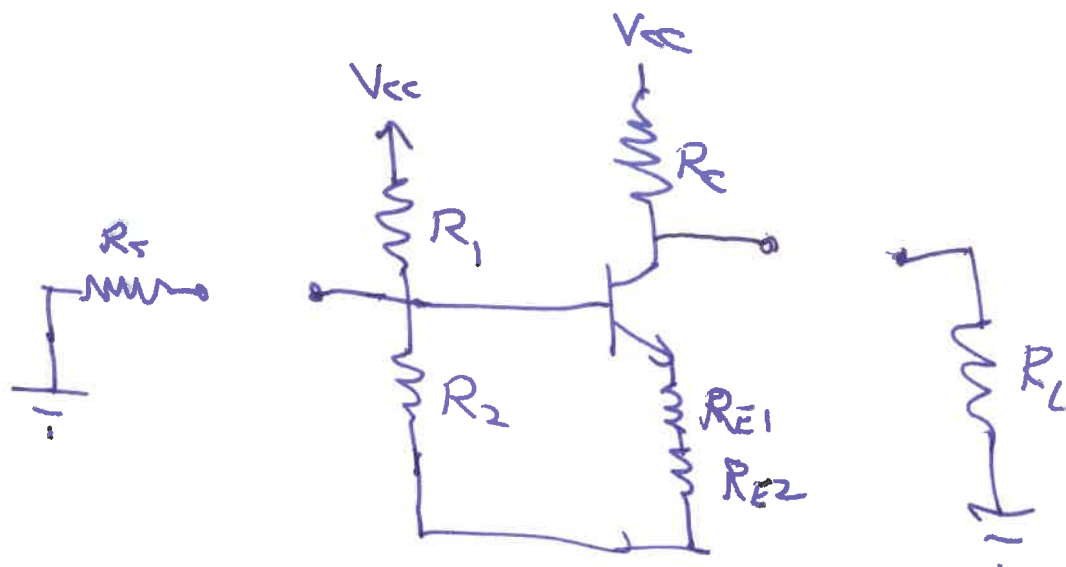


Thu, 27 Oct 2016

(84)



Recall (monday)

$$I_c = \beta \frac{V_{cc} \frac{R_2}{R_1 + R_2} - V_{BE}}{R_1 \parallel R_2 + (\beta + 1) R_E}$$

?

$$\approx \frac{V_{cc} \frac{R_2}{R_1 + R_2} - 0.7V}{R_E}$$

$$g_m = \frac{I_c}{V_T} \approx \frac{V_{cc} \frac{R_2}{R_1 + R_2} - 0.7V}{V_T R_E}$$

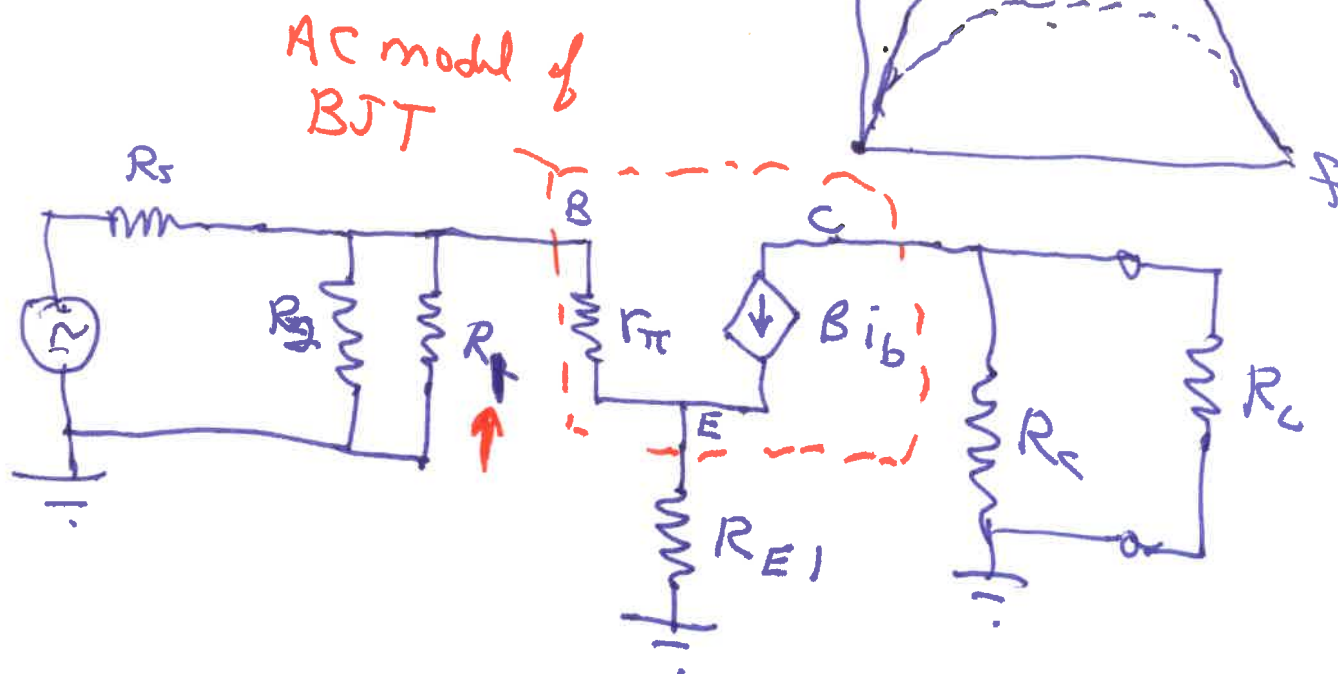
$$R_E = R_{E1} + R_{E2}$$

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

midband Performance

 A_{vo}

midband gain



$$V_{in} = V_{be} + i_E R_{E1}$$

$$= i_b [r_{\pi} + (\beta + 1) R_{E1}]$$

$$V_{out} = -(R_C || R_L) i_c = -(R_C || R_L) \beta i_b$$

$$A_v = \frac{V_{out}}{V_{in}} = \frac{-(R_C || R_L) \beta}{r_{\pi} + (\beta + 1) R_{E1}}$$

open circuit gain

$$A_{vo} = - \frac{R_C \beta}{\frac{\beta V_T}{I_C} + (\beta + 1) R_{E1}}$$

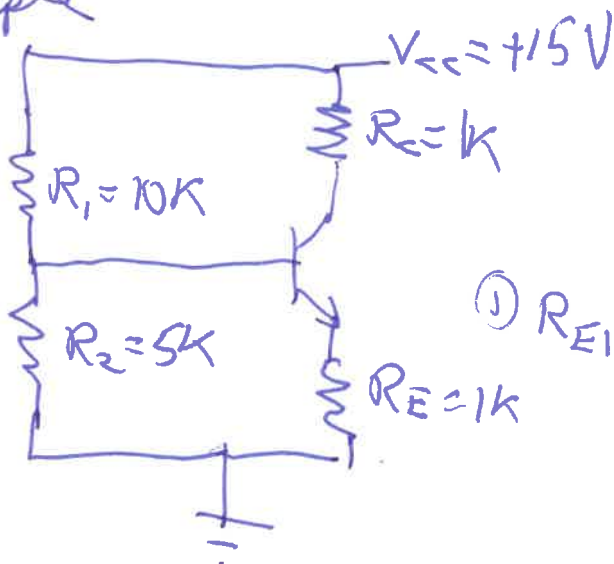
Large R_E ,

$$A_v \approx - \frac{R_C \parallel R_L}{R_E}$$

Small R_E ,

$$A_v \approx - \frac{R_C \parallel R_L}{V_T / I_C}$$

Example



$$I_C = 4.12 \text{ mA}$$

(monday)

① $R_{E1} \rightarrow 0$

$$A_{v0} = - \frac{R_C I_C}{V_T}$$

$$= -165$$

② $R_{E1} = R_E$

$$A_{v0} = - \frac{R_C}{R_E} = -1$$

Input Impedance

$$R_1 \parallel R_2 \parallel (r_{\pi} + (\beta + 1)R_{E1})$$

$$3.33 \text{ k} \parallel \left(\frac{25 \text{ mV}}{4.12 \text{ mA}} + 10 \text{ k} \right)$$

R_{out} :

$$V_{oc} = -\beta i_B R_C$$

$$i_{sc} = -\beta i_B$$

$$\boxed{R_o = R_C}$$
