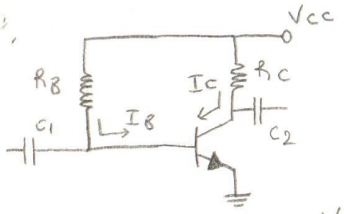
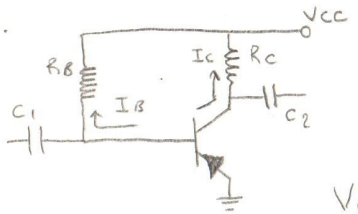
(1)



$$I_B = \frac{V_{CC} - V_{BE}}{R_B}$$

$$I_C = \beta . I_B$$

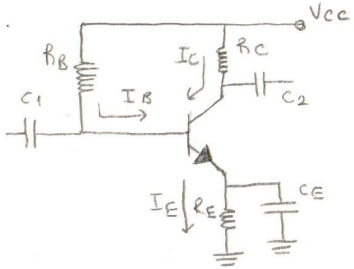
$$V_{CE} = V_{CC} - I_C R_C$$



$$I_B = \frac{V_{CC} - V_{BE}}{R_B}$$

$$I_C = \beta . I_B$$

$$V_{CE} = -(V_{CC} - I_C R_C)$$

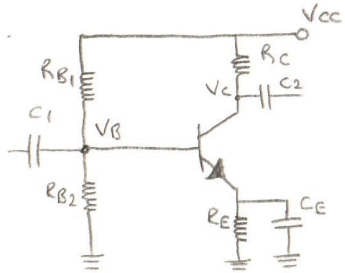


$$I_B = \frac{V_{CC} - V_{BE}}{R_B + (\beta+1) R_E}$$

$$I_C = \beta I_B \cong I_E$$

$$V_{CE} = V_{CC} - I_C R_C - I_E R_E$$

$$V_C = V_{CC} - I_C R_C$$



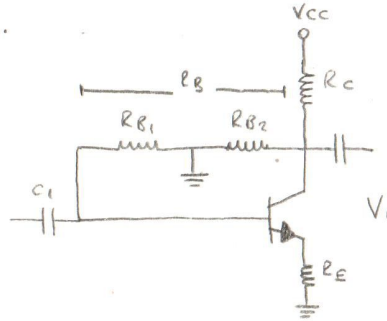
$$V_B = \frac{R_{B2}}{R_{B1} + R_{B2}} V_{CC}$$

$$V_E = V_B - V_{BE}$$

$$I_E \cong I_C$$

$$V_C = V_{CC} - I_C R_C$$

$$R_{BB} = \frac{R_{B1} \cdot R_{B2}}{R_{B1} + R_{B2}} \; , \; V_{CE} = V_C - V_E$$



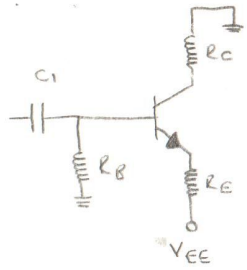
$$I_B = \frac{V_{CC} - V_{BE}}{R_B + (\beta+1)(R_E + R_C)}$$

$$I_E = (\beta+1) I_B$$

$$V_{CE} = V_{CC} - I_E (R_C + R_E)$$

$$I_C = \beta . I_B$$

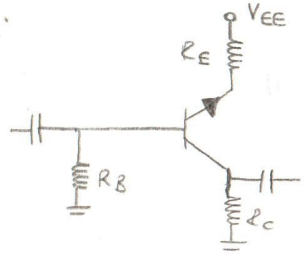
$$V_C = V_{CC} - I_C R_C$$



$$I_B = \frac{V_{EE} - V_{BE}}{R_B}$$

$$I_C = \beta . I_B$$

$$V_C = -I_C . R_C$$

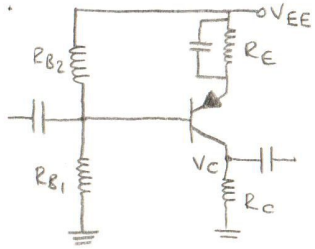


$$I_B = \frac{V_{EE} - V_{BE}}{R_B + (\beta+1) R_E}$$

$$I_C = \beta I_B \cong I_E$$

$$V_E = V_{EE} - I_E . R_E$$

$$V_{CE} \cong V_{EE} - I_C (R_C + R_E)$$

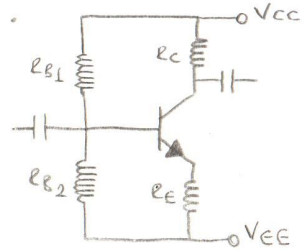


$$V_B \cong \frac{R_{B1}}{R_{B1} + R_{B2}} V_{EE}$$

$$V_E = V_B + V_{BE}$$

$$I_E = \frac{V_{EE} - V_E}{R_E} \cong I_C$$

$$V_C = I_C R_C$$



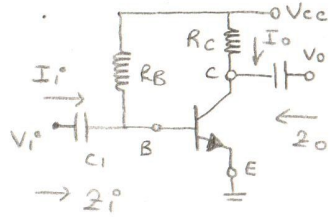
$$R_{BB} = \frac{R_{B1} . R_{B2}}{R_{B1} + R_{B2}}$$

$$I_B = \frac{V_{EE} - V_{BB} - V_{BE}}{R_{BB} + (\beta+1) R_E}$$

$$I_E = (\beta+1) I_B$$

$$V_C = V_{CC} - I_C R_C$$

$$V_{BB} = \frac{R_{B2}}{R_{B1} + R_{B2}} V_{CC} + \frac{R_{B1}}{R_{B1} + R_{B2}} V_{EE}$$



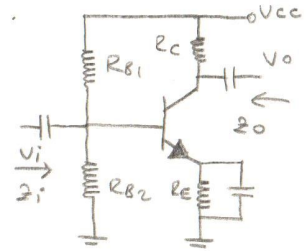
$$Z_i = R_B \| h_{ie}$$

$$Z_i \cong h_{ie} \; , \; Z_i \cong \beta r_e$$

$$Z_o = R_C$$

$$A_V = \frac{V_o}{V_i} = -\frac{h_{fe} . R_C}{h_{ie}} \; , \; A_V = -\frac{R_C}{r_e}$$

$$A_i = \frac{I_o}{I_i} \cong h_{fe} \; , \; A_i \cong \beta$$



$$R_{BB} = R_{B1} \| R_{B2}$$

$$Z_i = R_{BB} \| h_{ie}$$

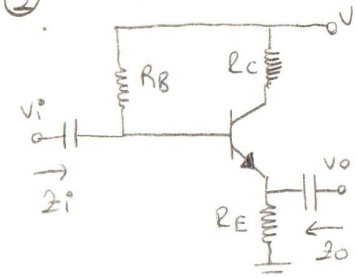
$$Z_i = R_{BB} \| \beta r_e$$

$$Z_o = R_C$$

$$A_V = \frac{V_o}{V_i} = -\frac{h_{fe} . R_C}{h_{ie}} \; , \; A_V = -\frac{R_C}{r_e}$$

$$A_i = \frac{R_{BB} . h_{fe}}{R_{BB} + h_{ie}} \; , \; A_i = \frac{R_{BB} . \beta}{R_{BB} + \beta r_e} = h_{fe}$$

②

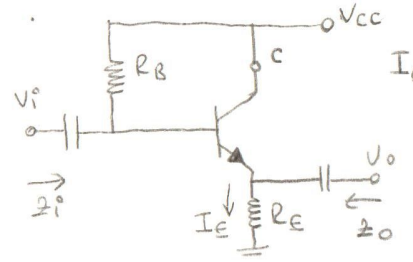


$Z_b = h_{ie} + (1+h_{fe}) R_E$

$Z_i = R_B \parallel Z_b$

$A_i = -\dfrac{R_B h_{fe}}{Z_b}$

$A_V = \dfrac{-h_{fe} R_c}{Z_b}$, $Z_o = R_c$



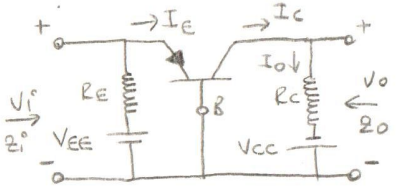
$I_E = \dfrac{(1+h_{fe}) V_i}{h_{ie} + (1+h_{fe}) R_E}$

$Z_o = R_E \parallel \dfrac{h_{ie}}{1+h_{fe}}$

$Z_o = R_E / r_e$

$A_V = \dfrac{V_i}{R_E + [h_{ie} // (1+h_{fe}) + R_E]} = \dfrac{V_o}{V_i}$

$A_i = \dfrac{(1+h_{fe}) R_E}{R_B + Z_b}$



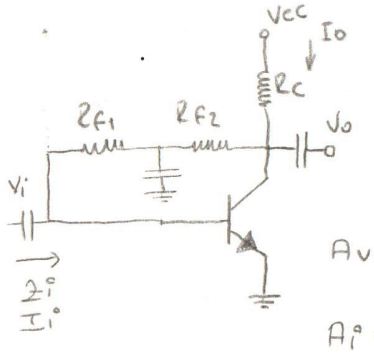
$Z_i = R_E \parallel h_{ib}$

$Z_i = R_E \parallel r_e$

$Z_o = R_C$

$A_V = \dfrac{V_o}{V_i} = \dfrac{-h_{fb}}{h_{ib}} R_c$, $A_V = \dfrac{V_o}{V_i} = \dfrac{R_c}{r_e}$

$A_i = \dfrac{I_o}{I_i} = -h_{fb}$, $A_i = \dfrac{I_o}{I_i}$



$Z_i = R_E \parallel h_{ib}$

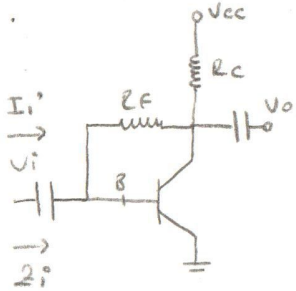
$Z_i = R_E \parallel r_e$

$Z_o = R_C$

$A_V = \dfrac{V_o}{V_i} = \dfrac{-h_{fb}}{h_{ib}} R_C$

$A_i = \dfrac{I_o}{I_i} = -h_{fb}$.

$A_V = \dfrac{V_o}{V_i} = \dfrac{R_c}{r_e}$, $A_i = \dfrac{I_o}{I_i}$

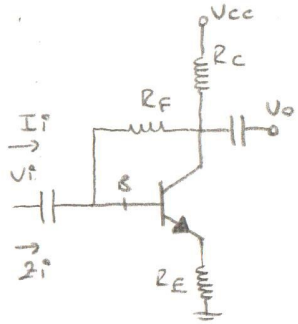


$A_V = \dfrac{V_o}{V_i} \cong -\dfrac{h_{fe}}{h_{ie}} R_C$

$A_i = \dfrac{I_o}{I_i} \cong \dfrac{h_{fe} R_F}{R_F + h_{fe} R_C}$

$Z_i = \dfrac{V_i}{I_i} = h_{ie} \parallel \dfrac{R_F}{|A_V|}$

$Z_o \cong R_C \parallel R_F$

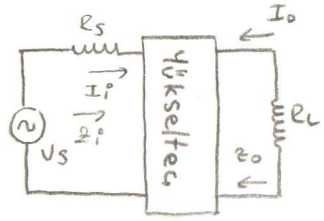


$A_i \cong \dfrac{-R_F}{R_E + R_C + R_F/h_{fe}}$

$A_V = -\dfrac{R_C}{R_E}$

$Z_i \cong h_{fe} R_E \parallel \dfrac{R_F}{A_V}$

$Z_o \cong R_C \parallel R_F$



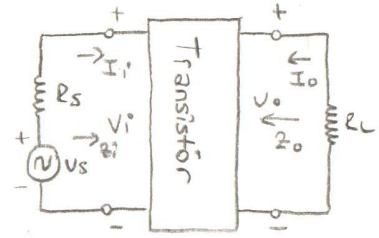
$Z_{giriş} = R_S + Z_i$

$\dfrac{V_i}{V_S} = \dfrac{Z_i}{Z_i + R_S}$

$A_{VS} = \dfrac{V_o}{V_S} = \dfrac{V_o}{V_i} \cdot \dfrac{V_i}{V_S}$

$I_i = \dfrac{V_S}{R_S + Z_i}$

$|A_i| = \left|\dfrac{I_o}{I_i}\right| = \dfrac{Z_i}{R_L} |A_V|$



$A_i = \dfrac{I_o}{I_i} = \dfrac{h_f}{1 + h_o R_L}$

$A_p = A_V . A_i$

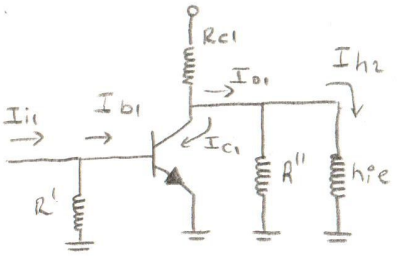
$Z_i = h_i - \dfrac{h_f . h_r R_L}{1 + h_o R_L}$

$A_V = \dfrac{V_o}{V_i} = \dfrac{-h_f R_L}{h_i + (h_i h_o - h_f h_r) R_L}$

$Z_i = h_i - \dfrac{h_f h_r R_L}{1 + h_o R_L}$

$Z_o = \dfrac{V_o}{I_o} = \dfrac{1}{h_o - [h_f h_r / (h_i + R_S)]}$

(3)



$$I_{o1} = \frac{-R_{c1}(I_{c1})}{R_{c1}+R_{c2}}$$

$$I_{c2} = h_{fe} I_{b2}$$

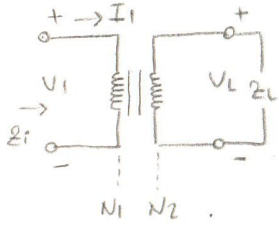
$$I_{b2} = \frac{R'' I_{i2}}{R''+hie}$$

$$I_{o2} = \frac{R_{c2} I_{c2}}{R_{c2}+R_L}$$

$$I_{b1} = \frac{R' I_{i1}}{R'+hie} \quad , \quad A_{i1} = \frac{I_{o1}}{I_{i1}} \quad , \quad A_{iT} = A_{i1} \cdot A_{i2}$$

$$A_V \cong \frac{-h_{fe}}{hie} = \frac{-R_L}{r_e} \quad , \quad A_{VT} = A_{V1} \cdot A_{V2}$$

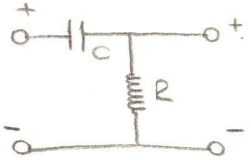
$$|A_{VT}| = |A_{iT}| \cdot \left|\frac{Z_L}{Z_{i1}}\right|$$



$$\frac{V_1}{V_2} = \frac{N_1}{N_2} = \alpha$$

$$\frac{I_1}{I_2} = \frac{N_2}{N_1} = \frac{1}{\alpha}$$

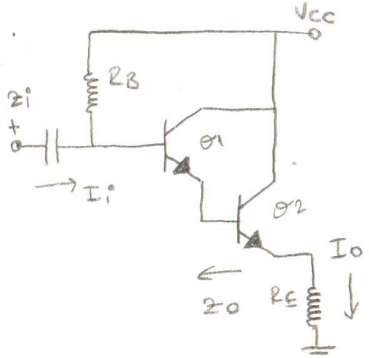
$$A_{V1} = \frac{V_2}{V_1} = \frac{-h_{fe} \cdot Z_L}{hie} \quad , \quad Z_i' = \alpha^2 Z_L$$



$$f_1 = \frac{1}{2\pi RC} \quad , \quad A_V = \frac{V_o}{V_i'}$$

$$X_C = \frac{1}{2\pi f_1 C} = R$$

$$V_o = \frac{R \cdot V_i'}{\sqrt{R^2 + X_C^2}}$$



$$A_i' = \frac{I_o}{I_i'} = A_{i1} \cdot A_{i2} = \frac{h_{fe1} \cdot h_{fe2}}{1 + h_{oe1}(h_{fe2} \cdot R_E)}$$

$$A_i' = \frac{h^2_{fe}}{1 + h_{oe} \cdot h_{fe} \cdot R_E} \quad , \quad A_i' \cong h_{fe}^2 = \beta^2$$

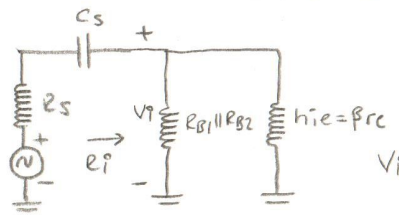
$$I_1 = \frac{R_B \cdot I_i'}{R_B + Z_{i1}'}$$

$$Z_{i1}' = \frac{h_{fe1} \cdot h_{ee2} \cdot R_E}{h_{oe1} \cdot h_{oe2} \cdot R_E + 1} \quad , \quad Z_{i1}' \cong \frac{h^2_{fe} \cdot R_E}{1 + h_{oe} h_{fe} R_E}$$

$$Z_{i1}' \cong h^2_{fe} \cdot R_E = \beta^2 \cdot R_E$$

$$Z_{o1} \cong \frac{R_{S1} + hie_1}{h_{fe1}} \quad , \quad Z_{o2} \cong \frac{(R_{o1} \parallel 1/h_{oe1}) + h_{ie2}}{h_{fe2}}$$

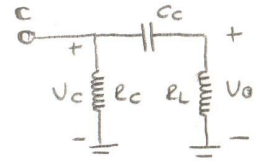
$$A_V \cong \frac{1}{1 + hie_1/(h_{fe2} \cdot R_E)}$$



$$R_S + R_i' = X_{CS}$$

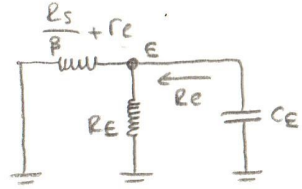
$$V_i' = \frac{R_i' V_S}{R_f + R_S}$$

$$f_{LS} = \frac{1}{(2\pi (R_S + R_f) C_S)}$$

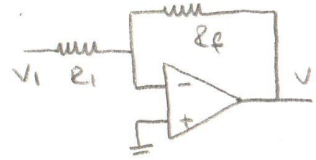


$$R_C + R_L = X_{CC}$$

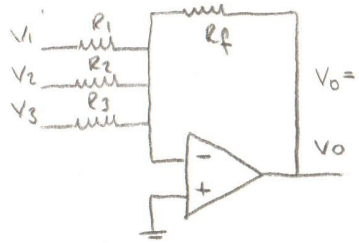
$$f_{LC} = \frac{1}{2\pi (R_C + R_L) C_C}$$



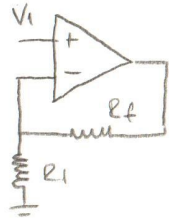
$$R_e = R_E \parallel \left[\frac{R_S'}{\beta} + r_e\right] = X_{CE}$$



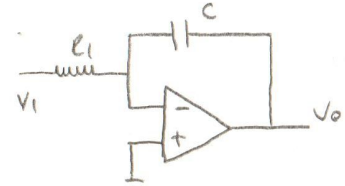
$$V_o = -\frac{R_f}{R_1} \cdot V_1$$



$$V_o = -\left(\frac{R_f}{R_1} \cdot V_1 + \frac{R_f}{R_2} V_2 + \frac{R_f}{R_3} \cdot V_3\right)$$

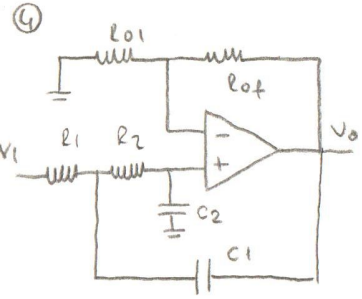


$$V_o = \left(1 + \frac{R_f}{R_1}\right) V_1$$

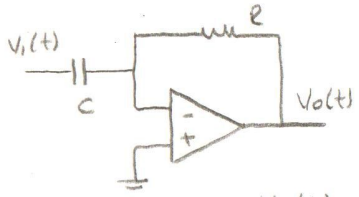


$$V_o(t) = \left[\frac{1}{R_1 C} \int V_1(t)\,dt + \frac{1}{R_2 C} \int V_1(t)\,dt \ldots\right]$$

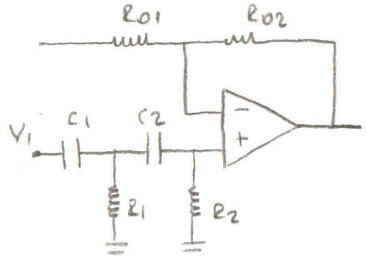
④



$$f_{0,H} = \frac{1}{2\pi R_1 C_1}$$



$$V_0(t) = -RC \frac{dV_i}{dt}(t)$$



$$A_V = 1 + \frac{R_{0f}}{R_{01}}$$

$$f_{0,L} = \frac{1}{2\pi R_1 C_1}$$