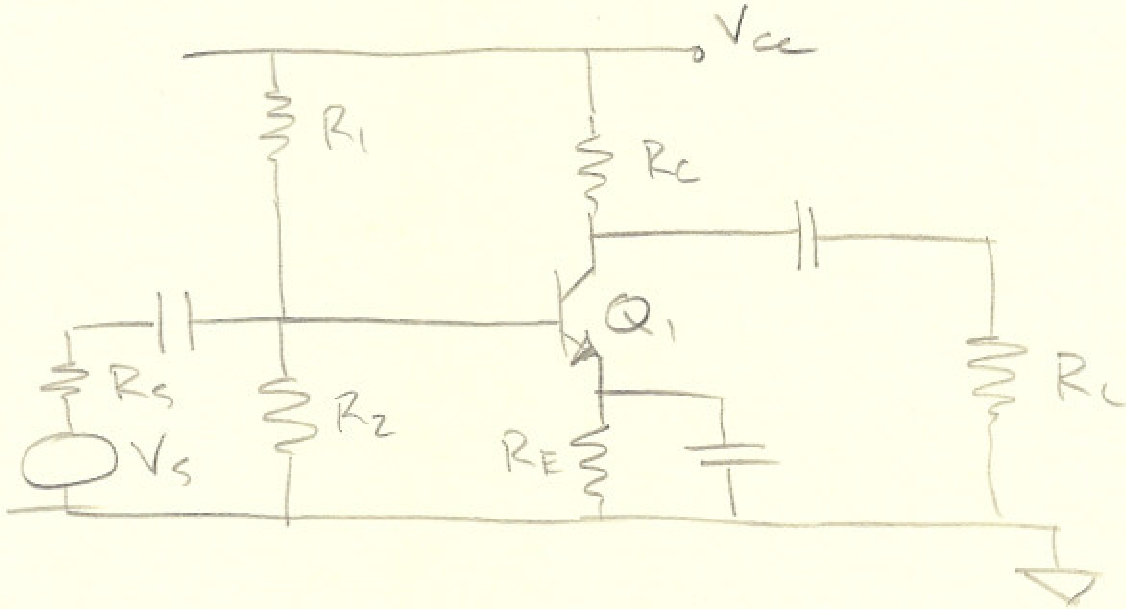
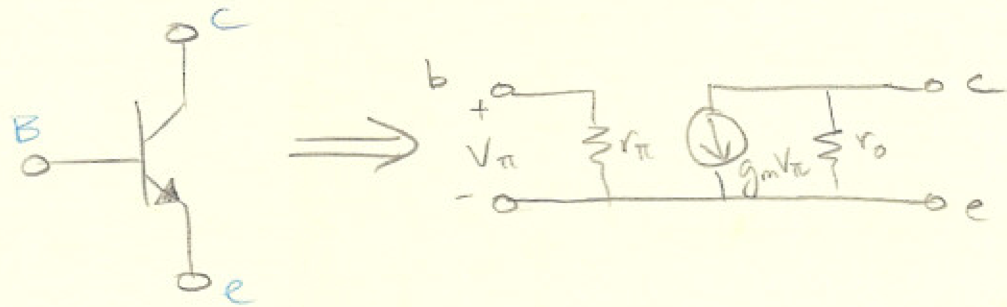


Capacitors behave like short circuit to the signal.

We use small signal analysis to study pathways.



This is valid for active region

$$g_m = \frac{I_c}{V_T} \qquad r_\pi = \frac{\beta}{g_m} \qquad r_o = \frac{V_A}{I_c}$$

V_T: termal voltage

$$V_T = \frac{kT}{q_0}$$

- k: boltzman constant
- T: absolute temp.
- q: electron charge

$V_T \sim 0.026\,V$ @ $300°K$

V_A: early Voltage

Other considerations for small signal analysis

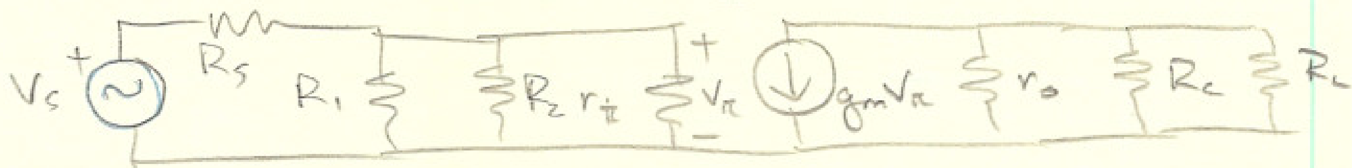
* Constant independent sources are set to zero

$V_S \rightarrow SC$

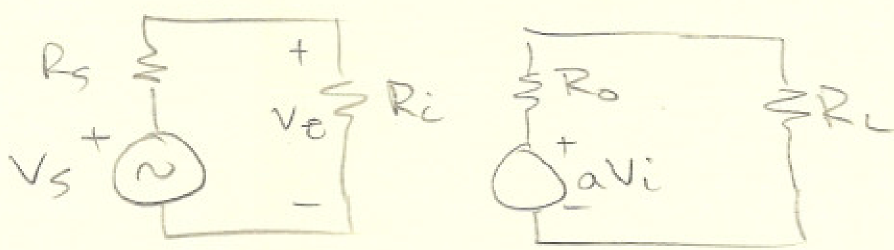
$CS \rightarrow OC$

* For now caps are short circuit.

* Other components stay



Now we can find the model for the whole thing



note: for bias point qualities we use uppercase for ~~large~~ signal analysis and lower case for small signal analysis

Input Resistance: (R_i) Usually the R_i value is the thevin value - We can see this from inspection of the circuit.

Output Resistance: (R_o) Passive i/p source $V_\pi = 0 \therefore g_m V_\pi = 0$. Then we apply a test source ... $R_o = R_c // r_o$

Voltage gain:

$$a_v = \frac{V_o}{V_i}$$