

Homework 4

This homework is about the low frequency response of amplifiers. For the circuit below, use as a signal source a sinusoidal with 10mV amplitude. Before starting ac analysis, please do a transient analysis at 10kHz to see that all DC voltages are reasonable and there is amplification in the circuit and no clipping. A BJT circuit was chosen for the homework because the corner frequencies due to C_E and C_{C1} are not independent, which makes the problem a little more difficult. Please use related transistor models given on the moodle.

- 1) Calculate all the low frequency poles and zeros coming from the coupling and bypass capacitances.
- 2) Do an AC simulation of the circuit from 10 Hz to 10 Megahertz to observe the low frequency, mid-band, and high frequency regions.
- 3) In order to verify your calculations, keep only one capacitor at 10 μ F and make the others 10mF so that only that capacitor is dominant and the others are shorted at those frequencies. Repeat this for every capacitor and compare with your calculations. If there are discrepancies, try to figure out why and modify this simulation approach to correct them.
- 4) Try to design the capacitance values so that the low frequency cut-off point is at approximately 50 Hz. The constraint for this design is to minimize the sum of the values of all capacitors in the circuit. Show calculations and verify with simulation.
- 5) For the original circuit, try to cancel one of the poles with the zero by changing either C_{C1} or C_{C2} . Show calculations and simulations.

