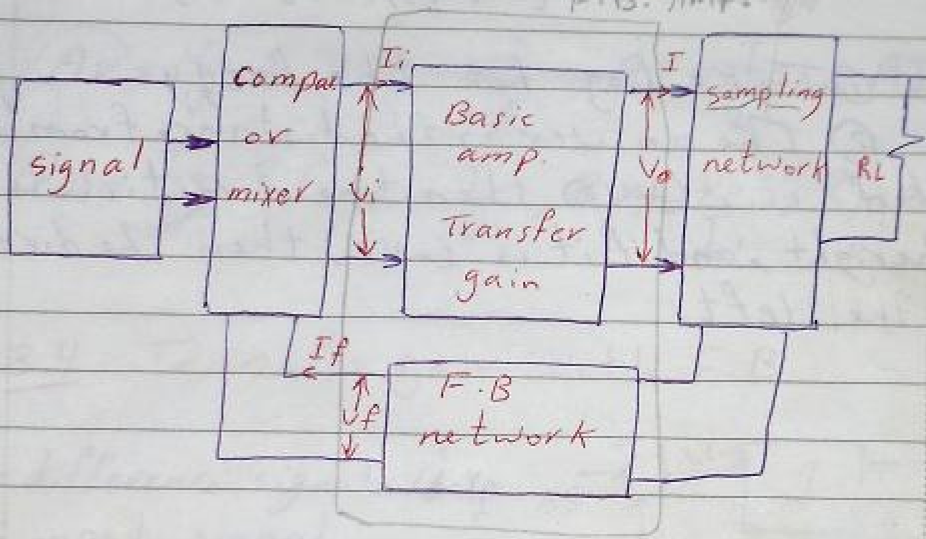
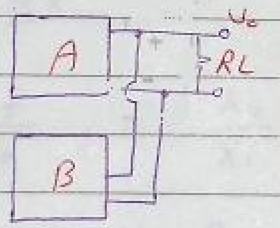
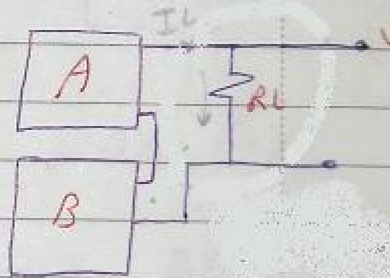
3.2 Feed Back Concept:



3.2.1 Sampling network:

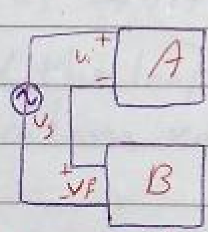
It is either voltage or current gain



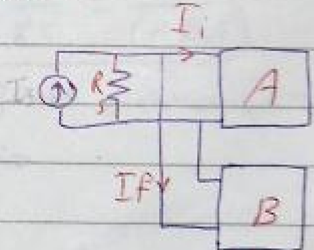


3.2.2 Comparator or Mixer

It is either series or shunt mixer



Series Mixer



shunt mixer

shunt mixer

3.3: Transfer ratio or gain:

$$A_V = \frac{V_o}{V_i} \ \& \ A_{Vf} = \frac{V_o}{V_s}, \quad A_I = \frac{I_o}{I_i} \ \& \ A_{If} = \frac{I_o}{I_s}$$

$$G_M = \frac{I_o}{V_i} \ \& \ G_{Mf} = \frac{I_o}{V_s}, \quad R_M = \frac{V_o}{I_i}, \quad R_{Mf} = \frac{V_o}{I_s}$$

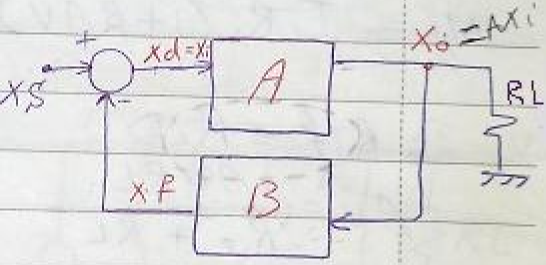
3.4 Transfer gain with F.B

x_d = difference signal = $X_S - X_f$

X_S = input signal.

X_o = o/p signal = AX_i

X_f = F.B signal = BX_o



We have $\beta = \frac{X_f}{X_o}$, $A = \frac{X_o}{X_i}$, $A_f = X_o / X_s$

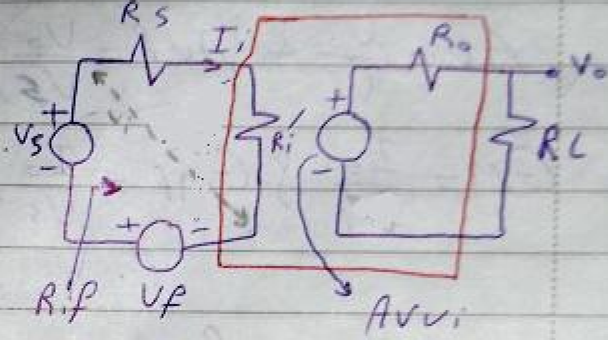
$$X_i = X_s - X_f = X_d = X_s - \beta X_o = X_s - \beta A X_i$$

$$\therefore (1 + \beta A) X_i = X_s \Rightarrow A_f = \frac{X_o}{X_S} = \frac{A}{1 + \beta A}$$

* $-\beta A$ is called the loop gain, and $(1 + \beta A) = D$ is called the return ratio

3.5.1 Input Resistance of voltage series:

$R_i = R_i' + R_s$, $\beta = V_f / V_o$



$$V_s = V_i + V_f$$
$$= V_i + \beta V_o$$
$$= V_i + \beta A_V V_i$$
$$= V_i(1+\beta A_V)$$
$$V_i = I_i R_i$$
$$V_s = I_i R_i (1+\beta A_V) \quad \therefore \frac{V_s}{I_i} = R_{if} = R_i(1+\beta A_V)$$

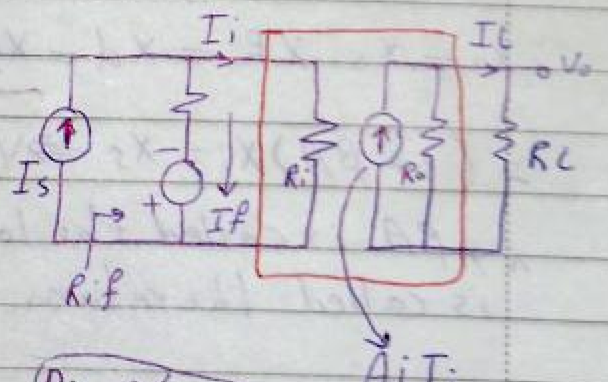
$$\therefore R_{if} = R_i D$$

$$A_V = \frac{A_V R_L}{R_o + R_L} \quad \text{or} \quad A_V = \lim_{R_L \to \infty} A_V$$

3.5.2 Input Resistance of current shunt F.B.

Similarly

$\beta = I_f / I_o$, $R_{if} = \frac{R_i}{D}$



$$D = (1+\beta A_I)$$

$$A_I = \frac{A_i R_o}{R_o + R_L}$$

$$A_i = \lim_{R_L \to 0} A_I$$

$R_i = R_i' // R_s$

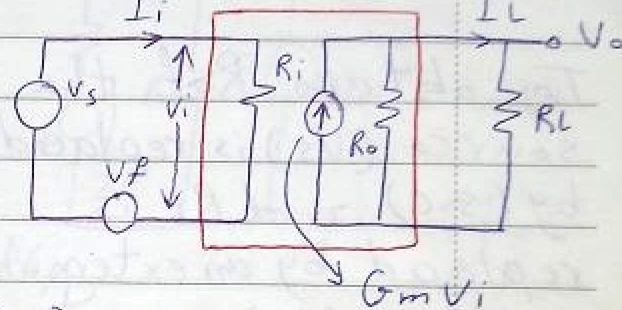
3.5.3 Input Resistance of current series F.B

$\beta = V_f / I_o$

$R_{if} = R_i D$, $D = (1 + \beta G_M)$

$G_m = \lim_{R_L \to 0} G_M$

$G_M = G_m R_o / (R_o + R_L)$



$R_i = R_i' + R_s$

3.5.4 Input Res. of voltage shunt:

$\beta = I_f / V_o$, $D = (1 + \beta R_M)$

$R_{if} = R_i / D$

$R_M = R_m R_L / (R_o + R_L)$

$R_m = \lim_{R_L \to \infty} R_M$