# Electronics lab

The Inverting amplifier uses negative feedback to invert and amplify a voltage by a certain gain value which Is determined by the values of the input and feedback Impedances. We will show this relationship In this experiment by changing the resistance values and measuring the voltages, Introduction: The purpose for this experiment is to get familiar with basic properties and applications of the integrated-circuit operational amplifier, the pop amp, one of the most versatile building blocks currently available to electronic-circuit designers.

The emphasis will be primarily on the nearly ideal, on what is easily and conveniently done. Exploration of what is less-than-ideal about commercial operational amplifiers will be deferred to later experiments. For the procedure the goal of this experiment is to design two different types of pop amp circuits, one inverting and non-inverting pop- amps. By using ( IN Elvis unit, PC w/Mulls, Resistors, Capacitors, 741 Type Pop Amp) to build pop-amps. Equipment: Equipment IN Elvis unit Multi, Resistors Components Resistors Capacitors Sty Value 1 OK KICK 1 MOM 0. 01 It-if Procedure:

We started off by building the circuit using multi simulation software for the inverting amplifier as shown in figure 1 below. We used a millimeter to measure the voltage at the various nodes with node A grounded and confirmed that all voltages showed zero as seen in figure 1 . Discussion/ Schematics: Figure : Schematic for voltage measurements of nodes B, C, and D without voltage source for the inverting amplifier. Node A is grounded By connecting a 1 OVA voltage source to node A we were able to measure the node voltages at nodes B and C and the output voltage at node D as shown in figure 2.

We then repeated the same measurements with the voltage source having been replaced by a -VIVO source as shown in figure 3 below. A separate millimeter was used on each measurement to avoid repetition when running the simulations. Figure : Schematic for voltage measurements of nodes B, C, and D with +V voltage source for the inverting amplifier. All the values obtained for the measurements in this section are tabulated in table 1 below. VA PVC 0. VIA 4. Up -o. V -love -0. VIA -4. Up o. V Table : Table showing voltage measurements for the inverting amplifier with different Olathe source values.

To investigate the voltage gain changes we varied the resistances and measured the node voltages at the various nodes. With the VIVO voltage source still connected to node A we shunted the RE resistor by connecting a resistor of equal value in parallel with RE as shown in figure 4 below. This caused the output voltage to reduce to half the initial value and therefore also reduced the gain. Figure : Schematic for voltage measurements of nodes B, C and D with RE shunted with a resistor of equal value for the inverting amplifier.

Next we shunted RI with another resistor of equal value connected in parallel after which we measured the node voltages for nodes C and D as shown in figure 5. This resulted in the output voltage doubling in magnitude and therefore doubling the gain. Figure : Schematic for voltage measurements of nodes B, C and D with RI shunted with a resistor of equal value for the inverting amplifier. We opened the connection between RI and node B and connected another resistor of same magnitude as RI in series with RI . There is now a new node called X between the two resistors so we our values as seen on table 2.

Figure : Schematic for voltage measurements of nodes B, C, D and X with RI connected in series with a resistor of equal value for the inverting amplifier. RI 1 Zoom smoke 0. V 2. Up -0. V 0. smoke 1 Smoke 0. VIVA 8. Up -1 . VIA smoke 0. VIA 0. VIVA 2. Up -0. VIA Table : Table showing voltage measurements for the inverting amplifier when resistances are varied. The next section has to do with the non-inverting amplifier and its node voltage measurements. Figure 7 shows the schematic for the non-inverting amplifier connection.

The measurements shown below are for the OVA connection. Resource for the non-inverting amplifier. Node A is grounded. We connected a VIVO source to node A and measured the node voltages for B, C and D nodes and then we replaced the source with the -VIVO source and measured the same voltages as shown in figures 8 and 9 respectively. Source for the non-inverting amplifier. Figure : Schematic for voltage measurements of nodes B, C, and D with -VIVO voltage source for the non-inverting amplifier. We can see the values of the various voltages obtained from the measurements on the table below.

The difference in the voltage lariat results in a phase change in the output gain seen by a sign change in the output voltage. 0. 91 v 1 . VIA 12. VIA -0. 91 v -1 . VIA -12. VIA Table : Table showing voltage measurements for the non-inverting amplifier with different voltage source values. With RE as shown in figure 10 below. With a resistor of equal value for the non-inverting amplifier. Next we shunted RI with another resistor of equal value connected in parallel after which we measured the node voltages for nodes B, C and D as shown in figure 1 1 . With a resistor of equal value for the non-inverting amplifier.

We proceeded to short- circuiting the RE resistor and obtaining measurements for the voltages at nodes B and D as shown below in figure 12. This resulted in all the nodal voltage values being equal and therefore yielding a gain of unity. Table 4 shows the results obtained from our measurements in this section. Circuited for the non-inverting amplifier. RI 5. V -0. VIA -12. V O ohm Table : Table showing voltage measurements for the non-inverting amplifier when resistances are varied. Conclusion: This experiment was designed to better our understanding of amplifiers both inverting and non-inverting.