Winick

EECS 210 EXAM #1 WINTER 1997

NAME (Print): _____

HONOR CODE PLEDGE: "I have neither given nor received aid on this exam, nor have I concealed any violations of the honor code."
Closed book. One 8-1/2"x11" sheet of notes is allowed.

SIGN YOUR NAME HERE: _____

1. Sit every other seat where possible.
2. Write your answers and do your work on the exam pages.
3. You will get no credit if you don't show your work on the exam.
4. There are four problems and each is worth 25 points.
5. Don't forget to give the units for your answers.

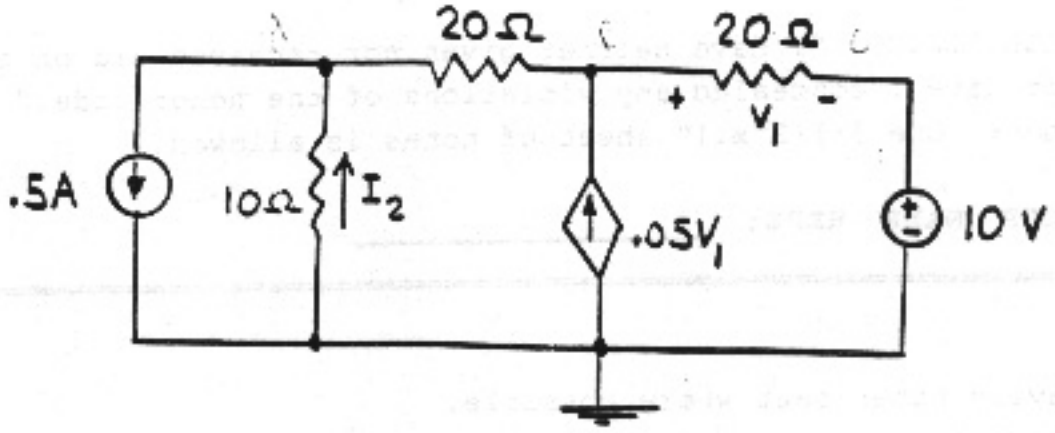
Good Luck!

DO NOT TURN THIS PAGE OVER UNTIL TOLD TO DO SO.

(25 points)

Problem # 1

Consider the following circuit.



(a). Label the circuit node on the above figure using the letters A,B,C,...

(b). Write the node equations for this circuit.

Ans:

(c). Solve the node equations to determine the current I_2.

I_2 =

(25 points)

Problem # 2

Consider the following circuit.

(a). Find its Thevenin equivalent voltage and Thevenin equivalent resistance.

V_T = R_T =

(b). Draw its Thevenin and Norton equivalent circuits.

Ans:

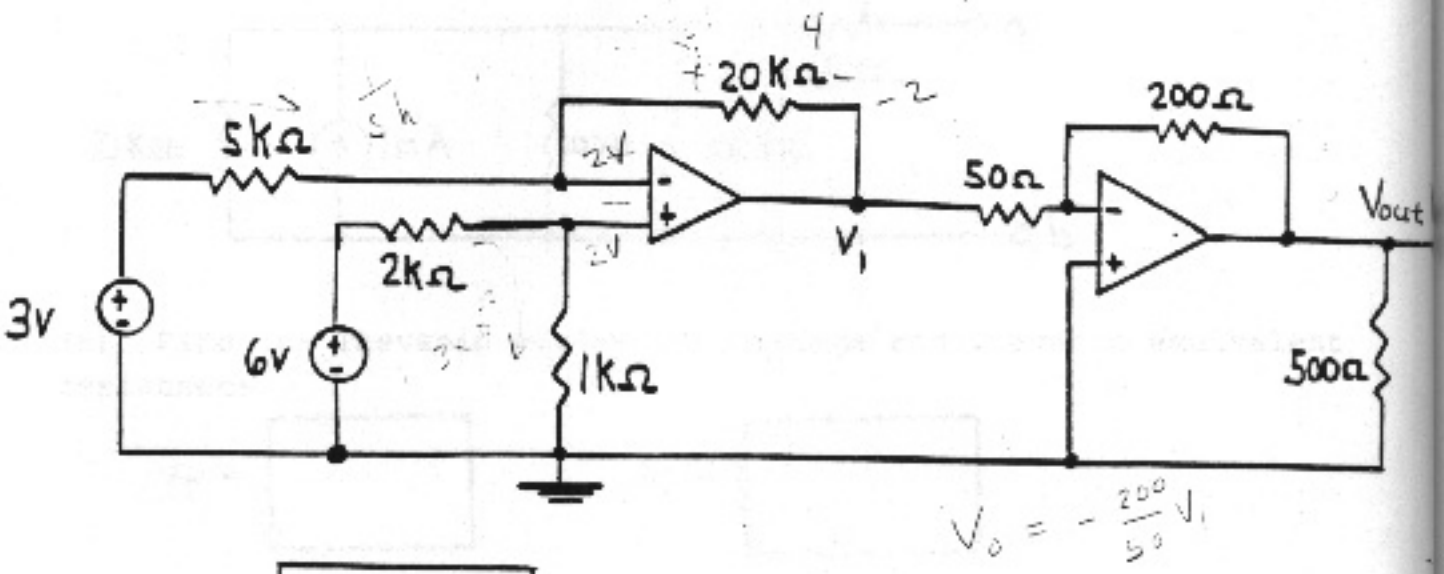
(c). A load resistor with resistance R_L Ω is connected across the terminals a,b. Find the value of R_L such that maximum power is delivered to the load. Find the maximum power P_{max}.

R_L = P_{max} =

(25 points)

Problem # 3

Find v_1 and v_{out} for the following operational amplifier circuit. Express your answer for v_{out} in both units of volts and dBv.



v_1 = [ ]

v_{out} = [ ] volts

V_{out} = [ ] dBv

(25 points)

Problem # 4

A signal x(t) can be represented by the following sum

$$x(t) = 1 + \sum_{n=1}^{\infty} \frac{1}{n^2} \cos(2000\pi n t)$$

(a). What is the fourth harmonic fequency of this signal?

ans:

(b). The signal x(t) is put through a filter, and the output of the filter is given by

$$y(t) = 1 + .5\cos(2000\pi t) + \frac{1}{90} \cos(6000\pi t + \pi/3)$$

Determine the values of the magnitude and phase <u>transfer functions</u> evaluated at a frequency of 3 KHz.

magnitude =

phase =

(c) Find the output of this same filter when the input signal is

$$\sin(2000\pi t) + 4\cos(4000\pi t) + 6\sin(6000\pi t + \pi/4) + \cos(12000\pi t)$$

Ans: