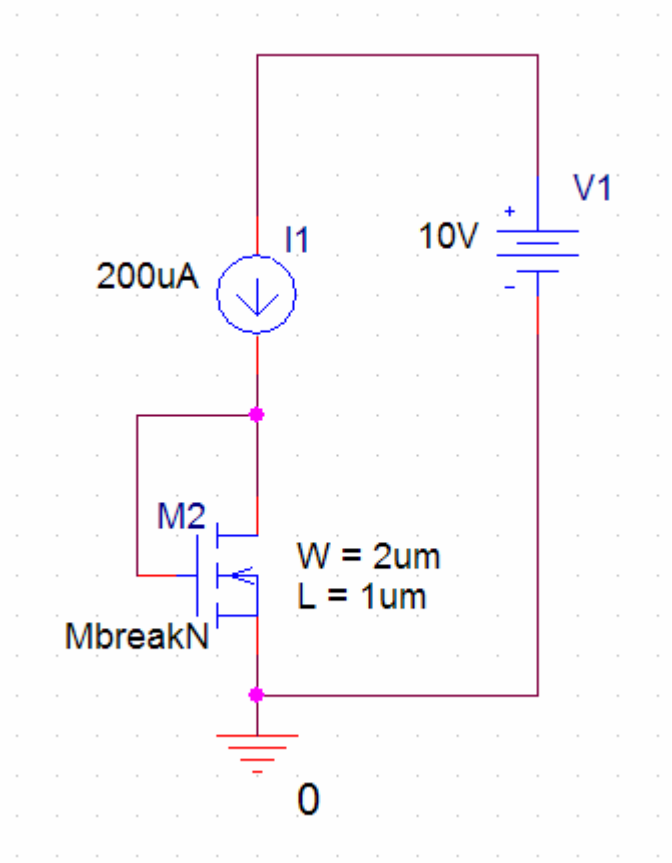

**I =** _____

**V1 =** _____

**Problem 1 EXTRA WORKSPACE**

**Problem 2 NMOS FETs (25 points)**

In the circuit below, which elements are absorbing and which elements are releasing power? Specify how much power an element is absorbing or releasing. Use VT0 = 1 V and KP = 50 uA/V$^2$ for the NMOS.




Power Absorbed or Delivered by Elements

**NMOS:** _____

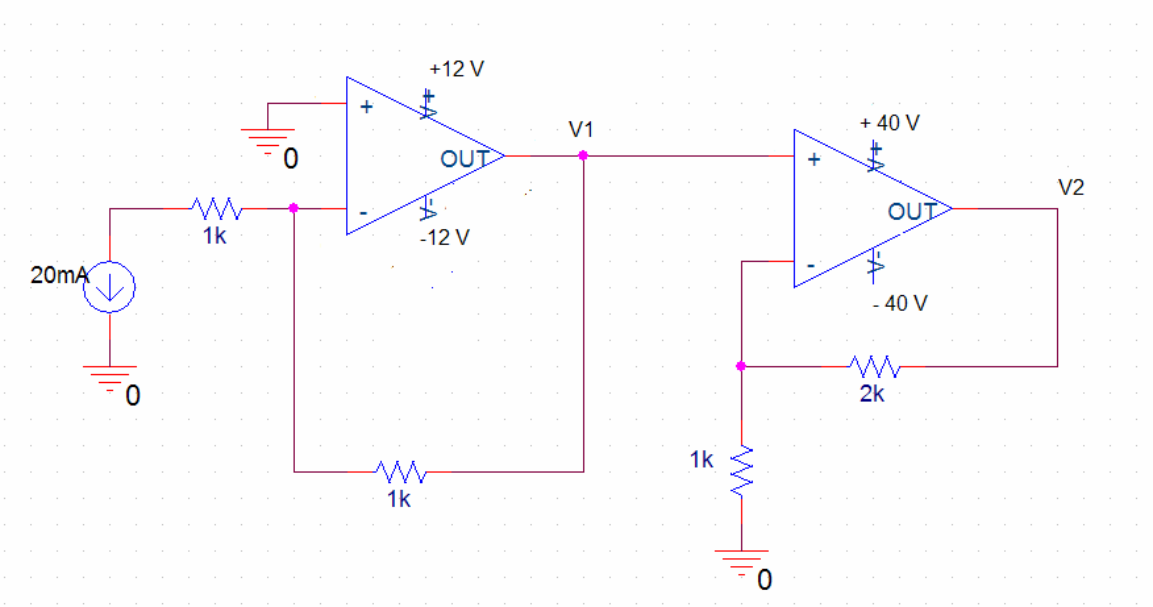
**Current Source:**_____

**Voltage Source:**_____

**Problem 2 EXTRA WORKSPACE**

**PROBLEM 3 Cascaded Opamps (25 points)**

In the circuit below, find V1 and V2. **DO NOT IGNORE THE EFFECTS OF THE OPAMP RAIL VOLTAGES!**

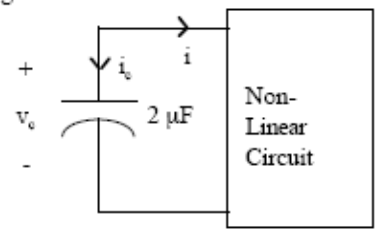



**V1 = _____**
**V2 = _____**

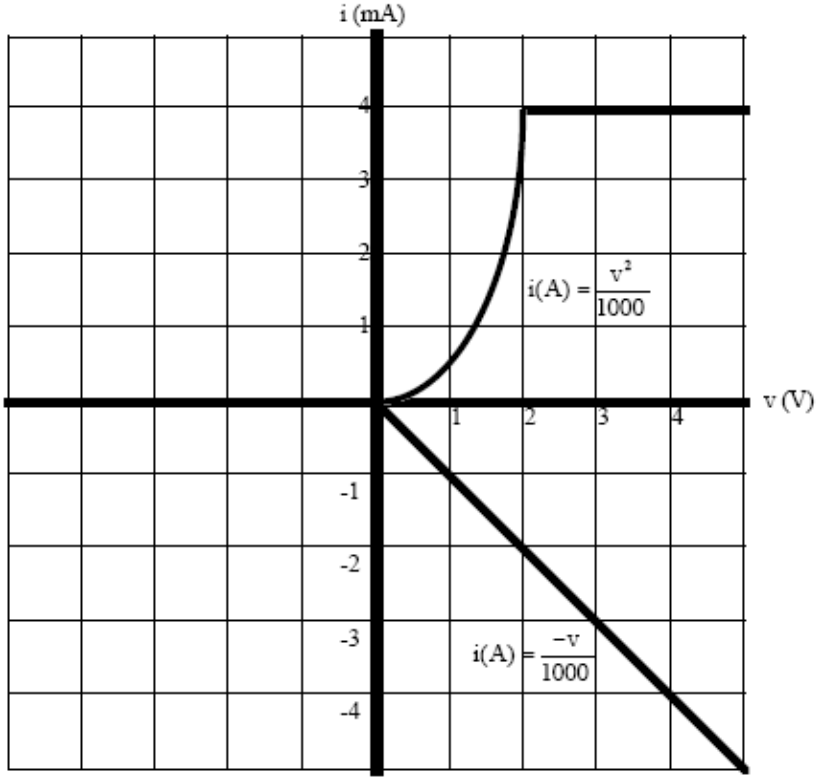
**Problem 3 EXTRA WORKSPACE**

## PROBLEM 4 Nonlinear Circuit Analysis (25 points)

Suppose you are given the following circuit:




The i-v relationship of the non-linear circuit is shown below:




(Note: the parabolic portion is not drawn to scale, but the equations are valid.)

a.) Sketch the dynamic route, label all equilibrium points, and describe them as stable or unstable.

b.) Given that $v_c(0) = 4V$ and $i_c(0) = -4mA$, how long (in milliseconds) does the current remain constant? If the current is never constant, then explain why.

c.) Using the same initial conditions, how long (in milliseconds) does it take for the voltage to reach 0.01V?

**T1 (for constant current) =_____**

**T2 (for voltage to reach 0.01 V) = _____**

**Problem 4 EXTRA WORKSPACE**

**EVEN MORE EXTRA WORKSPACE**