Assignment 7

1 Design Exercises

Feel free to use Multisim to test and confirm your derivations. However, Multisim by itself does not prove anything! We need to see derivations.

1.1 (5 points)

Using superposition principle, derive the output (V_{out}) of the differential amplifier (shown in Figure 1) as function of input potentials V_{in1}, V_{in2}, and resistors used in the circuit diagram.

1.2 (5 points)

For the differential amplifier depicted above. Find values of resistors R_1, R_2, R_3, and R_4 which provide $V_{out} = 10 \times (V_{in2} - V_{in1})$. Express, your answers as ratios of resistors values relative to R_1

1.3 (10 points) (Can be done after the lab)

Using superposition principle, derive the output (V_{out}) of the "mixed" amplifier (shown in Figure 2) as function of input potentials V_{in1}, V_{in2}, and resistors used in the circuit diagram. Note: the non-inverting input contribution is trickier than it might look. Think how R_1 and R_2 combo looks when both resistors are connected to the reference?

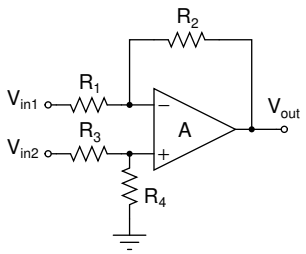

Figure 1: A differential amplifier.

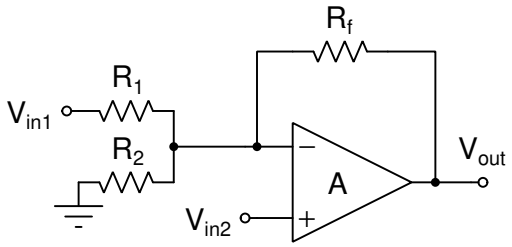

Figure 2: A tricky amplifier.

2 Lab 7: Gain bandwidth product of OpAmps and simple algebra with OpAmps

Always start with a circuit diagram and only then build it in hardware.

Your notebooks must be complete, understandable, and address all activities, design exercises, observations, and questions noted in the laboratory's procedures. Remember to use your notebook as a laboratory journal and record your data, design calculations, notes and scratch work. *Make sure to write a conclusion for each exercise and each week.*

Task 0

Demand

- a review of gain bandwidth product.

Task 1 (20 points) GBW of noniverting amplifier

Use LM741 to build a noninverting amplifier with gain of about 10. Make a set of measurements to confirm that it works. Now measure magnitude of its gain as a function of frequency. What can you say about its GBW?

Task 2 (30 points) Differential amplifier

Use LM741 and build the differential amplifier from DE 2. Confirm that it works as expected by sending different signals to the inputs and observing the output. Sketch your input and output signals. It will be handy to use a second (pulsed) output of the function generator.