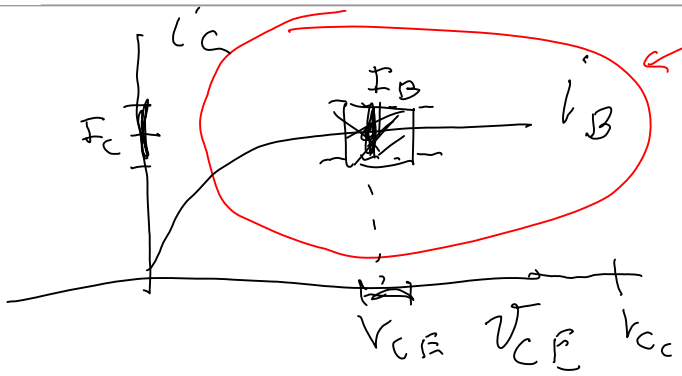
EE307
02/13/17

Note Title 2/12/2017

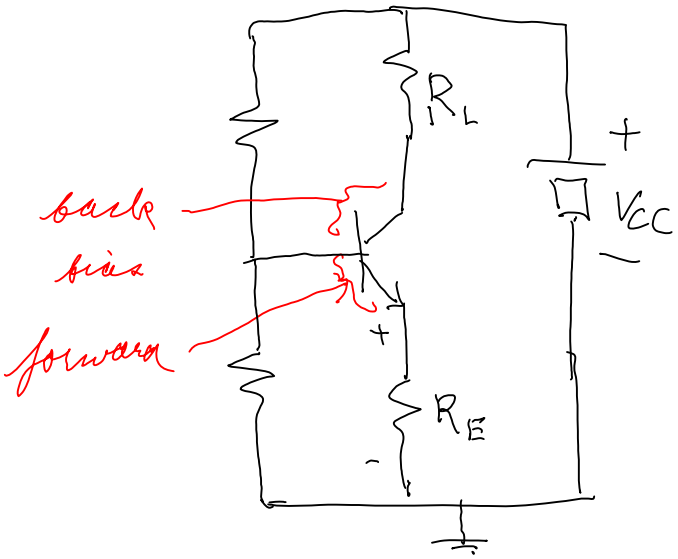


forward active

total signal = bias signal + small signal

$i_C = I_C + i_c$

$v_{CE} = V_{CE} + v_{ce}$



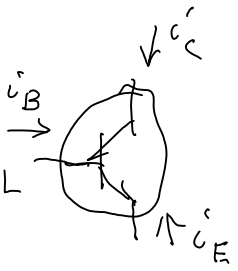
desire $A_v = \frac{v_{out}}{v_{in}} = -g_m R_L$

choose Q point

I_B, I_C, V_{CE}

$V_T = \frac{KT}{|Q_E|}$

$i_E = -I_S\left(e^{v_{BE}/V_T} - 1\right)$



$i_E + i_C + i_B = 0$ KCL

$g_m = g_{21} = \left.\frac{\partial i_C}{\partial v_{BE}}\right|_Q$

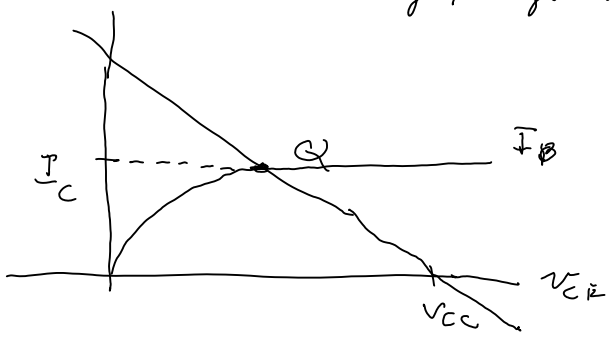
$= -\alpha I_S \frac{1}{V_T} e^{v_{BE}/V_T}$

$= I_C/V_T$

$i_C = -\alpha i_E$

$= \beta i_B, \quad \beta = \frac{\alpha}{1-\alpha}$

$i_C = -\alpha i_E = \left(-I_S e^{v_{BE}/V_T}\right)\alpha$

v_{BE}

gives gain via g_m by I_C the Q point collector current