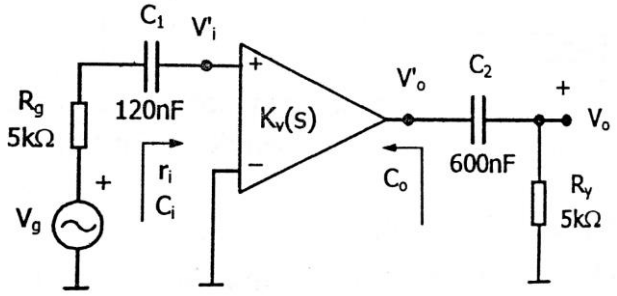
EHB 335E HW#5

Due: 5 December 2017 @9:00 am – No late homework will be accepted.

1) In the figure below, the unloaded transfer function of the amplifier is given. You can assume that $r_i = 50k\Omega$, $r_o = 1k\Omega$, $C_i = 250pF$, $C_o = 0$.

$$\frac{V_0'}{V_i'} = \frac{48\pi^3 10^{15}}{(s+200\pi)(s+6\pi\times10^4)(s+4\pi10^6)}$$

a) Find the mid-band gain (defined as V_o/V_g) and the lower cutoff frequency (–3dB) of the amplifier.
b) If an ideal (zero rise time) periodic pulse with an on-time of $T_D = 20\mu s$ is applied at the input of the amplifier, find the rise time and the total tilt observed in the output signal.



2) The amplifier below has a very large input resistance and a very small output resistance. Besides, the input and output capacitances can be neglected. Following component values can be used for calculations: $R_g = 10k\Omega$, $C_1 = 180nF$, $R_1 = 120k\Omega$, $R_2 = 1k\Omega$, $R_3 = 25k\Omega$, $R_4 = 3k\Omega$, $C_2 = 1\mu F$, $C_3 = 4nF$, and $R_L = 8k\Omega$. The transfer function of the amplifier can be given as:

$$K(s) = \frac{2\pi10^6}{s+500\pi}$$

a. Find the mid-band gain of the amplifier defined as V_o/V_g.
b. Find the lower and upper cutoff frequencies (–3dB) of the amplifier.
c. If an ideal (zero rise time) periodic pulse with an on-time of $T_D = 1ms$ is applied at the input of the amplifier, find the rise time and the total tilt observed in the output signal.
d. Simulate the circuit using your favorite Spice simulator and compare the outcomes with the results you found above. You can assume $V_g = 1\,V$ (DC) and a periodic pulse at V_g varying between 0 to 2V with a frequency of 500 Hz.