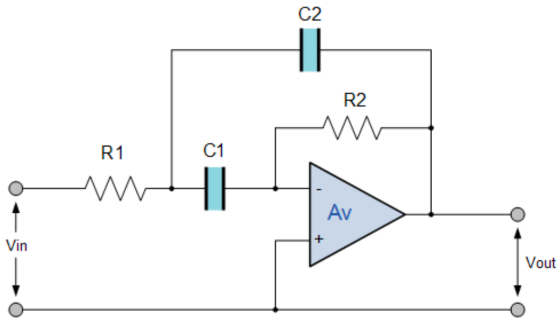
Dr. Müştak E. Yalçın

Circuit and System Analysis

Project

1. Consider the circuit which is known as Infinite Gain Multiple Feedback Active Filter. Determine the voltage transfer function $H(s) = \frac{V_o(s)}{V_i(s)}$.



2. $$H(s) = -K\frac{s}{s^2 + \frac{w_0}{Q}s + w_o^2}$$

   is the biquadratic Band Pass function. Depict $|H(jw)|$ and show the critical point. Calculate the gain K value to have unit gain in the critical point.

3. Obtain $H(s)$ transfer functions for the center frequencies $w_o = 2\pi(1209)$ and $w_o = 2\pi(1336)$ ($Q = 20$ for both cases). Compute the gains K in order to have unit gain in the center frequencies. Draw the $|H(jw)|$ and $\angle H(jw)$.

4. Draw Bode diagrams of these two systems.

5. The magnitude of the transfer function is $\frac{1}{\sqrt{2}}H_{max}$ that is named the cutoff frequencies. Calculate the cutoff frequencies for the given center frequencies.

6. Download `data` file from http://web.itu.edu.tr/~yalcinmust/dersler.html Using `load` , `tf` and `lsim` Matlab function, obtain the outputs of the transfer functions and plot the output.

7. Determine the capacitances and resistor values comparing the transfer function of the circuit and the obtained transfer function for two different center frequencies.

8. Using SPICE, simulate your circuits.

Chapter 14: James W. Nilsson and Susan A. Riedel, "Electric Circuits," Pearson Prentice Hall, 2008. Chapter 4:Leon O. Chua, Charles A. Desoer, Ernest S. Kuh, "Linear and Nonlinear Circuits," McGraw-Hill, 1987. Appendix E: James W. Nilsson and Susan A. Riedel, "Electric Circuits," Pearson Prentice Hall, 2008.