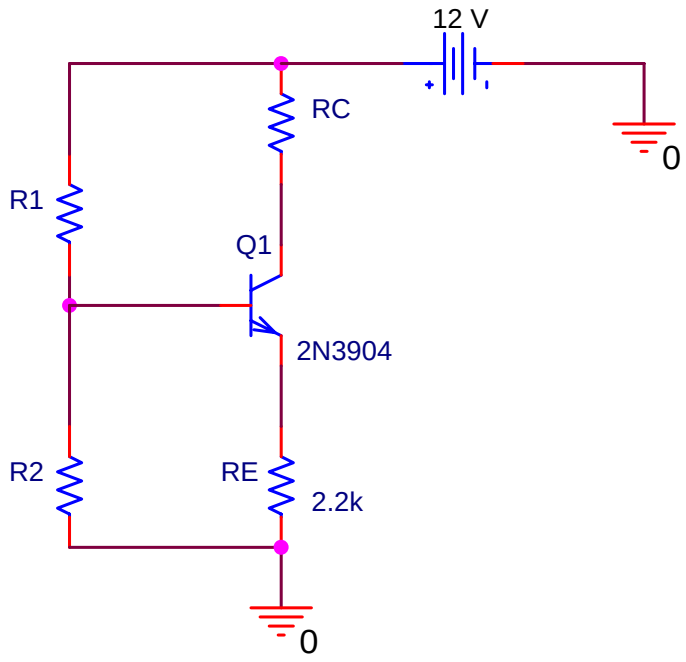
EECE-315 Prelab 5

1. Assuming $\beta = 100$, design a bias circuit to give a nominal $I_{CQ} = 2$ mA with a supply voltage of 12 V. Assume the BJT is biased in its active region and the emitter resistance is 2.2 kΩ.

2. Calculate the largest value of collector resistance, $R_{C,max}$, that will allow the transistor to remain in active region. Assume $V_{CE\ (min)} = 0.4$ V.



EECE-315 Lab 5

1. Let $R_C = 0\ \Omega$ (short circuit). Build the circuit that you designed in the prelab. Measure the quiescent collect current. Correlate your measurement to the theoretically value given in the prelab.

2. Use a Tektronix curve tracer to display and plot the i-v family curves of your 2N3904 transistor. Scale the curves to display from the origin to the maximum v_{CE} ($I_C = 0$) and the maximum i_C ($V_{CE} = 0$).

3. From the i-v curves, determine the values of dc β and ac β . Here is the procedure to determine them:

(a) Draw the dc load line of your circuit on the plotted i-v curves.
(b) Mark the Q-point you measured on the load line. Divide I_{CQ} by I_{BQ} to get β_{dc} .
(c) Draw a vertical line through the Q-point and find the values of I_C where it intersects with the curves either above or below the Q-point.
(d) Subtract those two values of I_C to call it ΔI_C .
(e) Divide ΔI_C by ΔI_B to get β_{ac}.

NOTE: You may need to re-run the curve tracer to get a plot over proper ranges of v_{CE} and i_C.

4. Calculate the I_{CQ} using the measured β_{dc} .

5. You will be given two other transistors. Measure their β_{dc} on the curve tracer. DO NOT make hard copies of the displayed curves. Insert each of them into your circuit and record I_{CQ} and V_{CEQ}. Discuss your results.

6. Place the 2N3904 transistor in the circuit and increase R_C until the collector-emitter voltage drops to 0.4 V. Call this $R_{C,max}$. Measure the I_{CQ}.

7. Repeat the calculation done in part 2 of the prelab using the measured I_{CQ} in part 1 of the lab. Compare the result of this calculation to $R_{C,max}$.

8. Plot the dc load lines for $R_C = 0$ and $R_{C,max}$ on your hard copy of the i-v curves. Mark the Q-point in each case.