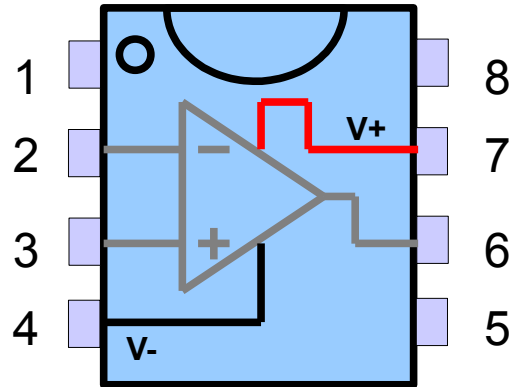


Semiconductor Devices and Analog Circuits

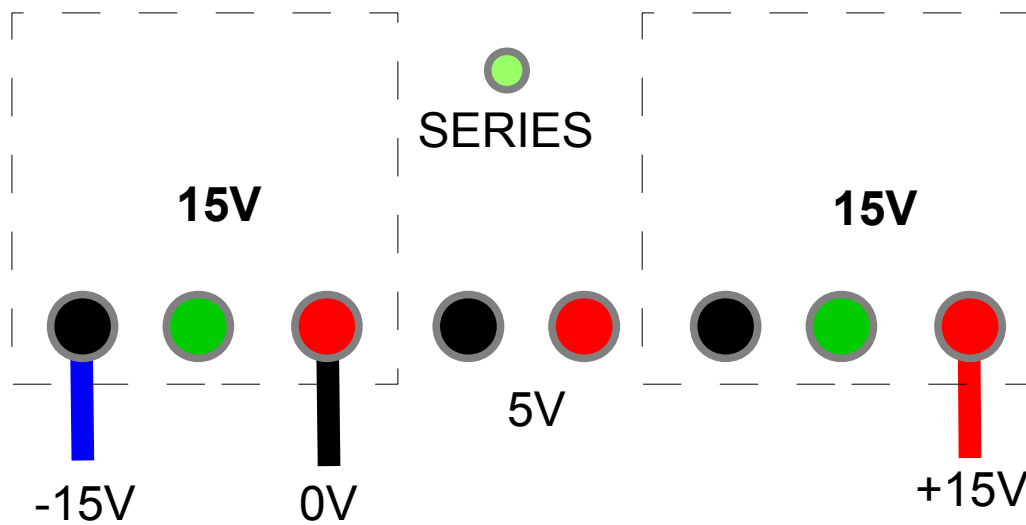
Lab 5

Wein bridge generator

1. During this lab an operational amplifier type 741 will be used. The pinout of the device in the view from above is shown below.

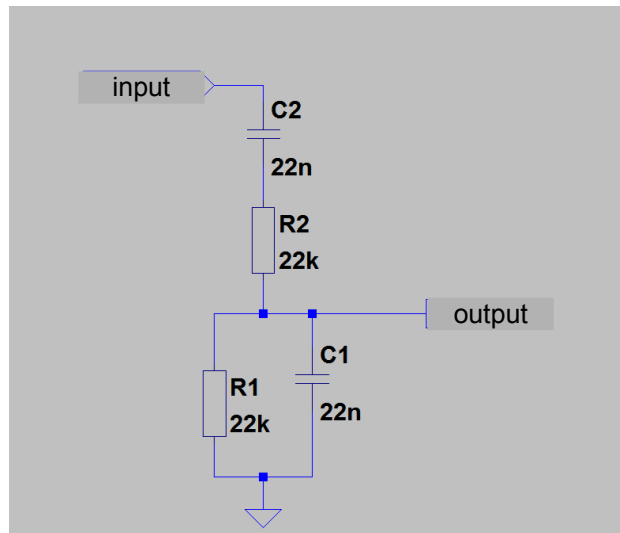


2. Symmetrical power supply $\pm 15V$ used to power the amplifier during this lab can be obtained using the connections shown below (*Series mode* needs to be activated):

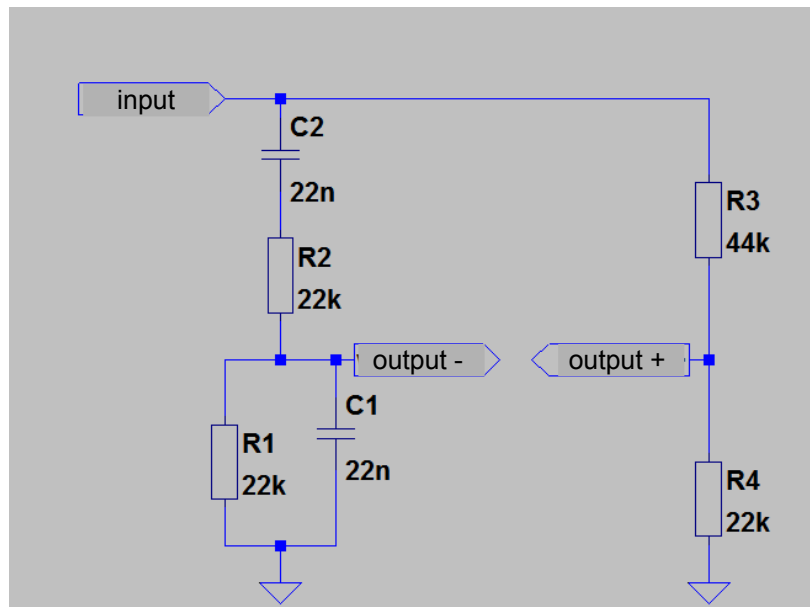


3. Please decode markings of all the resistors and capacitors used in today's lab. Measure the resistance and capacitance and compare it to the decoded values.
4. Please build the RC circuit shown below. Apply a sinusoidal signal to the input.

Please determine the frequency for which the phase difference between input and output signal is equal to 0. Please measure the signal attenuation $\beta = U_{out}/U_{in}$. Please compare the results with theoretical values obtained from the calculations of a voltage divider formed by two impedances: ($Z1 = R1 \parallel C1$ and $Z2 = R2 + C2$) for the frequency $f = \frac{1}{2\pi RC}$ (i.e. $\omega = \frac{1}{RC}$).

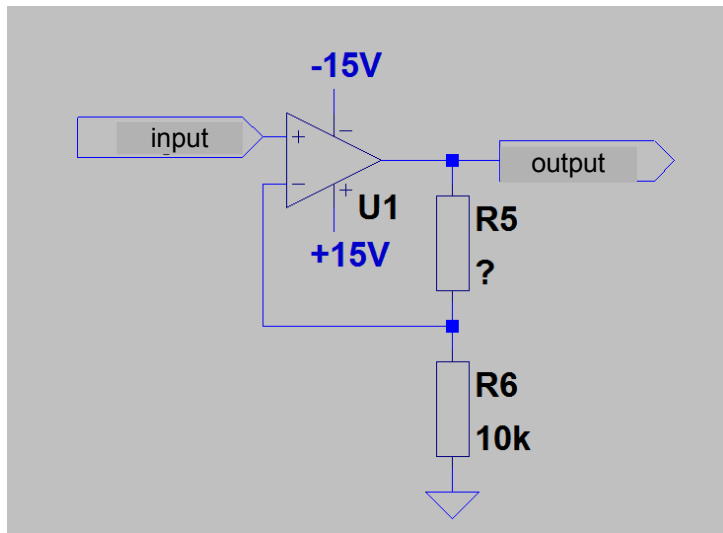


5. Please add the following components, as depicted below:



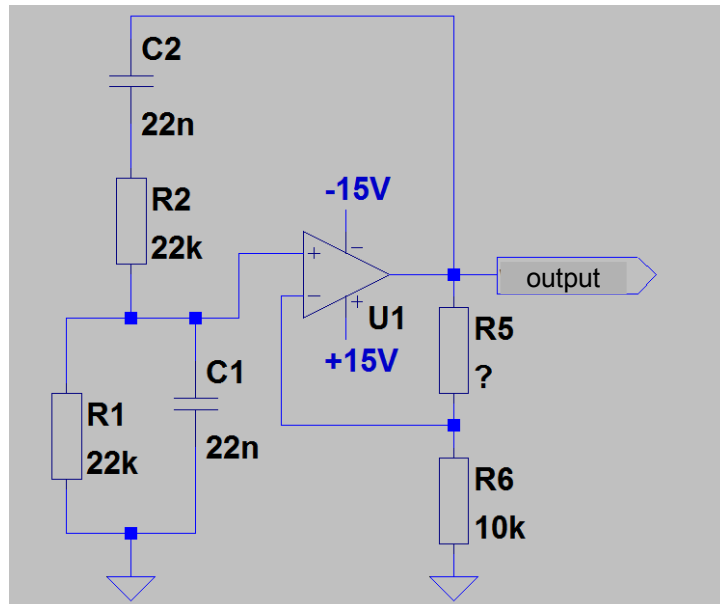
Please observe the changes of amplitude and phase of the signal on the output of the bridge (between points "output -" and "output +"). It will be necessary to use mathematical functions of the oscilloscope – the difference between two ground referenced channels. Please explain why it is necessary to use this kind of operation.

6. Please build a non inverting amplifier with the gain equal to approximately 3.2 times. Please do not destroy the previously built circuit!



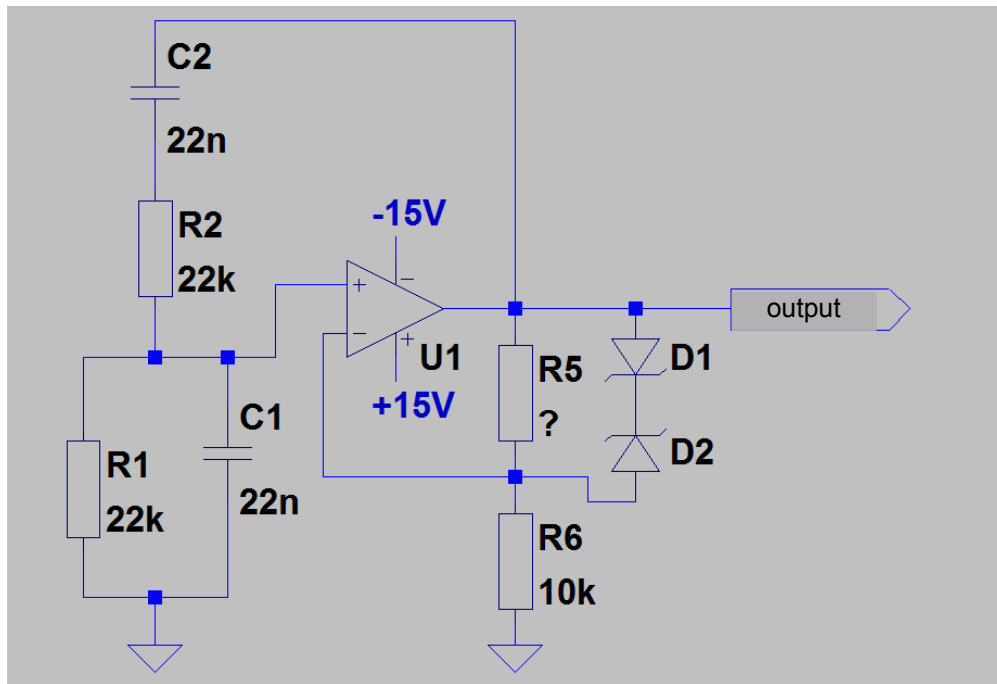
After building it, please verify if the gain has the correct value.

7. Please connect the two previously built modules to form the circuit depicted below.



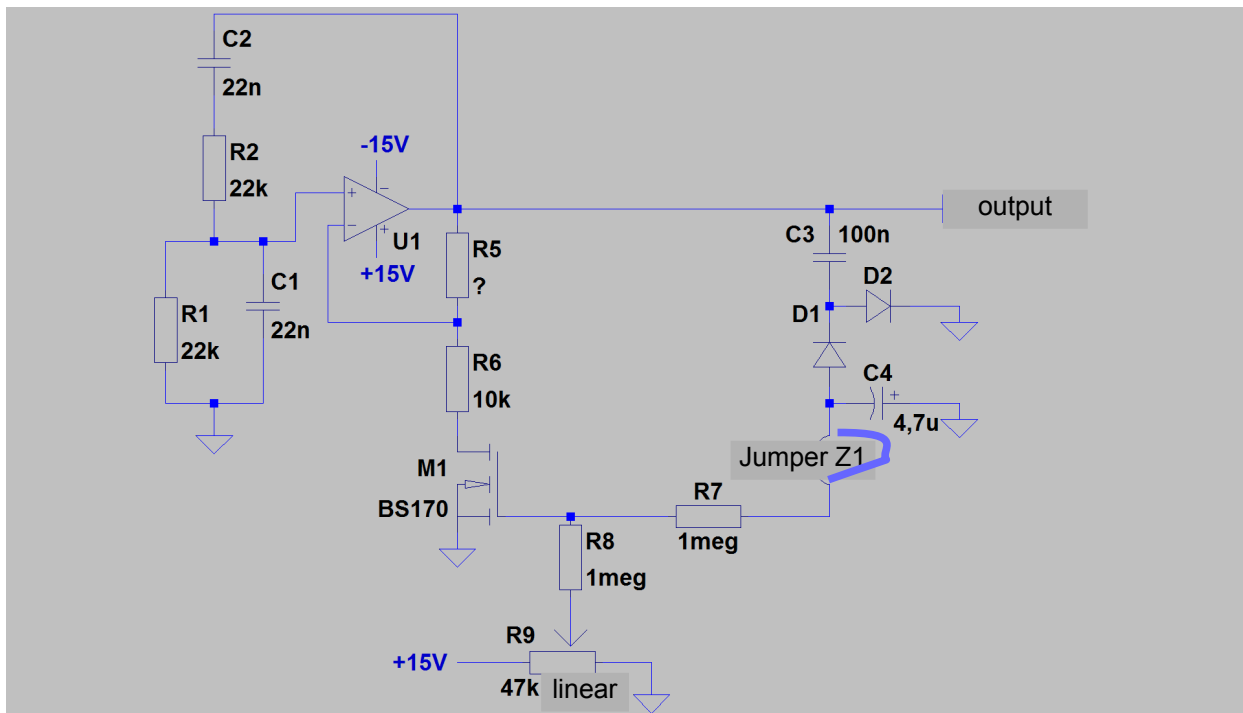
Please observe the output signal and measure its frequency. How does it correspond to the previously measured frequencies? Please explain the cause of output signal distortions

8. Please add 2 Zener diodes with Zener voltage of approximately 3.6V



Please observe the output signal and measure its frequency. How does it correspond to the previously measured frequencies? Please explain how do the diodes influence the circuit behaviour

9. Please add the automatic level control (ALC) circuit. The terminals of BS170 transistor are described in the datasheet.



Please check, in the order given:

- the operation of the generator with jumper Z1 disconnected (ALC disengaged) – adjustment of potentiometer should change the amplitude of the output up till the point when the oscillation ceases. At the same time please observe the voltage across C4.
- the operation of the generator with jumper Z1 connected (ALC engaged) – adjustment of potentiometer should change the amplitude of the output. At the same time please observe the

voltage across C4.