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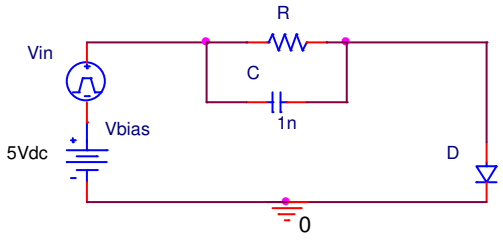
303 Spring 2011 – Homework 2 Due ~~M 02/14/11~~ ~~W 02/16/11~~ M 02/21/11

1. Set up in PSpice a circuit to obtain the IC versus VCE with IB as secondary sweep for BJT npn and pnp transistors. Do this for the 2N3904 and 2N3906 transistors used in the laboratory such that curves for both transistors can be seen in the same plot. Note that these transistors are in the bipolar library and indexes by Q as the first letter identifying them in the library. For the npn give runs for VCE from 0 to 9 V (use VEC for the pnp) with IB of 0 to 20uA in 10uA steps. You can use one current source for IB and two F (=CCCS) components to feed it to the two bases (gain of 1 for npn and -1 for pnp)

2. Using those curves for the above npn transistor find g_π, g_m, beta_forward, and g_o at VCE = 4V and 6V and IB = 10uA and VCE = V4 & 6V. Repeat for the pnp transistor at the corresponding (<0) point. Repeat at IB =20uA and VCE = 4V and 6V. Make a table comparing these results.

2. In the following circuit assume the diode is the BE junction of a 2N3904 transistor (by connecting the collector to the base).
   a. Run PSpice to obtain V_D for I_D=3mA and with that the resistor value needed to bias it at the Q point having I_D = 3mA.
   b. Draw the small signal equivalent circuit assuming Vin is a small signal and set up the first order differential equation for the capacitor voltage.
   c. From the small signal equivalent circuit find the small signal current (downward) in the diode when Vin(t) is a unit step function of 2 uV amplitude.



3. Using the mnmosis and mpmosis transistors find the width of the mpmosis transistor needed to set the output voltage, Vo, of the following circuit to 2V.