

Recitation 3 : Bipolar junction transistor (BJT) Static Study

Exercise 1

We consider a bipolar transistor powered by a voltage source $E=30V$. The two circuits which will be successively associated with it must impose a collector current I_C of $10mA$. We specify that the current gain $\beta=350$ and $V_{BE}=0.6V$.

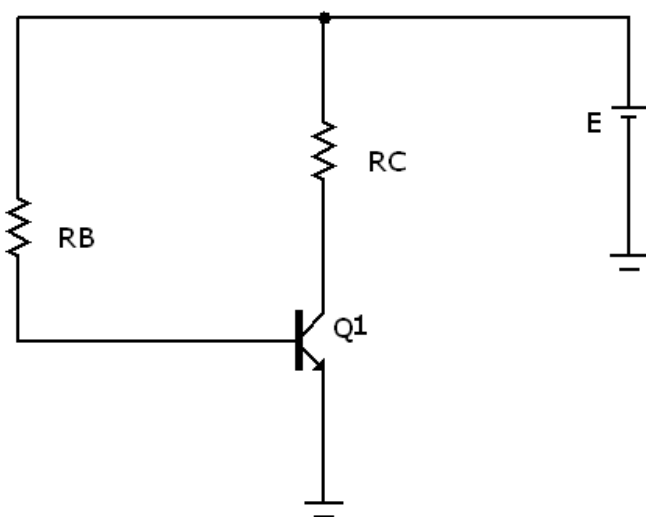


Figure 1

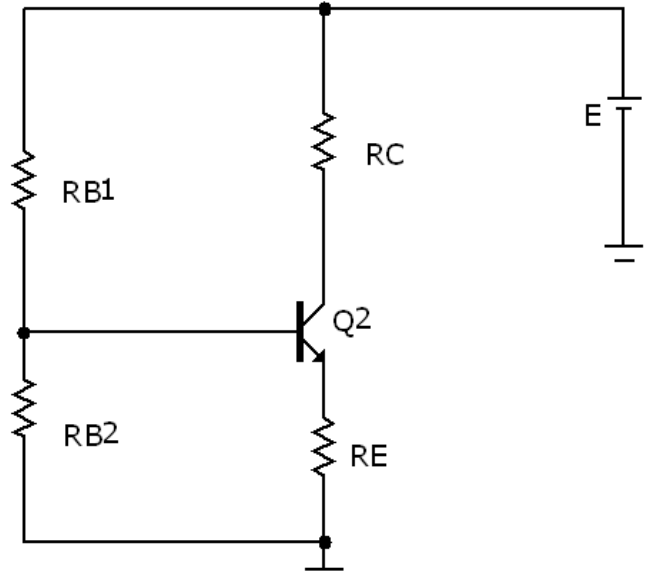


Figure 2

1. Consider the circuit of Figure 1

1.1. Determine the values of R_C and R_B in which the operating point is located in the middle of the static load line.

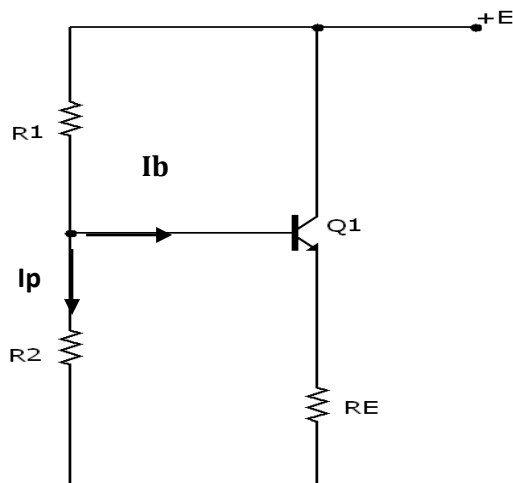
2. The circuit in Figure 2 is mixed biasing made using a base bridge and a resistor on the emitter $R_E=100\Omega$.

Note: The current I_B is negligible compared to the current passing through R_{B1} and R_{B2} .

2.1. What must be the values of R_{B1} and R_{B2} of the base bridge in which the collector current is still $10mA$, knowing that $R_B=R_{B1} // R_{B2}=10K\Omega$. The R_C resistance has the value found previously.

Exercise 2

Consider the circuit based on a bipolar transistor (Q1) given in the figure below:



Given :

$$\beta = 120$$

$$E = 8V$$

$$I_p = 12I_B$$

$$V_{CE0} = 4V$$

$$I_C = 10mA$$

$$V_{BE0} = 0.7V$$

Figure 3

1. Calculate the value of the resistors R_E , R_1 et R_2 as well as $R_B = R_1/R_2$.

Homework

For the circuit in the Figure 4, find V_B , V_E and V_C for $R_B = 100K\Omega$, $10K\Omega$, and $1K\Omega$. Let $\beta = 100$.

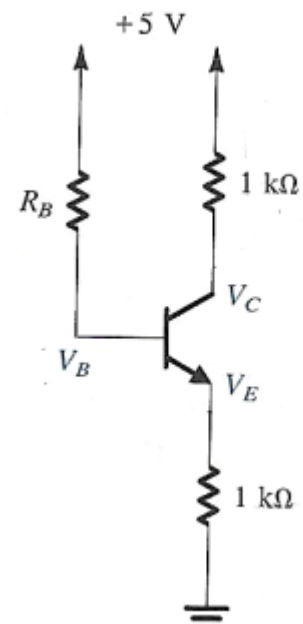


Figure 4