HACETTEPE UNIVERSITY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
ELE-313 ELECTRONICS LABORATORY II

EXPERIMENT – 5 BANDWIDTH, SLEW RATE. And OFFSET

PRELIMINARIES:

1. Students who will attend this experiment are assumed to know:
   OP-AMP characteristics and circuits
2. Read "Chapter 14-Operational Amplifiers" from Electronic Devices and Circuit Theory by Robert Boylestad and Louis Nashelsky" and lecture notes.

WORK

1) If the unity gain frequency of an Op-Amp is 5MHz, what would be the cut-off frequencies of the circuit given figure 1 when R_f=47KΩ and 100KΩ.

2) In a circuit with Op-Amp, output of an OpAmp is limited by its slew rate which directly limits the applicable frequency from input. As an input for the circuit in figure 2, a sinusoidal input is applied and its peak value, Vpeak= 0.5V. In order to prevent distortion at the output what should be the maximum frequency of this sinusoidal signal. R_f=100KΩ
Note: Find the slew rate of LM741 from its specification sheet!!!

3) The circuit in figure 3 is used to measure output offset voltage. Output offset voltage is caused by input offset voltage and input offset current. Calculate the output offset voltage, by using typical values from the related spec of LM741 where assume T_A=25C°.

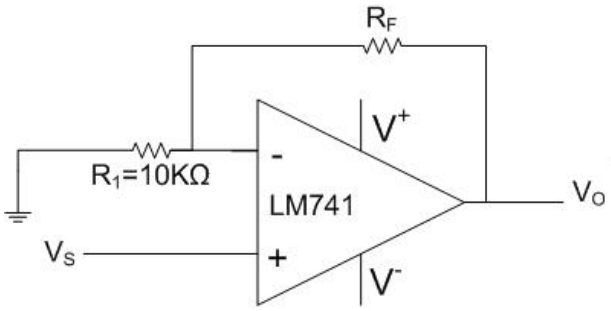


Figure 1

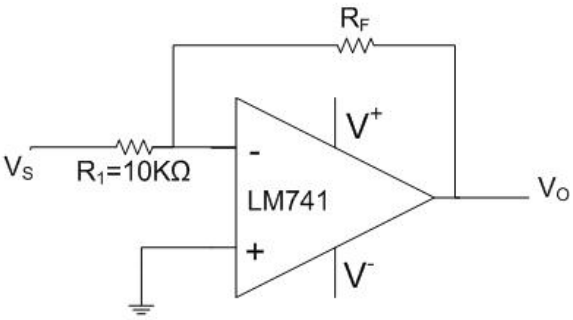


Figure 2

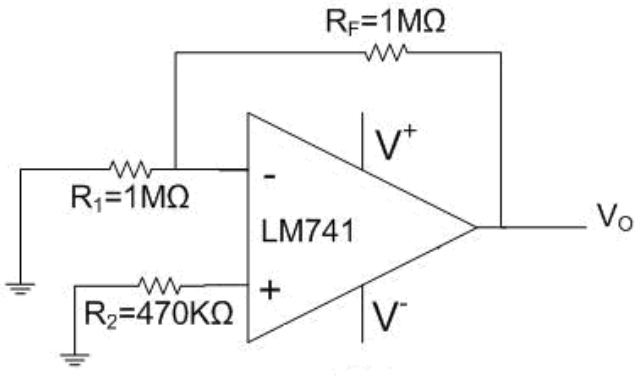
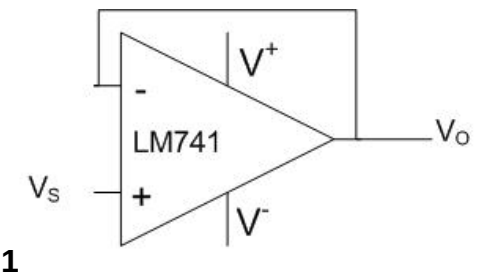


Figure 3

4) Pspice Simulation

1). Connect V^+=15V and V^-=-15V of LM 741 OpAmp. Keep these connections till the end of the experiments.
2). In order to measure the unity gain frequency of the op-amp connect circuit given in (1) with V_s=50mV peak at 100Hz.
3). Observe V_s and V_0. Increase the frequency of the signal generator, and record the frequency where V_0 decreases to 0.707 times its value at 100Hz. This frequency is the unity gain frequency (gain bandwidth product) of the amplifier.
4). In order to prove that unity gain bandwidth is constant set up the circuit given in (2). Measure the output voltage V_0 with R_F=47KΩ V_s=50mV peak at 100Hz. Increase the frequency of the signal generator, and record the frequency where V_0 decreases to 0.707 times its value at 100Hz.
5). Repeat 4) with R_F=100KΩ
6). In order to measure the slew rate of the op-amp, set up circuit given (3) R_F=100KΩ, with V_s=50mV peak at 100Hz square wave.
7). Calculate the maximum frequency imposed by the slew rate. Increase the frequency of the signal generator beyond this calculated maximum frequency with V_s=0.5V peak at 1kHz sine wave and R_F=100KΩ.
8). In order to measure the total output offset voltage of the op-amp set up the circuit given in (4). Measure the DC output voltage V_0.



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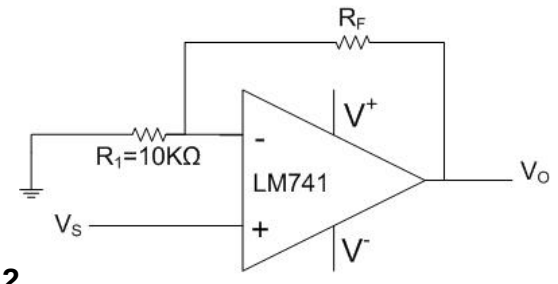

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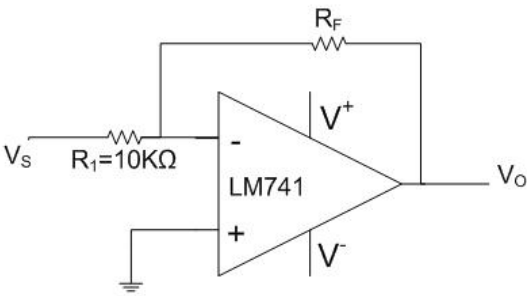

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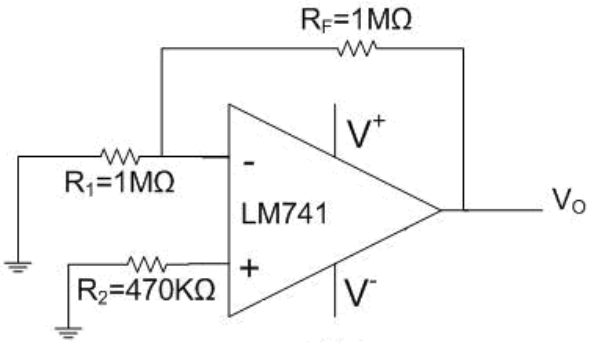

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