Indian Institute of Technology, Delhi
ELL304 Analog Circuits
Tutorial 3, 13 August 2015

1. Consider the circuit in (a). β is 100, $I_S = 6 \times 10^{-16}$ A. V_A is very large. Find the minimum R_B that guarantees operation in the active mode. For this value of R_B, if β changes to 200, how much base-collector forward bias is sustained?

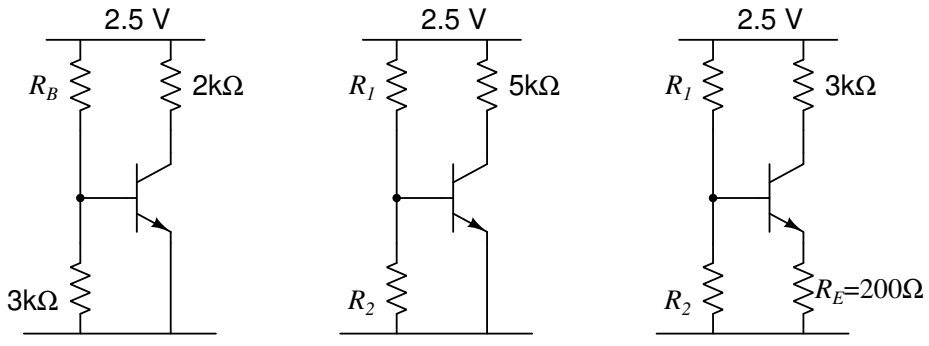
2. The circuit in (b) is to be designed for an input impedance > 10 kΩ, $g_m > 1/260$ S. β is 100, $I_S = 2 \times 10^{-17}$ A. Ignore V_A. What are minimum values of R_1, R_2? A small signal is coupled onto the base with a coupling capacitor, and the circuit an amplified signal appears at the collector on top of the operating point. Find the maximum and minimum voltages that are allowed at the collector for the device to be in the active region all the time.

3. The circuit in (c) is designed for a collector current of 0.25 mA. Assume $I_S = 6 \times 10^{-16}$ A, β of 100. Ignore V_A. Determine R_1. If R_E deviates by 5%, what is the error in I_C?

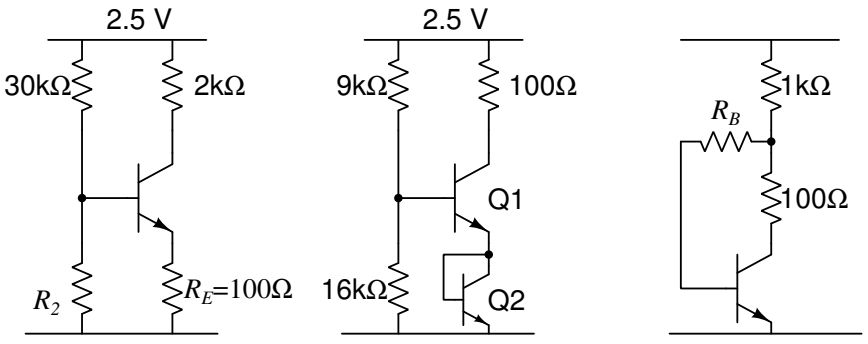
4. In the circuit of (d), determine the maximum R_2 that guarantees active mode operation of the device. Assume β of 100, $I_S = 10^{-17}$ A. Ignore V_A.

5. In the circuit of (e), $I_{S_1} = I_{S_2} = 4 \times 10^{-16}$ A, βs of the transistors are 100. Ignore V_A. Determine the operating point of the transistors.

6. The circuit in (f) must be biased with a collector current of 1 mA. Compute the required value of R_B if $I_S = 3 \times 10^{-16}$ A, β is 100. Ignore V_A.



(a) (b) (c)



(d) (e) (f)