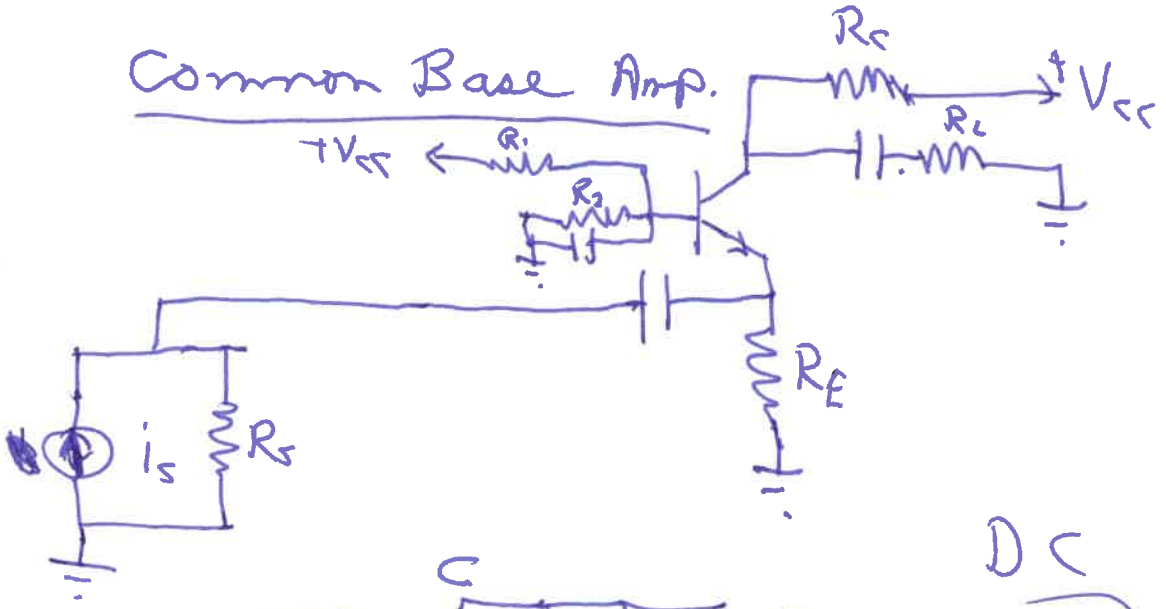
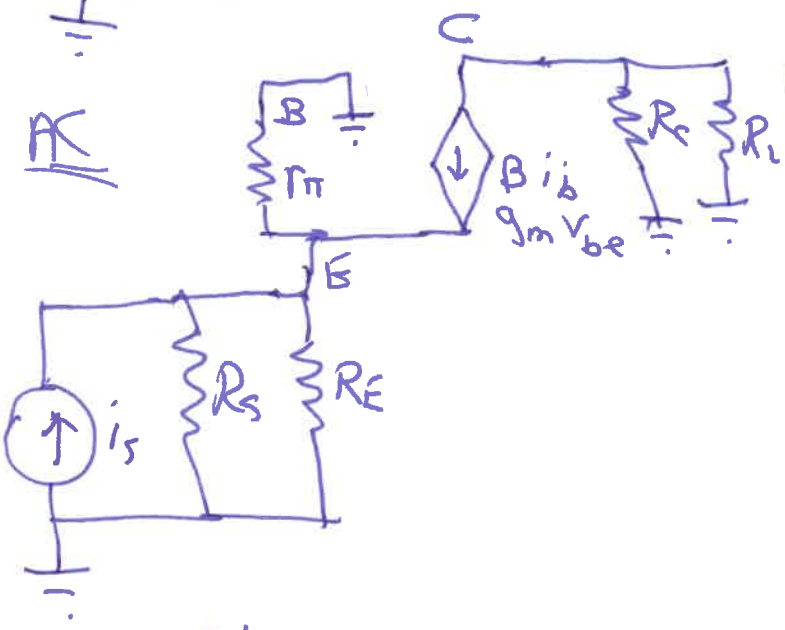
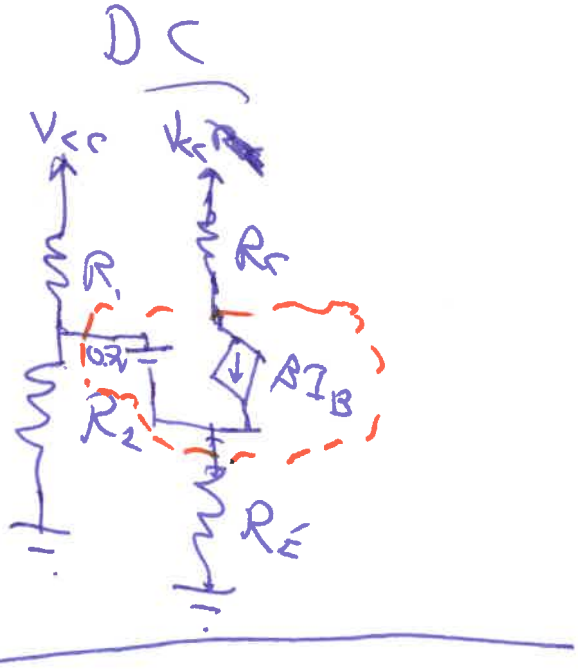
Common Base Amp.

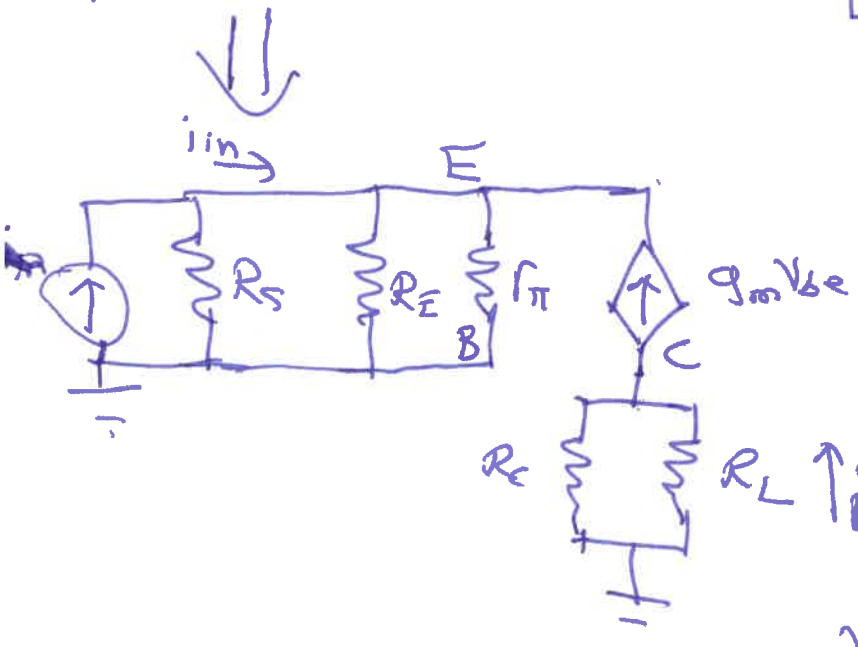


AC



DC





$$V_e = \left(i_{in} + g_m V_{be}\right)\left(R_E \| r_\pi\right)$$

~~V_{be}~~

$V_b = 0 \quad V_{be} = -V_e$

$$V_e\left(1 - g_m\left(R_E \| r_\pi\right)\right) = i_{in}\left(R_E \| R_{in}\right)$$

$(g_m v_{be})$

$$i_c = -g_m v_e = -g_m i_{in} \frac{(R_E \| r_\pi)}{1 - g_m (R_E \| r_\pi)}$$

$$i_{out} = \frac{R_c}{R_L + R_c} \cdot \frac{g_m (R_E \| r_\pi)}{g_m (R_E \| r_\pi) - 1} i_{in}$$

↑ current divider

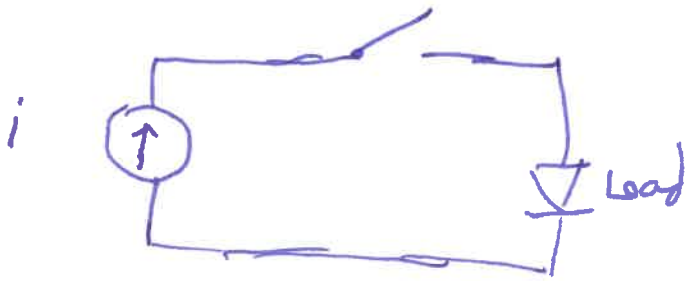
R_L small, R_E small

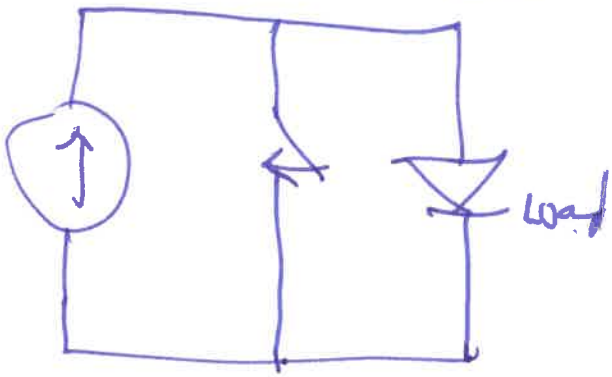
$i_{out} \approx i_{in}$

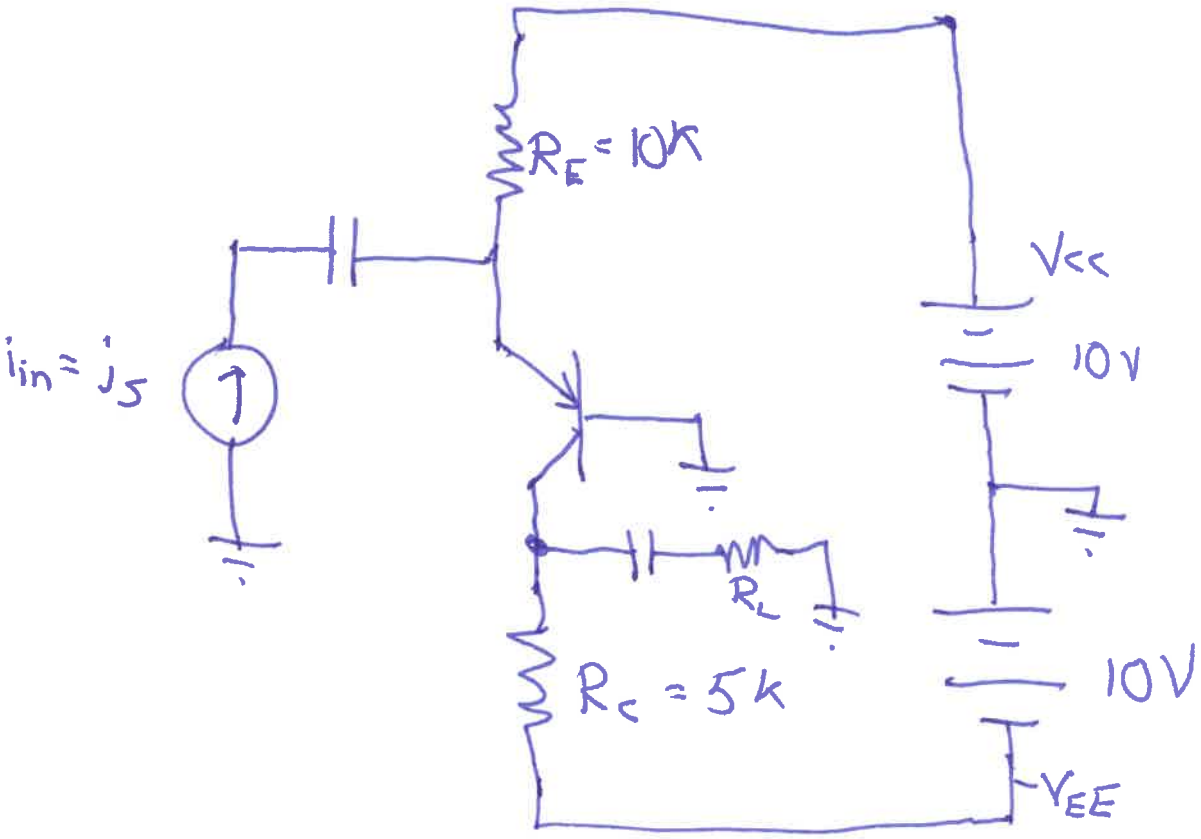
Common E → high gain

Common C (Emitter follower) → $A_v = 1$

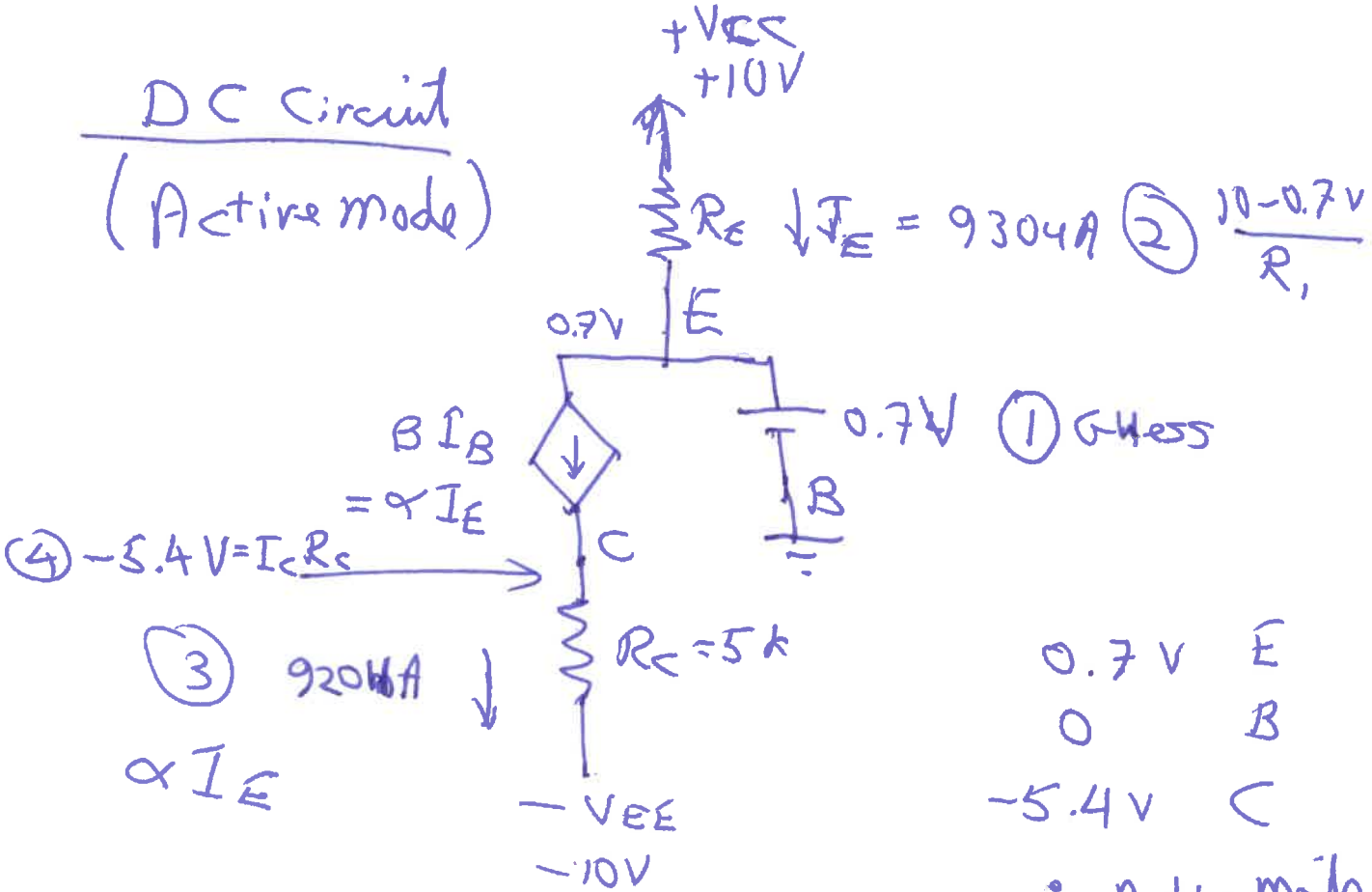
Common B → $A_i = 1$







DC Circuit
(Active mode)



0.7 V	E
0	B
−5.4 V	C

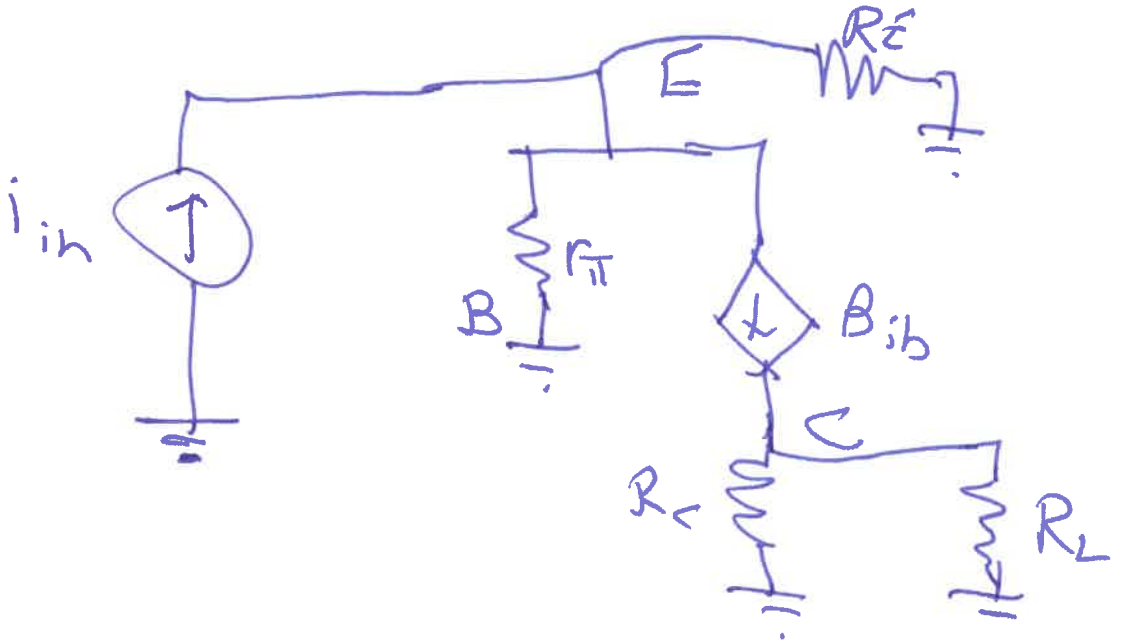
∴ Active mode OK

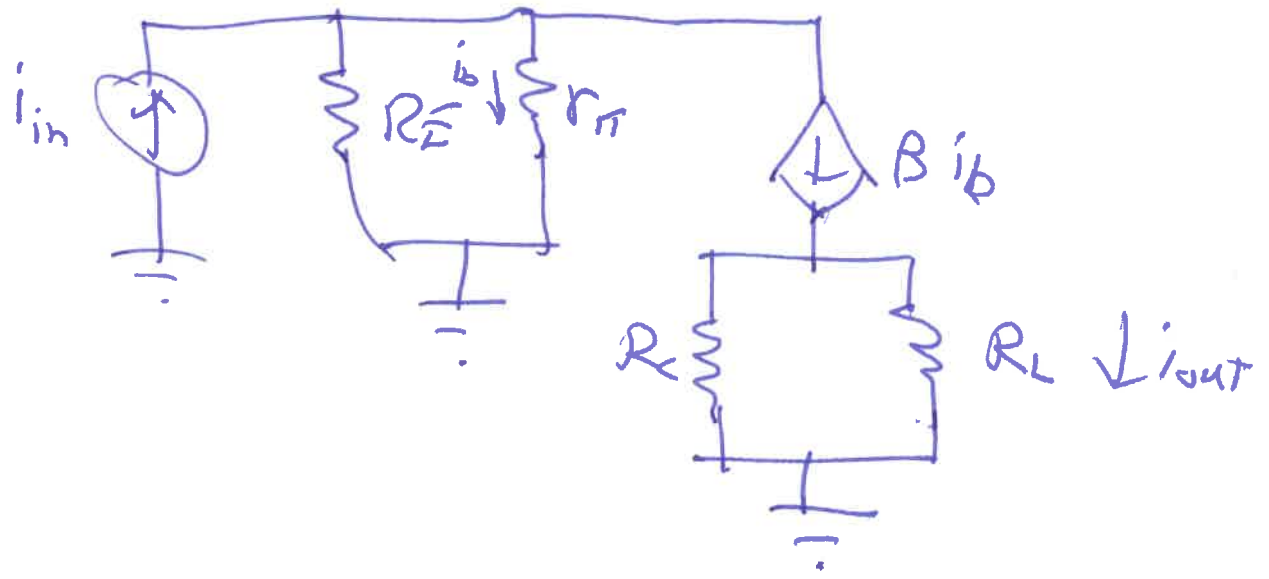
Small Signal model

$i_c = \beta i_b$ or $i_c = \alpha i_e$ or $g_m = \frac{I_c}{V_T}$

$= 0.037 \frac{A}{V}$

$r_\pi = \beta \frac{V_T}{I_C} = 100 \times \frac{25mV}{0.92mA} = 2.7k$





$$i_{in} = i_b \frac{R_E}{R_E + r_\pi} + \beta i_b = \frac{10K}{127K} * 100 i_b$$

$$\approx 100 i_b$$

$$i_{out} = \beta i_b \frac{R_C}{R_E + R_C} \approx 100 i_b$$

$A_i \approx 1$