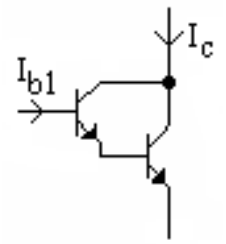
EE2032 Electronics Quiz#6

April 17, 2019

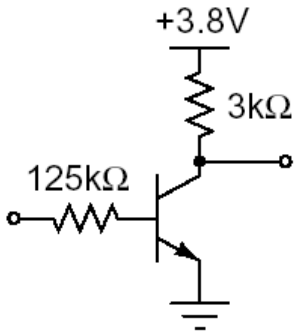
1) The Darlington connection of two identical transistors is shown in the figure. Assuming that the transistors works in the active region (β=50), find the current gain I_c/I_{b1}.



2) A simple logical inverter is shown in the figure.

a) When its input goes high (3.8V), the transistor should saturate as to have the minimum possible output voltage (V_{CEsat}=0.2 V). What is the minimal β the transistor must have to saturate at an input voltage of 3.8V given the resistors as shown?

b) Draw the input-output voltage transfer characteristics if the transistor has β=100. (Use the horizontal axis for the input voltage in the range of 0 to 3.8 volts. Use the vertical axis for the output voltage.)



3) In the circuit given, R_L represents a light bulb and its value is 100Ω. R_S is a light sensor with the following values:

At light R_S = 100Ω, and at dark R_S = 100KΩ.

Our objective is that the bulb should turn on at dark and turn off at light. To satisfy this, we require that, at dark, the transistor should be in saturation, and at light, the transistor is at cut-off.
Transistor has β=100 and $V_{ce(sat)}$ = 0.2 V (and V_{be}=0.7V if in active region).

a) Considering the dark, what is maximum value of R such that the transistor is in saturation?
b) Considering the light, what is minimum value of R such that the transistor is in cut-off?
c) Suggest a suitable R value for this circuit to work properly.