File: f:/coursesS11/303/303S11Hmwk3.doc RWN 02/18 – 24b/11

ENEE 303 Spring 2011 – Homework 3 Due M ~~02/28/11~~ 03/07/11

1. For the following two complementary BJT grounded emitter amplifier circuits:

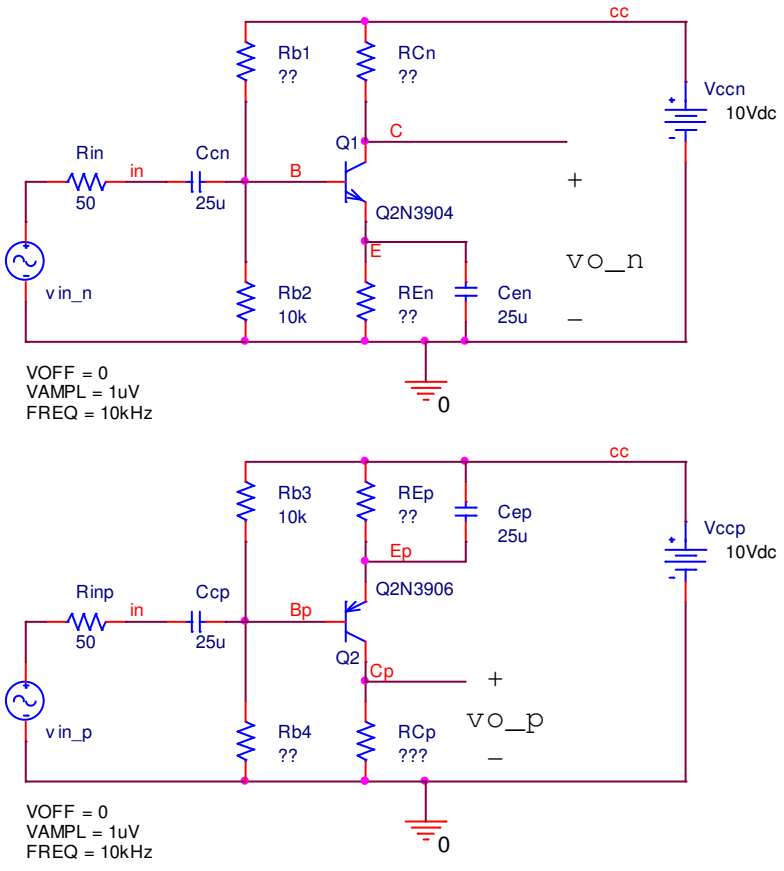
a) Make a table with the following data from the Spice models (except find $f_T$ from the data sheets)

| | Beta = Bf | Early V=Vaf | $f_T$ |
|---|---|---|---|
| 2N3904 = npn | | | |
| 2N3906 =pnp | | | |

b) Run the Spice curves and choose a Q point which has |IC| = 4mA and VCE=4V. Give the resulting IB from the curves and compare the beta with that of part a). Using IB from the Spice curves give hand calculations to fill in the following table; use |VBE|=0.7 Assume that a voltage gain, AV = -100, is desired (when the Early effect is ignored). Choose Rb2=Rb3=10kΩ. Again make a table with the following Q point values.

| amplifier | RCn | RCp | REn | REp | IB | Rb1 | Rb4 | $g_m$ | $g_\pi$ | $g_o$ |
|---|---|---|---|---|---|---|---|---|---|---|
| npn | | | | | | | | | | |
| pnp | | | | | | | | | | |

c) In Spice do a frequency response (of |vo/vin(jω)| ) and compare (for both amplifiers) the low-frequency gain with that calculated. Finally run a frequency response to frequencies above $f_T$ of the transistors (starting at 100Hz) and note the behavior.



2. Using the following circuit with 4007 transistors design a current source and a sink to create output currents of 2 milliAmps. You can use F components to measure the output currents.