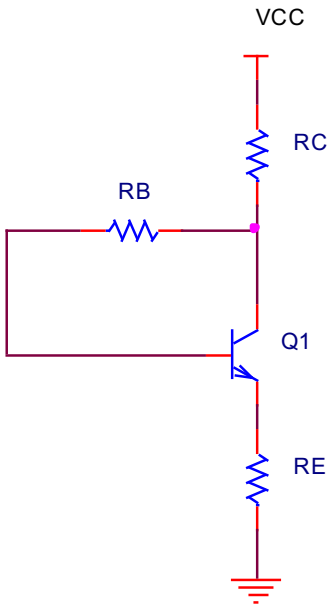
Practice Problem Set #3

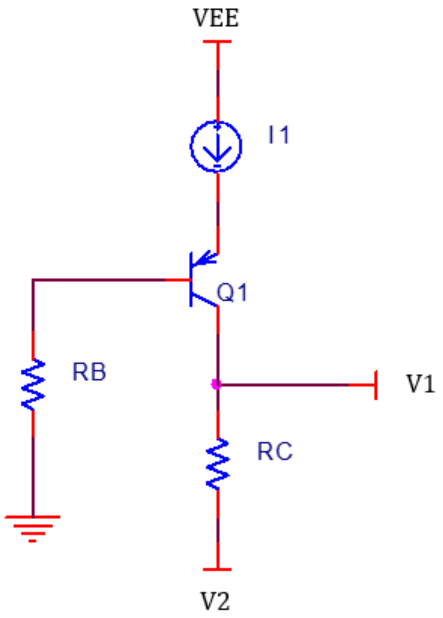
Biasing Techniques

ENEL469: Analog Electronics

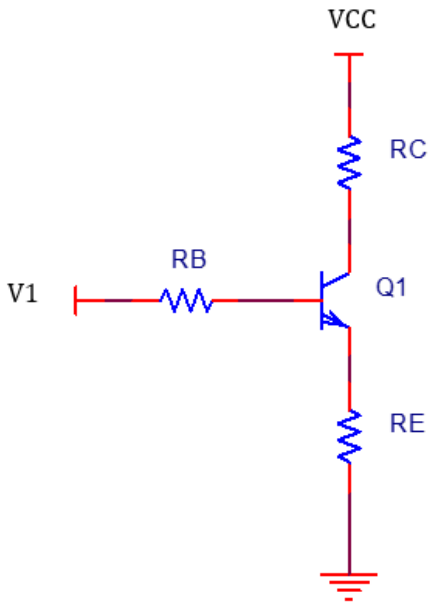
1. For the circuit shown below, determine I_B, I_C, I_E , V_{CB} and V_{CE}. Use the following characteristics: $\beta = 75$, $V_{BE(ON)} = 0.7$ V, $V_{CC} = 5$ V, $R_C = 10$ kΩ, $R_B = 20$ kΩ and $R_E = 2$ kΩ.



2. Consider the following circuit where $\beta = 75$ and $|V_{BE(ON)}| = 0.7$ V, $V_{EE} = 5$ V, $V_1 = -1$ V, $V_2 = -5$V, $I_1 = 0.5$ mA, $R_B = 25$ kΩ. Determine I_B, I_C, I_E , R_C, V_{CB}, V_{CE}, and power absorbed or delivered by the I_1 current source.

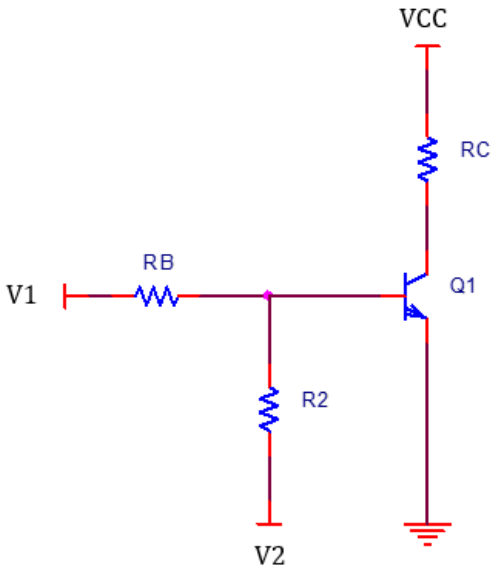


3. The circuit shown below to be designed such that I_C = 0.8 mA and V_{CE} = 2 V for the case when R_E = 1 kΩ. Assume β = 80, $V_{BE(ON)}$ = 0.7 V, V_{CC} = 5 V and V_1 = 2 V. Find the value of R_C and R_B.

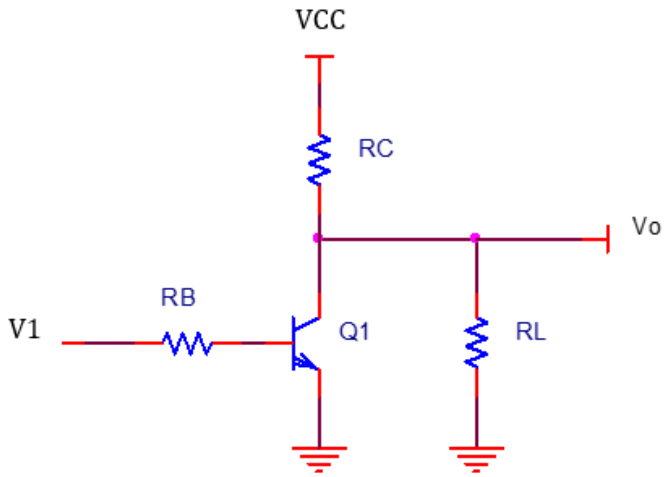


4. Consider the given circuit where β = 80 and $V_{BE(ON)}$ = 0.7V. Determine V_1 such that V_{CE} = 6 V. Use the following characteristics: R_C = 2.2 kΩ , R_B =15 kΩ , R_2 =100 kΩ, V_{CC} = 12V, V_2 = -12V.

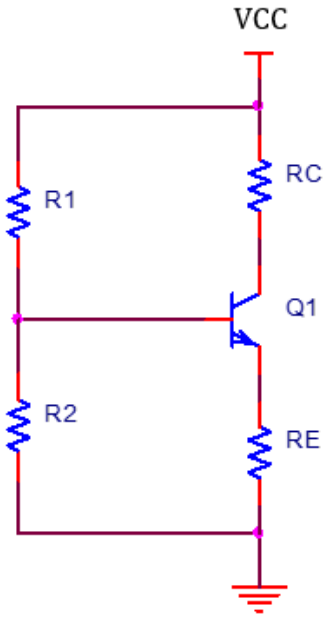
   Note: The terminal where V_1 is measured is not open, but it is connected to other part of the circuit not shown here.



5. The current gain of the transistor shown in the following circuit is 75 and $V_{CE(sat)}$ = 0.2 V. Given, V_{CC}= 5V, R_C = 5 kΩ , R_B = 50 kΩ, R_L = 10 kΩ. Determine V_0 for,
   a) V_1 = 0V and
   b) V_1 = 2 V.



6. In the circuit below, β = 100, V_{CC}= 10V, $V_{BE(ON)}$ = 0.7 V, R_1 = 56 kΩ, R_2 =12.2 kΩ, R_C = 2 kΩ , R_E = 400Ω. Determine I_B, I_C, I_E, and V_{CE}.



7. The circuit below shows multistage amplifier where β = 100 for each transistor and here the B-E junctions require 0.7 V to turn on. Given, V_{CC}= 5V, V_1= -5 V, R_1 = 100 kΩ, R_2 =50 kΩ, R_{C1} = 5 kΩ , R_{E1} = 2kΩ, R_{C2} = 1.5 kΩ , R_{E2} = 2kΩ. Determine V_{CE2}.

   Note: Do not ignore the base currents.