`bjt_inverter.sqproj`

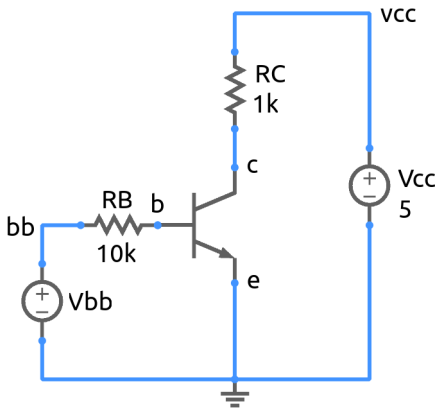

Figure 1: Circuit schematic for BJT inverter.

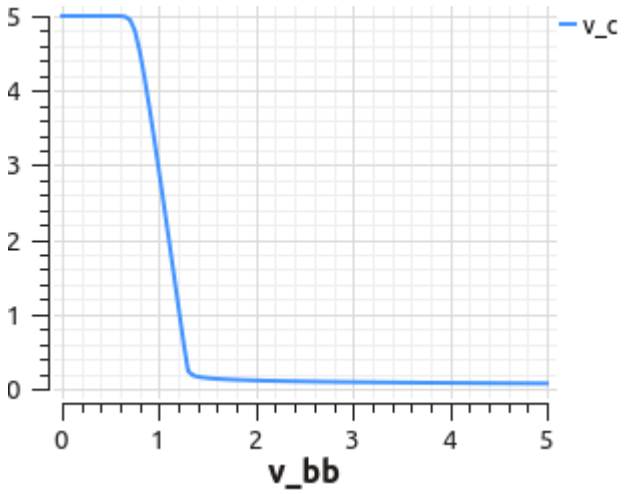

Figure 2: Output voltage versus input voltage.

The BJT circuit shown in Fig. 1 acts as an inverter: When the input voltage is low, the transistor does not conduct, there is no current through R_C, and the collector voltage (output) is pulled up to V_{CC}. When the input voltage is increased, the transistor beings to conduct, the voltage drop across R_C starts increasing, and the output voltage falls (see Fig. 2). Finally, when the input voltage is high enough to drive the transitor into saturation, there is a fixed small drop (V_{CE}=0.1 to 0.2 V) across the transitor, and the output voltage saturates to this low value.

Assignments

1. Write V_C as a function of V_{BB} for the transition region in Fig. 2. Assume that V_{BE} is approximately 0.7 V in this region.

2. If R_B is doubled, how will the plot change?

3. If R_C is doubled, how will the plot change?

4. If the transistor β decreases by a factor of 2, how will the plot change?

5. Check your answers against simulation results.

6. If the circuit has to be used as an amplifier, what V_{CE} value will you choose as the DC bias? What would be the gain of this circuit?