Experiment: Hands-On

Op Amps (I)

Part 1

Build a non-inverting amplifier as shown in Figure 1. Don't forget to connect the ground of the two power supplies to the ground of the amplifier circuit. Let the input signal be a 1 k Hz, 150 mVPP sine wave with a +100 mV offset. Adjust the potentiometer R_2 to see the gain change. Can you get a gain less than one by tuning R_2? Turn the potentiometer to its maximum value (*i.e.* when you see maximum voltage output) and then add a different DC offset to the input signal to see what happens. Play around using both positive and negative DC offset. What do you observe?

Now replace the potentiometer with a 20 kΩ resistor with the offset of +50 mV. Draw the input and output waveform. Can you explain this result?

Next, set the input signal to be 1k Hz, 400 mVPP **ramp** signal with a +50 mV offset. Use the XY mode of the oscilloscope (press the Main/Delay button, followed by the XY softkey) to find out the transfer curve of the non-inverting amplifier. You will need to use A1(100 mV/div) as the input and A2 (1V/div) as the output.

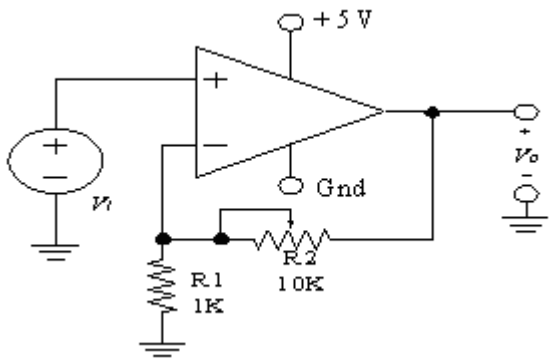

Figure 1

Do not disconnect this circuit – it will be used in Part 2.

Part 2

Build an inverting amplifier as shown in Figure 2. Let the input signal be a 1 kHz, 150 mVPP sine wave with a –100 mV offset. Adjust the potentiometer and observe the resulting change in the amplitude of the output.

Now replace the potentiometer with a 20 kΩ resistor with the offset of -50 mV. Draw the input and output waveform. Can you explain this result?

Next, set the input signal to be 1k Hz, 400 mVPP **ramp** signal with a -50 mV offset. Use the XY mode of the oscilloscope to find out the transfer curve of the non-inverting amplifier. You will need to use A1(100 mV/div) as the input and A2 (1V/div) as the output.

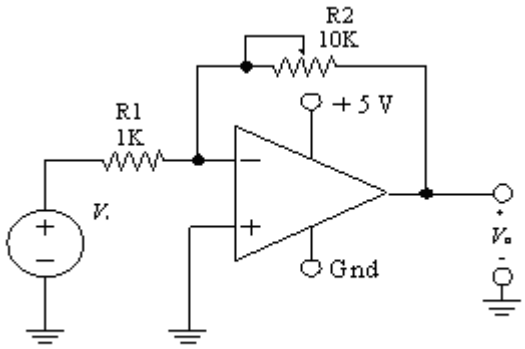

Figure 2

Part 3

Build a comparator as shown in Figure 3 (Vcc = 5V). Let the input signal be a 1 kHz 1.25 VPP with 1.25 V offset (saw tooth wave). Adjust the amplitude and describe what happens. Now set it back to 1.25 VPP and adjust the offset and describe how the duty cycle of the output changes. Why does it behave like this?

Measure how close the output gets to the +5 V and Gnd rails.

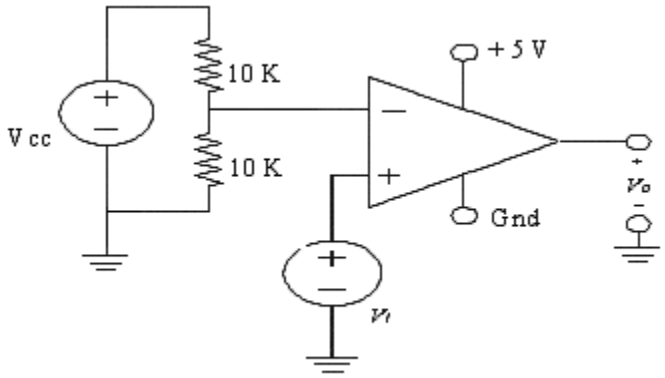

Figure 3