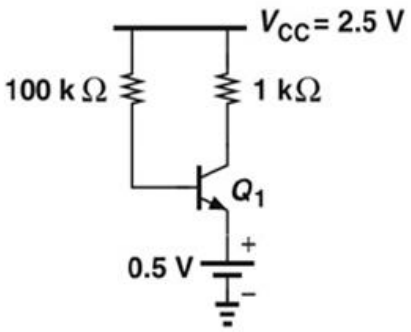
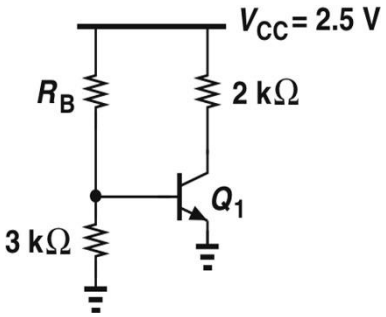
EE 101 Tutorial -4 – BJT Amplifiers

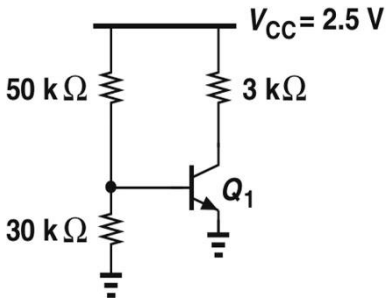
1. Compute the bias point of the circuits depicted in given figure. Assume $\beta = 100$, $I_S = 6 \times 10^{-16}$ A, and $V_A = \infty$.



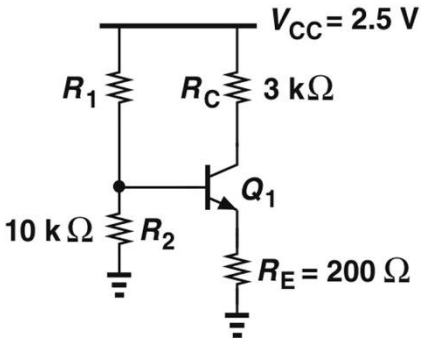
2. Consider the circuit shown in the figure, where β $= 100$, $I_S = 6 \times 10^{-16}$ A, and $V_A = \infty$.
(a) What is the minimum value of R_B that guarantees operation in the active mode?
(b) With the value found in R_B, how much base-collector forward bias is sustained if β rises to 200?



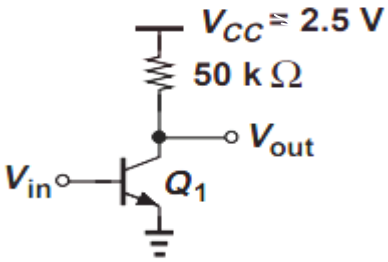
3. In the circuit of the figure, $\beta = 100$ and $V_A = \infty$.
(a) If the collector current of Q_1 is equal to 0.5 mA, calculate the value of I_S.
(b) If Q_1 is biased at the edge of saturation, calculate the value of I_s.



4. The circuit in the figure is designed for a collector current of 0.25 mA. Assume $I_S = 6 \times 10^{-16}$ A, $\beta = 100$, and $V_A = \infty$.
(a) Determine the required value of R_1.
(b) What is the error in I_C if R_E deviates from its nominal value by 5% ?

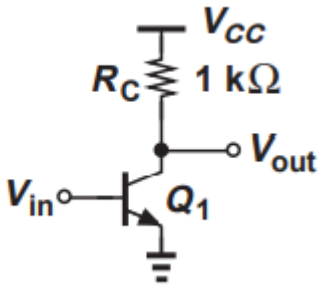


5. We wish to design CE stage of Fig. (given below) for a voltage gain of 20. What is the maximum allowable supply voltage if *Q1* must remain in active mode. Assume $V_A = \infty$. And $V_{BE} = 0.8\text{V}$.

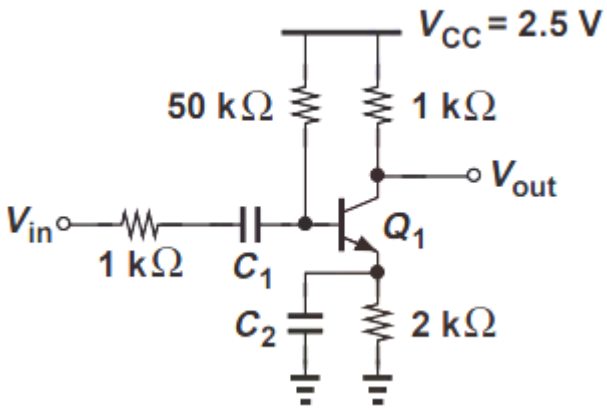


6. Suppose the bipolar transistor in Fig. (given bellow) exhibits the following hypothetical characteristic and no Early effect. Compute the voltage gain for a bias current of 1 mA.

$$I_c = I_s e^{\frac{V_{BE}}{2V_T}}$$



7. Calculate V_{out}/V_{in} for each of the circuits depicted in Fig. (given below). Assume $\beta = 100$, $I_S = 6 \times 10^{-16}$ A, and $V_A = \infty$. Also, assume the capacitors are very large.



8. For R_E = 100 in Fig. (given below), determine the bias current of *Q1* such that the gain is equal to 0.8. Assume $V_A = \infty$.