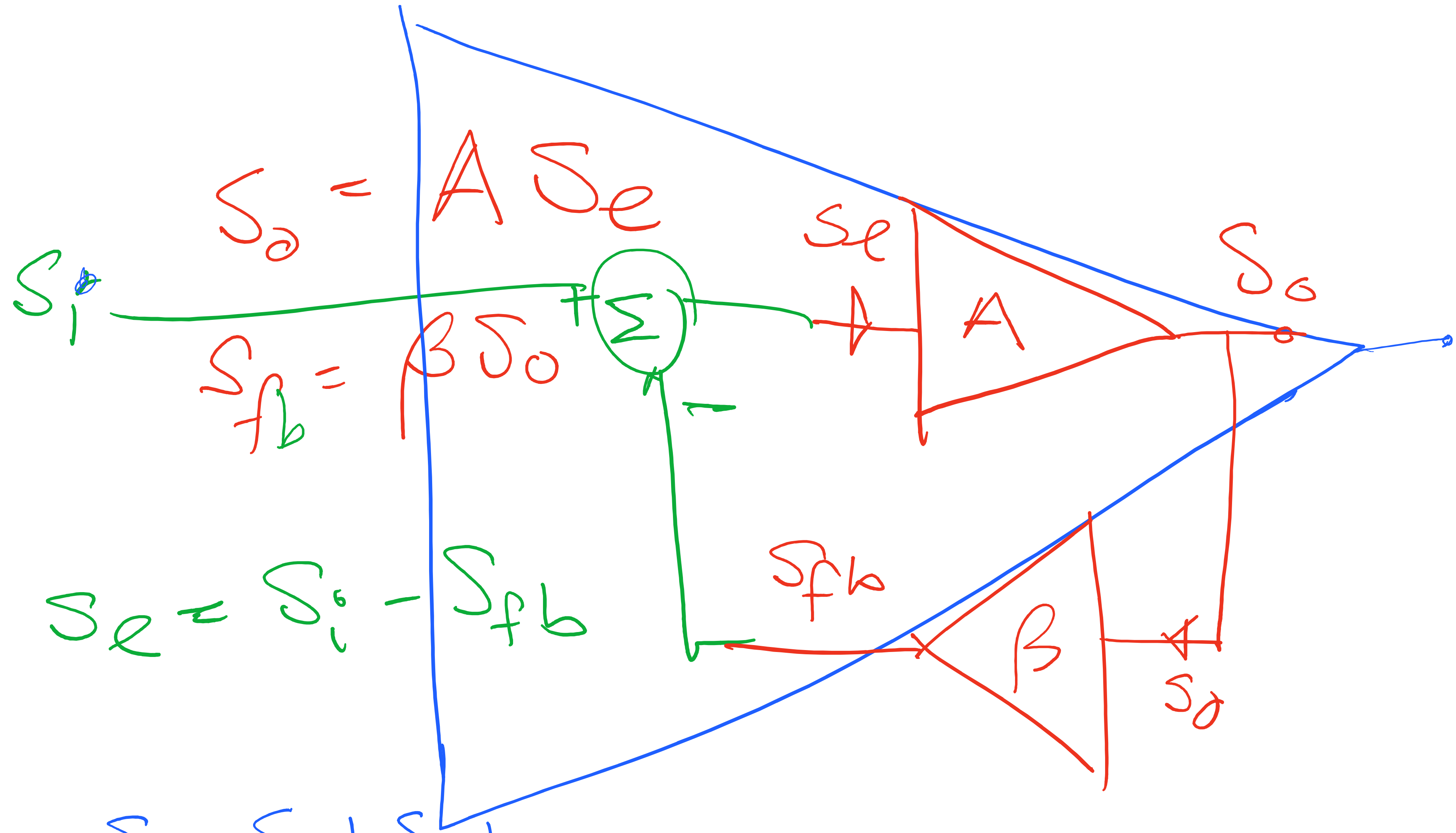
Feedback

Monday, April 11, 2016 3:56 PM



$S_o = A S_e$

$S_{fb} = \beta S_o$

$S_e = S_i - S_{fb}$

$S_i = S_e + S_{fb}$

$$\boxed{A_f = \frac{S_o}{S_i}}$$

$$\cancel{S_e = S_i - S_{fb} = S_i - \beta S_o}$$

$$S_i = S_e + S_{fb}$$

$$= \frac{S_o}{A} + \beta S_o = \frac{S_o}{A}\left[1 + \beta A\right]$$

$$\boxed{A_f = \frac{S_o}{S_i} = \frac{A}{1+\beta A}} \approx \frac{A}{\beta A} = \boxed{\frac{1}{\beta}}$$

β

$T = \beta A$ = loop gain

$$A_f = \frac{A}{1+T}$$

$A = 10^5$

gain variation 10%

$$\frac{A_0 - A_1}{A_0} \times 100 = \frac{\Delta A}{A_0} \times 100$$

$$= \frac{dA}{A_0} \times 100 = 10\%$$

$$\frac{dA_f}{A_f} \% \ ?$$

$$A_f = \frac{A}{1+\beta A}$$

$$\frac{dA_f}{\quad} \quad \frac{1}{\quad} - \frac{A\beta}{\quad}$$

$$\frac{dA_f}{dA} = \frac{1}{1+\beta A} - \frac{A\beta}{(1+\beta A)^2}$$

$$= \frac{1+\cancel{\beta A}-\cancel{\beta A}}{(1+\beta A)^2}$$

$$= \frac{1}{(1+\beta A)^2}$$

$$\frac{dA_f}{A_f} = \frac{\frac{1}{(1+\beta A)^2} \cdot dA}{\frac{A}{(1+\beta A)}}$$

$$= \frac{1}{(1+\beta A)} \cdot \frac{dA}{A}$$

$\beta = 0.9$

$$= \frac{1}{1+0.9\times 10^5} \times 1\%$$

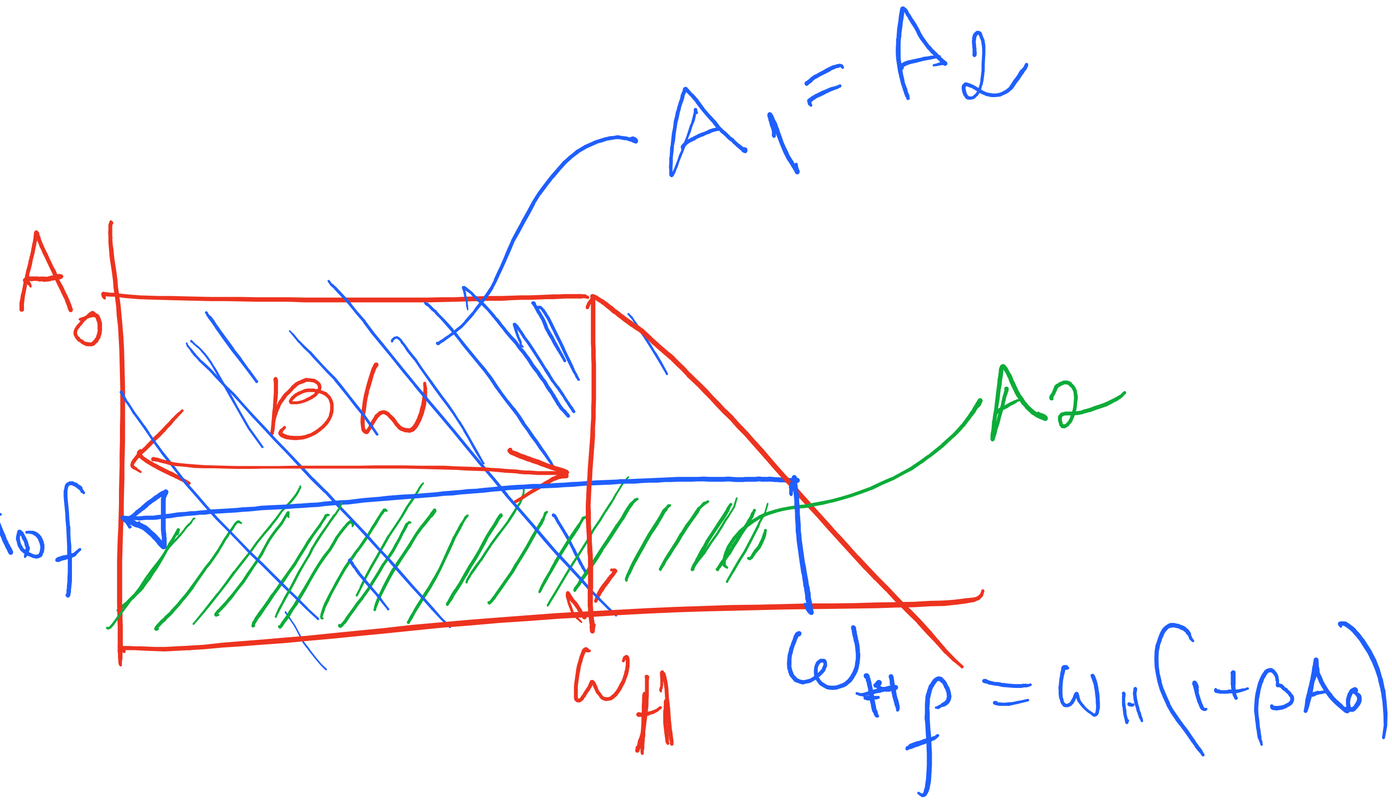
$$= 111.10 \times 10^{-6}\%$$

$A_f = ?$

$$= \frac{10^5}{1+0.9\times 10^5} = 1.11$$

$$= \frac{10}{1+0.9\times 105} = 1.11$$

$$\frac{A_0}{1+\beta A_0} = A_{0f}$$



$$A(s) = \frac{A_0}{1+\frac{s}{\omega_H}}$$

$$A_f(s) = \frac{A(s)}{1+\beta A(s)}$$

$$= \frac{\frac{A_0}{1+\frac{s}{\omega_H}}}{1+\beta\frac{A_0}{\left(1+\frac{s}{\omega_H}\right)}}$$

$$= \frac{A_0}{1+\frac{s}{\omega_H}+\beta A_0}$$

$$= \frac{A_0}{(1+\beta A_0) + \frac{s}{\omega_H}}$$

$$= \frac{A_0}{(1+\beta A_0)\left[1 + \frac{s}{(1+\beta A_0)\omega_H}\right]}$$

$$= \frac{A_{of}}{1 + \frac{s}{\omega_{Hf}}}$$

$$\left[\omega_{Hf} = (1+\beta A_0)\omega_H\right]$$

$$f_{Hf} = (1+\beta A_0) f_H$$

$$GBW\Big|_{\text{open loop}} = A_0 \omega_H$$

$$GBW\Big|_{\text{closed loop}} = A_{of}\,\omega_{Hf}$$

Gain x Bandwidth

$$= \frac{A_0}{1+\cancel{\beta A_0}}\,\omega_H(1+\cancel{\beta A_0})$$

$$= A_0\omega_H = GBW\Big|_{\text{open loop}}$$

Ex 12.3

$A_0 = 10^5$ $\quad A_{0f} = 100$

$f_H = 10\ Hz$

$f_{Hf} = ?$

$(K = 1 + \beta A)$

$$A_f = \frac{A}{1+\beta A} = \frac{A}{K}$$

$$\therefore K = \frac{A}{A_f} = \frac{10^5}{100} = 10^3$$

$$f_{Hf} = (1+\beta A) f_H = K \cdot f_H$$

$$= 10^3 \times 10 = \underline{\underline{10\ KHz}}$$

12.8 $\quad A = 10^5$

$f_H = 4\ Hz$

$A_f = 50$

$f_{\cdot} = 5\ Hz$

12.10

$A_{vf} = 50$, $f_H = 5\,HZ$

$BW = 20\,KHZ$ $A = ?$

$$\boxed{A_{vf} \times BW = A_v \times f_H}$$

$$f_{Hf} = BW = (1+\beta) f_H = K f_H$$

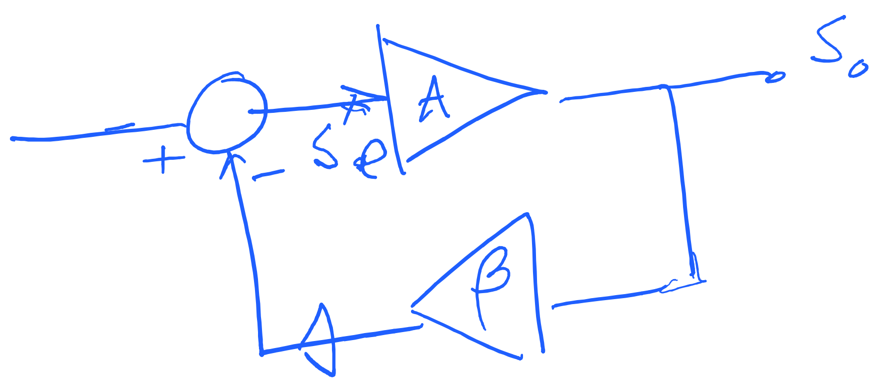
$$K = \frac{f_{Hf}}{f_H} = \frac{20K}{5}$$

$$A_f = \frac{A}{1+\beta A} = \frac{A}{K}$$

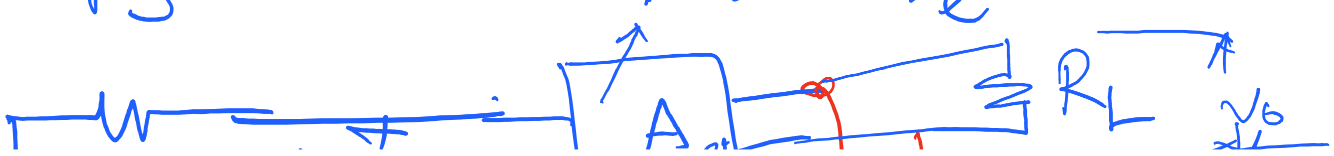
$$\therefore A = A_f \times K$$

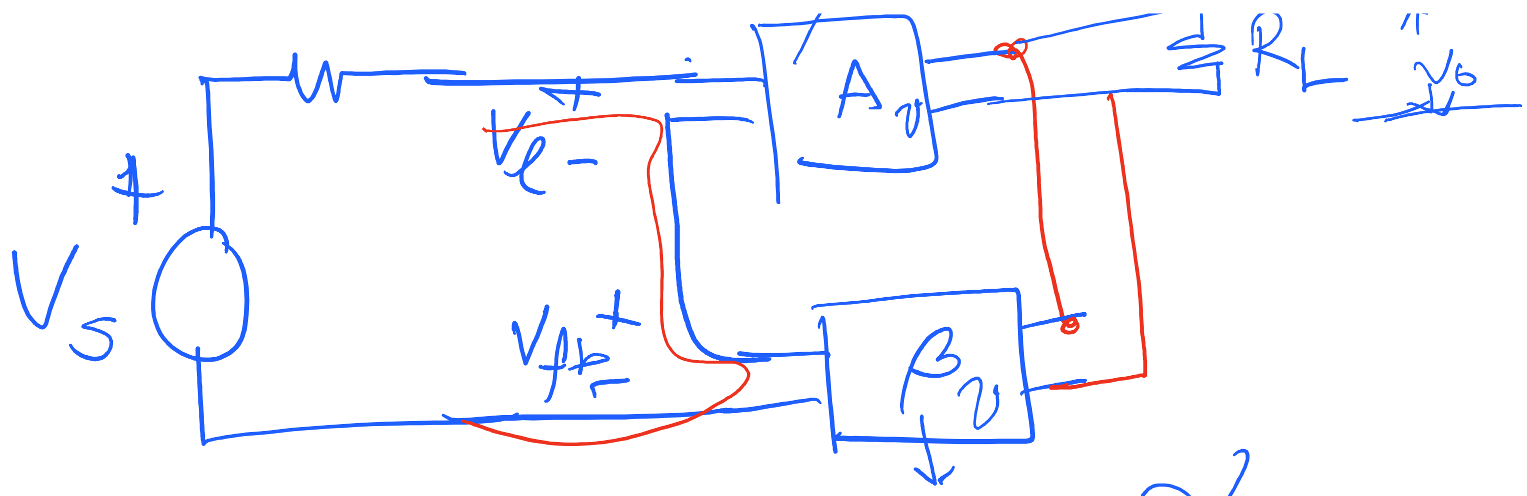
Serie-shunt (v_i, v_o)

Voltage-Amplifier



$R_S = 0$ $A_v = \frac{v_o}{v_e}$



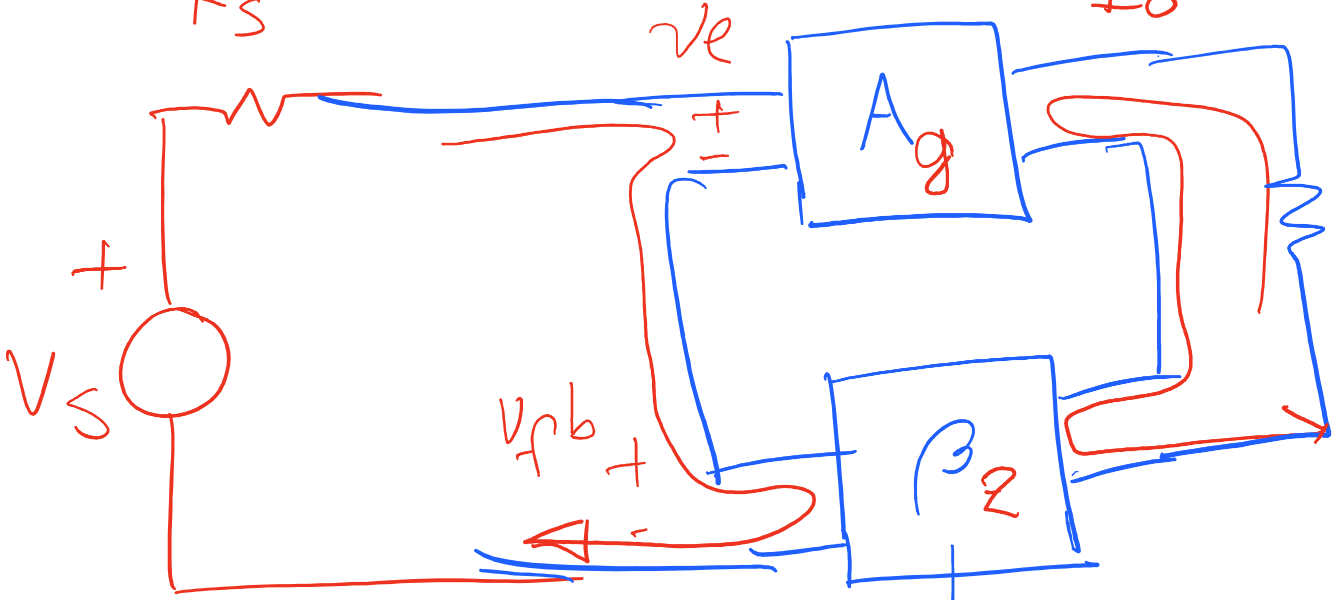


$$\beta_v = \frac{v_{fb}}{v_o}$$

Series-Series.

v_i $\quad$ i_o $\quad$ $R_s = 0$

$$A_g = \frac{I_o}{v_e}$$ (transconductance)



$$\beta_z = \frac{v_{fb}}{I_o}$$ (transimpedance)

$$A_{gf} = \frac{I_o}{v_s}$$ transconductance Amplifier