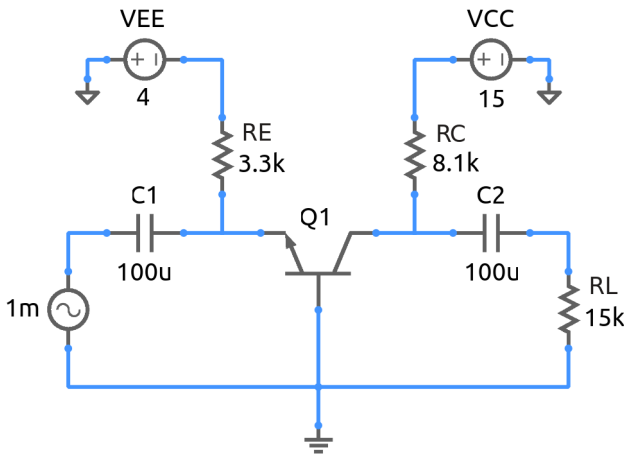
bjt_cb_amp.sqproj



Shown in the figure is a common-base amplfier. We are interested in computing the mid-band gain of the amplifier. Assume that the BJT is working in the active mode.

Exercise Set

1. What is the emitter bias voltage V_E?
2. Using the above value of V_E, calculate the DC current through R_E. This current is the same as I_E since the coupling capacitor C_1 blocks DC current.
3. Assuming β to be large, $I_C \approx I_E$. Using the bias currents obtained, find V_{CB} and V_{CE}, and make sure that the BJT is indeed operating in the active region.
4. Calculate the small-signal parameters r_π, g_m, r_e.
5. Draw the small-signal equivalent circuit of the amplifier using the T model for the BJT, and estimate the gain v_o/v_s.
6. Run the simulation, and compare your estimated gain with simulation results (of the first solve block). Note that the frequency has been specified to be in the mid-band region. This will become clear after you plot the frequency response of the amplifier.
7. What is the input resistance of this amplifier (as seen from v_s)? Is it desirable?

8. Using simulation results, plot the gain magnitude versus frequency (log-log plot). See how the frequency response changes if C_1 or C_2 is changed.

References

1. J. Millman and A. Grabel, *Microelectronics,* McGraw-Hill, 1988.

2. A. S. Sedra, K. C. Smith, and A. .N. Chandorkar, *Microelectronic Circuits*, Oxford University Press, 2004.