"BJT Configuration"

Common Emitter Fixed Bias

$Z_i = R_B // \beta r_e$

$Z_i \simeq \beta r_e$

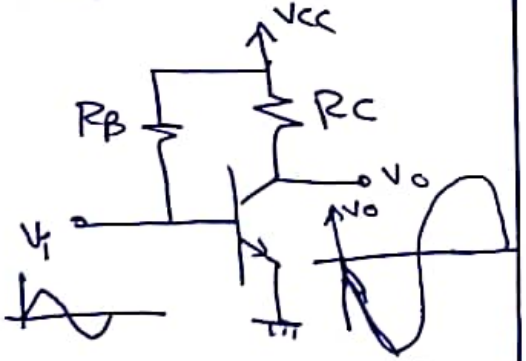
$R_B \gg 10 \beta r_e$

$Z_o \simeq R_C$

$A_v = \frac{V_o}{V_i} = -\frac{R_C}{r_o}$

$A_i \simeq \beta$

or $A_i = -A_v \frac{Z_i}{R_C}$



Voltage divider Bias

$R' = \frac{R_1 R_2}{R_1 + R_2}$

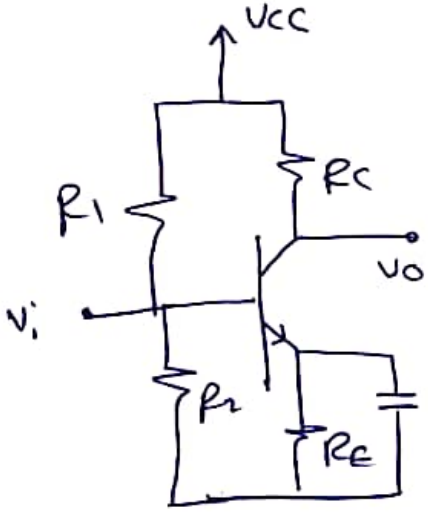
$Z_i = R' // \beta r_e$

$Z_o = R_C$

$A_v = -\frac{R_C // r_o}{r_e} \simeq -\frac{R_C}{r_e}$

$A_i = \beta$

or $A_i = -A_v \frac{Z_i}{R_C}$



Commen Emitter Bias

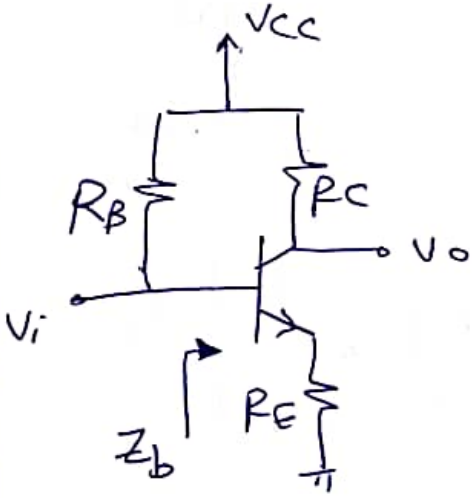
$Z_b \simeq \beta R_E$

$Z_i = R_B // Z_b$

$Z_o = R_C$

$A_v = -\frac{R_C}{R_E}$

$A_i = \frac{\beta R_B}{R_B + Z_b}$



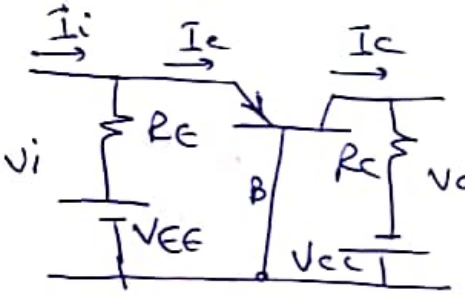
Common bias

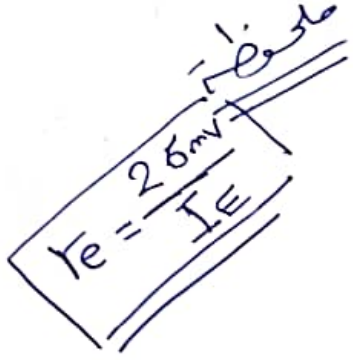
$Z_i = R_B // r_e$

$Z_o = R_C$

$A_v \simeq \frac{R_C}{r_e}$

$A_i \simeq -1$





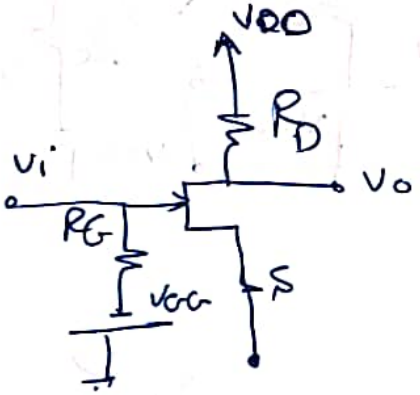
"JFET Configuration"

JFET Fixed Bias

$Z_i = R_G$

$Z_o \cong R_D$

$A_V = -g_m R_D$



$$g_m = \frac{2I_{DSS}}{|V_p|}\left[1 - \frac{V_{GS}}{V_p}\right]$$

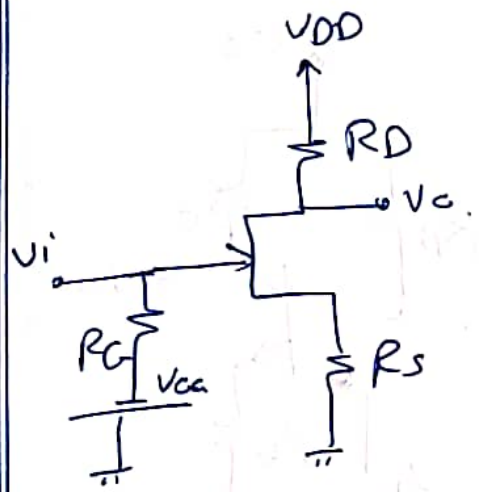
JFET Self Bias

unbypass capacitor

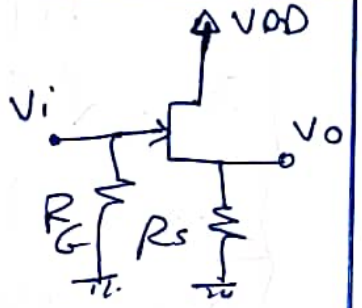
$Z_i = R_G$

$Z_o = R_D$

$$A_V = \frac{g_m R_D}{1 + g_m R_S}$$



JFET source follower



$Z_i = R_G$

$Z_o \cong R_S \,//\, \frac{1}{g_m}$

$$A_V \cong \frac{g_m R_S}{1 + g_m R_S}$$ as $r_d >> 10 R_S$

JFET Common Gate

$Z_i \cong R_S \,//\, \frac{1}{g_m}$

as $r_d >> 10 R_D$

$Z_o \cong R_D$

$A_V = g_m R_D$