ENEE 307, Midterm Quiz
2010

Part I (60pts.): The following questions refer to Figure 1. You can neglect the effects of g_m and r_π when appropriate. $\beta = 100$. $V_s(t) = (0.1)\sin(2\pi \times 10^5 t)$.

1. Calculate the small signal voltage gain, Rin and Rout for this circuit.
2. Sketch voltage versus time at the emitter and at the output for one period. Label the axes and put in proper scales. (Make sure you include both the AC and DC components)
3. If the input source signal is changed to $V_s(t) = (1.0)\sin(2\pi \times 10^4 t)$, sketch the output voltage for one period.
4. If a 2K load resistor is connected between the output and ground, what is now the gain of the circuit?

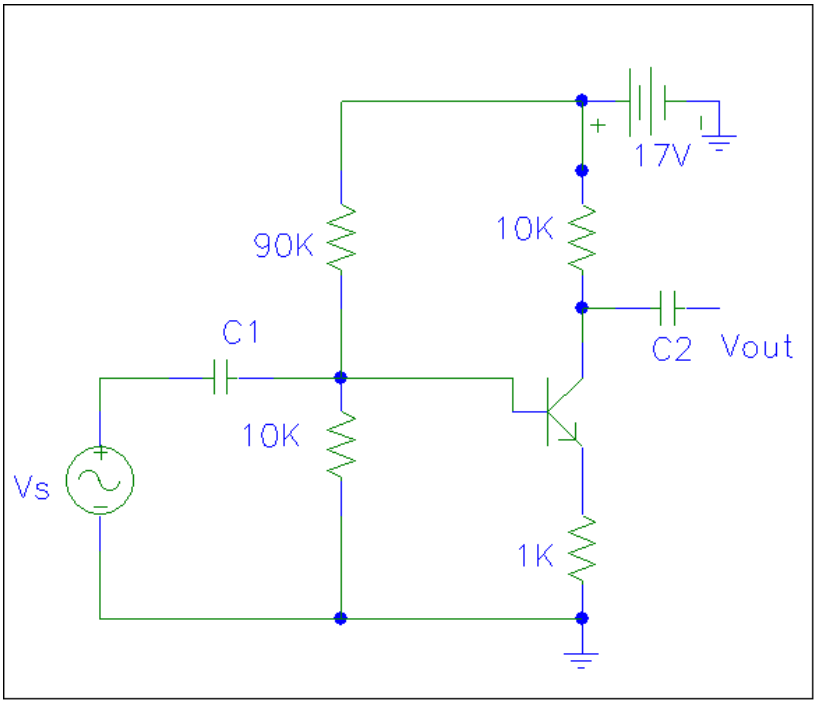


Figure 1

Part II (40 pts.). The Following questions refer to Figure 2.
The circuit in Figure 2 is the same as that of Part I, except that there is now an Emitter Follower circuit directly connected to the collector of Q1.

1. What is the DC voltage at the emitter of Q2? (Neglect the effect of the Q2 base current on Vc1.)
2. What is the AC voltage gain of the circuit?
3. Now, connect a 2K load resistor to the output of the circuit. What is the voltage gain now?
4. Compare and explain your results for Part 1 number 4 and Part II number 3.

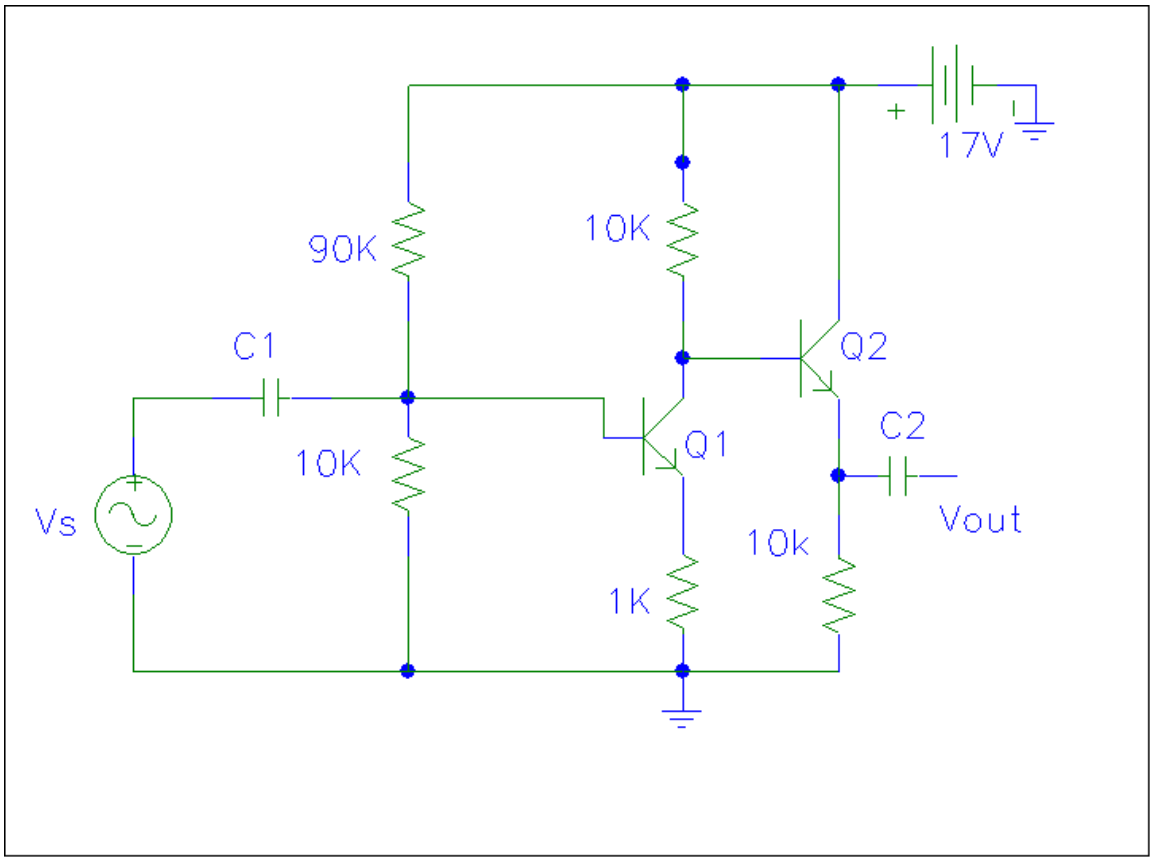


Figure 2

RTB= r_π + βRE

RTE = $1/g_m$ + RS/β

RTC = infinity