**EE2301/EE2501: Lab 2 AN5**

**Theme: Frequency response of single and double stage RC filters.**

**Note**: Please click images for setups and measurements (on DSO) and include them in your report. Hand-written reports **will not** be graded. Only pdf reports typed in Latex or Word are permissible. Please attach your raw experimental data with your reports for plagiarism check.

**Task 1: Design a high pass RC filter**

1. On your breadboard design a single stage high pass filter with cut-off frequency *f*c (in kHz) = month of your birth (labpartner\_1). i.e., if you were born in March *f*c =3 KHz. Of course, R, C available in the lab may not help you in getting the exact value so choose a combination of R, C to obtain closest *f*c
2. Now measure the frequency response (both phase and gain) of this circuit from 10 Hz – 100 *f*c. Choose the frequency points wisely. What is the experimentally obtained cut-off frequency and roll-off slope?
3. Now repeat steps (a) and (b) for a double stage filter with same values of R,C.
4. Plot the frequency response (both gain and phase) of the single and double stage on the same graph.
5. Simulate the above structures and frequency response in LT Spice. How well are they fitting to the experimental data? Now tweak the simulation parameter models or R/C values to obtain the closest fit to experimental data. Document the deviation between experimental R, C values used and the R, C values in the model which gives the best fit. The experimental and tweaked simulation values must be plotted on the same graph.

**Task 2: Making a better double stage filter.**

1. You may have noticed that although the frequency response of the single and double stage filter in theory should give the same fc ; in practise there are lot of deviations in the fc of the 1 and 2 stage filters. What is the fundamental reason for that?
2. Design a passive scheme (without active elements) to get rid of the effect described earlier.
3. Design an active scheme (with active elements) to get rid of the effect described earlier.
4. Plot the frequency response of the 2 -stage filters using (1) no correction (2) passive correction and (3) active correction on the same graph. Please include LT Spice simulations.

**Task 3: Design a band-stop LC filter**

1. Using the learnings of Task 2 design a band pass LC filter. The lower cut off frequency fL = month of your birth (labpartner\_2) and higher cut off frequency fH = month of your birth (labpartner\_2)\*10
2. Now measure the frequency response of this circuit. What is the experimentally obtained ‘centre’ frequency and bandwidth?
3. Simulate the above structures and frequency response in LT Spice. How well are they fitting to the experimental data? Now tweak the simulation parameter models and/or R/C values to obtain the closest fit to experimental data. Document the deviation between experimental R, C values experimentally used and the R, C values in the simulation which gives the best fit.