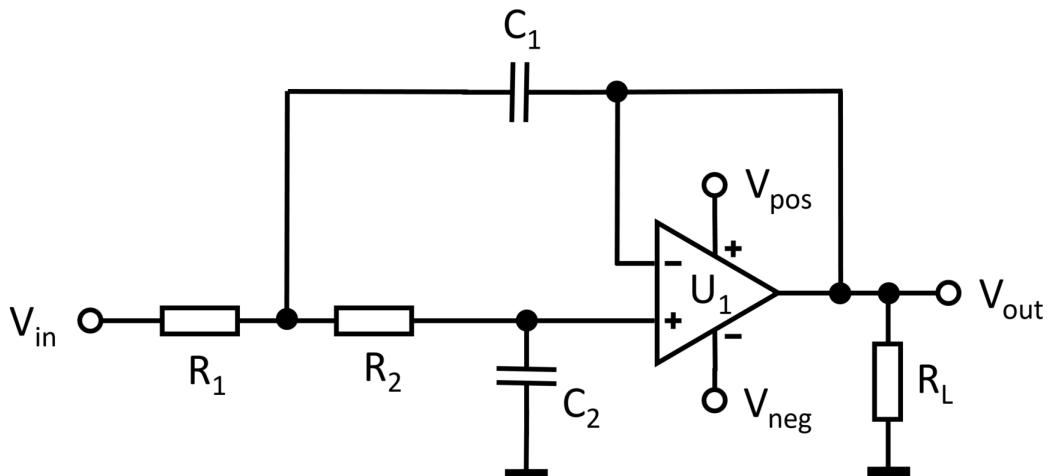


Exercise set #5

Exercise 1:

We want to analyze the following circuit using *LTspice*:



a) Draw the circuit and use the following values for the components:

| | |
|-----------|------------------------|
| R_1 | $15\text{ k}\Omega$ |
| R_2 | $15\text{ k}\Omega$ |
| R_L | $50\ \Omega$ |
| C_1 | 225 pF |
| C_2 | 115 pF |
| $U1$ | <i>UniversalOpamp2</i> |
| V_{pos} | 5 V |
| V_{neg} | -5 V |

b) Simulate the circuit and plot V_{out} as a function of time, when V_{in} is a sinusoidal signal with an amplitude of 1 V , a DC offset of 0 V and frequency $f = 10\text{ kHz}$.

c) Repeat the simulation for $f = 5\text{ kHz}$, $f = 50\text{ kHz}$, $f = 100\text{ kHz}$ and $f = 500\text{ kHz}$. What does the circuit do?

d) Find f_C for which the amplitude of V_{out} is 3 dB lower than V_{in} .

e) Repeat d) for $C_2 = 65\text{ pF}$, $C_2 = 200\text{ pF}$ and $C_2 = 250\text{ pF}$.

f) Find a value for C_2 such that $f_C = 30\text{ kHz}$.

g) Simulate the circuit and plot V_{out} as a function of time, when V_{in} is a rectangular signal with an amplitude of 1 V , a DC offset of 0 V and frequency $f = 20\text{ kHz}$. What do you observe?

h) Plot the spectrum of V_{out} .

i) Measure the average power required at V_{pos} .

j) What will happen to V_{out} if V_{in} is a sum of two sinusoidal signals with amplitudes of 1 V , DC offsets of 0 V and frequencies $f_1 = 10\text{ kHz}$ and $f_2 = 100\text{ kHz}$? What about $f_1 = 10\text{ kHz}$ and $f_2 = 40\text{ kHz}$?