

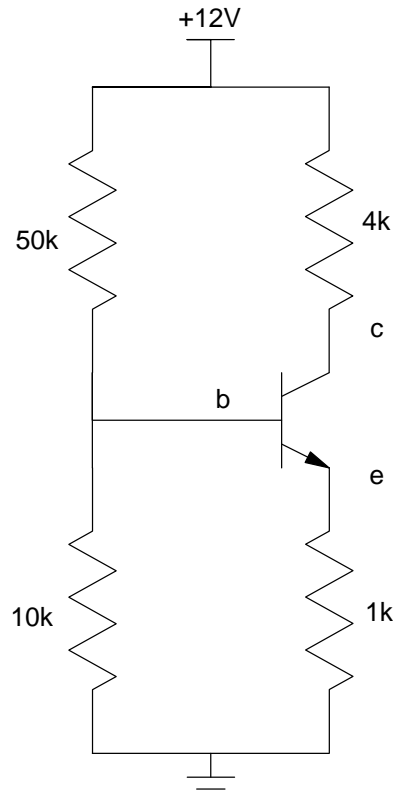
ECE 321 - Homework #3

Filters & 2-Port Models. Due Monday, April 24th, 2017

1) Determine the Q-point for the following circuit. Assume $\beta=100$

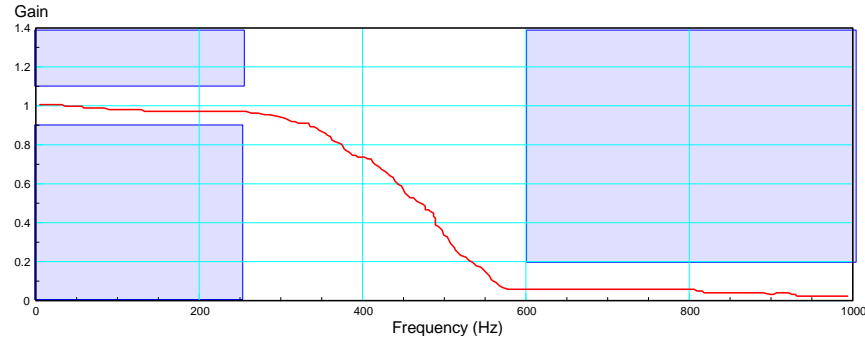
2) Find R_1 , R_2 , and R_e so that

- The Q-point is stabilized for variations in β , and
- $V_{ce} = 6V$



Problem 1 & 2

Design a filter for your push-pull amplifier



3) Requirements:

- Input: +/- 10V analog signal, 100Hz to 1kHz, capable of 20mA (i.e. a LM833 op-amp)
- Output: +/- 10V analog signal capable of 20mA (i.e. another LM833 op-amp)
- Relationship: Specify how the input and output relate. For a low-pass filter, for example, this might be
 - $0.9 < \text{Gain} < 1.1$ for frequencies below 250 Hz
 - $\text{Gain} < 0.2$ for frequencies above 600 Hz

4) Matlab Analysis:

- Give the transfer function for a filter which meets your requirements
- Plot the gain vs. frequency for your filter along with the requirements.

5) Analysis: R and C Calculations. Give the schematic along with calculations for R and C for a circuit to implement the transfer function you found in problem #3.

6) Test: Simulate your circuit in PartSim. Check the simulated gain at

- The two endpoints
- The corners, and
- A few other points

7) Validation (Lab): Build your filter. Measure the gain at several frequencies to see if it agrees with your analysis