ECE 255 ELECTRONIC ANALYSIS AND DESIGN Fall 2009

Homework 3 Due Friday, October 9

5:00 p.m. Room MSEE 180 Drop Box

COURSE WEBSITE: http://cobweb.ecn.purdue.edu/~ee255/

1) Text problem 5.86, page 270. Assume $V_{BE} = V_0 = 0.7$ V.

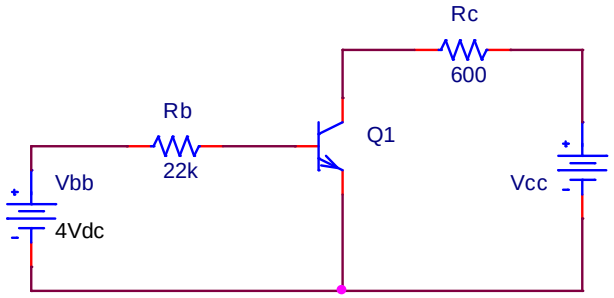
2) Text problem 5.87, page 270. Assume $V_{BE} = V_0 = 0.7$ V.

3) Text problem 5.91, page 270. Assume $V_{BE} = V_0 = 0.7$ V.

4) The transistor in the circuit shown below is modeled by $V_0 = 0.7\,\text{V}$, $\beta_{dc} = 100$, $I_{CE0} = 5\,\mu\text{A}$, and $R_{sat} = 60\,\Omega$. If $V_{BB} = 4\,\text{V}$, $R_B = 22\,\text{k}\Omega$, and $R_C = 600\,\Omega$, find I_C and V_{CE} if V_{CC} is:

(a) 12 V

(b) 6 V



5) An *npn* transistor is modeled in its active region by $\beta_{dc} = 75$, $V_0 = 0.6\,\text{V}$, and $I_{CE0} = 1\,\mu\text{A}$. A 1 kΩ resistor and a 9 V dc source are connected in series between the base and collector (positive source terminal to collector), and a 500 Ω resistor and a 3 V dc source in series are connected between the base and emitter (negative source terminal to emitter). Find I_B, I_C, I_E, V_{BE}, and V_{CE}.

6) A *pnp* transistor is described by $V_0 = \frac{2}{3}\,\text{V}$, $I_{CE0} = 3\,\mu\text{A}$, and $\beta_{dc} = 80$. Design a circuit (using a single power supply) that will give an operating point of $|I_C| = 6\,\text{mA}$ and $|V_{CE}| = 6\,\text{V}$.

7) Text problem 13.49, page 742. Note: use $\frac{q}{kT} = 38.92\,\text{V}^{-1}$

8) Text problem 13.50, page 742. Assume an ideality constant of unity and T = 25°C. (Note $r_o \equiv r_d$ and $V_A >> V_{CE}$)

9) Text problem 13.54 (part 1), page 742. Assume an ideality constant of unity and T = 25°C. Determine $\beta_F = \beta_{dc} \approx \beta_0$ and V_A using the values from the table.

10) Text problem 13.54 (part 2), page 742. Fill in the table. (Note the intrinsic voltage gain $\mu_f = g_m \times r_o$)