NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ECE 111**

**EXAM 2**

**Fall 2013**

FOR GRADERS’ USE ONLY.

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| --- | --- | --- |
| PROBLEM # | GRADE | POINTS |
| 1 |  | 8 |
| 2 |  | 24 |
| 3 |  | 16 |
| 4 |  | 54 |
| TOTAL |  | 102 |

1. (2 points each, 8 points total) Match the letter of the Configuration with the appropriate circuit diagram:

A) Inverting Configuration

B) True Differential Configuration

C) Non-inverting Configuration

D) Buffer Configuration

 

Configuration: \_\_\_**\_\_**\_\_\_ Configuration: \_\_\_**\_\_**\_\_\_

 

Configuration: \_\_\_**\_\_**\_\_\_ Configuration: \_\_\_**\_\_**\_\_\_

2. (24 Points Total)

Given this circuit:



A.) (8 points) What Thevenin Equivalent Circuit is seen by the load resistor RL?

B.) (4 points)? What value of load resistor would result in the maximum power being delivered to the load resistor RL?

C.) (8 points) Under those conditions, how much power would be dissipated by the load resistor?

D.) (4 points) Under those conditions, how much power is being DISSIPATED by the voltage source?

3.) (16 points total)

Given this circuit containing an Ideal Op-Amp, capable of Rail-to-Rail operation (that is, the output is able to go all the way to the supply voltage):



A. (2 points) Is this: Non-Inverting, Inverting, Comparator, Differential, or Buffer Configuration (CIRCLE ONE.)

B. (6 points) Given part A, what is the output Vout in terms of the input VS?

C. (4 points) If Vin is 0.3V, what will the output be?

D. (4 points) If Vin is 2V, what will the output be?

4. (54 points total)

Given the circuit below, in which the switch has been closed for a long time and opens at t=0, answer the following questions:



A. (6 points) Which quantity, voltage across or current through which element in this circuit, MUST be continuous across the switch opening? Label it on the diagram above.

NOW, I am going to ask you to find the current down through the 100 Ω resistor, iR(t).

B. (8 points) Label this current on the diagram above. Just before the switch opens, sketch the relevant equivalent circuit, and find both the current through the inductor (i.e., find iL(0-)) and the current through the 100Ω resistor (i.e., find iR(0-)).

C. (6 points) What is the current down through the 100Ω resistor just after the switch opens, iR(0+)? (HINT: Apply KCL at the top node of the resistor.)

D. (4 points) After the switch opens, what resistance is seen by the inductor, and what is the decay constant, τ? (NOTE: This is for time t≥0.)

E. (12 points) A long time after the switch opens, sketch the relevant equivalent circuit and find iR()?

F. (12 points) Evaluate the constant(s) and give the formula for iR(t):

iR(t) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

G. (2 points) How long would I have to wait to make sure all transients from the switch have died away?

H. (4 points) Sketch iR(t):

