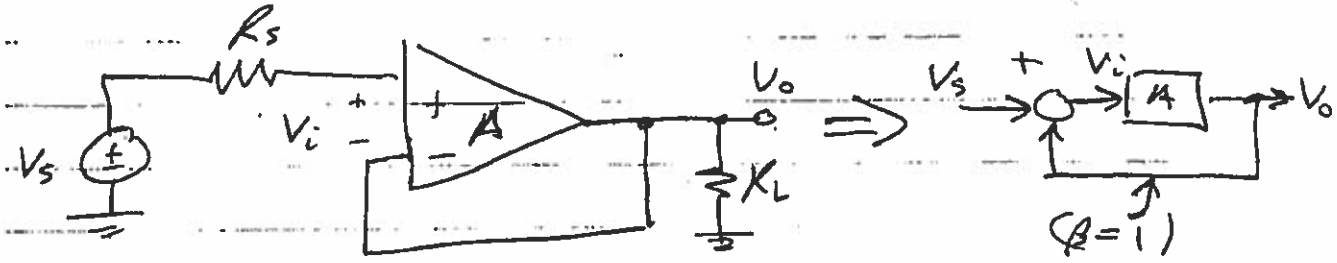
EE352 HW5 Solutions

11.3

(11) Text A



$$A_f = \frac{V_o}{V_s} = \frac{A}{1+A\beta} = \frac{A}{1+A}; \quad A\beta = A \Rightarrow \boxed{\beta = 1}$$

For $A = 1000$: $A_f = \frac{A}{1+A} = \frac{1000}{1001} = 0.999\ V/V$

Amt of Feedback $= 1 + A\beta =$ 1001

$=$ [redacted] 60 dB

For $V_s = 1V$:

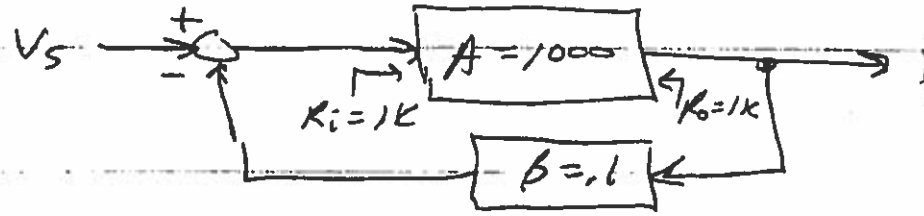
$V_o = .999V$

$$V_i = \frac{V_o}{A} = \frac{.999}{1000} = .999\ mV$$

$$\frac{dA_f}{A_f} = \frac{1}{1+A\beta}\frac{dA}{A} = \frac{1}{1001}(-10\%) = -.0999\%$$

EC 552 HW#5 Solutions

(2.)



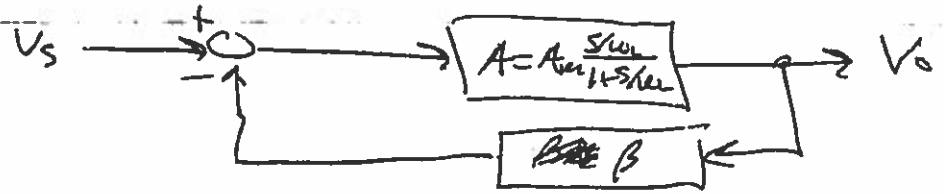
$$A_f = \frac{V_o}{V_s} = \frac{A}{1+A\beta} = \frac{1000}{1+100} \approx 100 = 9.9 \frac{V}{V} \approx 10 \frac{V}{V}$$

$$R_{if} = R_i(1+A\beta) = 1K(1+100) = 101\,K\Omega$$

$$R_{of} = \frac{R_o}{1+A\beta} = \frac{1K}{1+100} = 9.9\,\Omega$$

(3.) Text p. 11.18

$$A = A_m \frac{s/\omega_L}{1+s/\omega_L} \quad \text{(Given)}$$



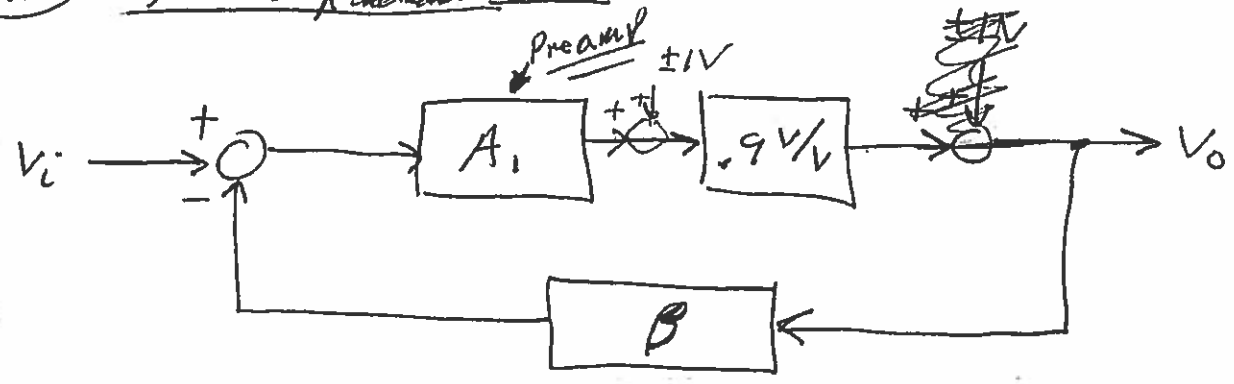
$$A_f = \frac{V_o}{V_s} = \frac{A}{1+A\beta} = \frac{\dfrac{A_m\, s/\omega_L}{1+s/\omega_L}}{1+\dfrac{A_m\beta\, s/\omega_L}{1+s/\omega_L}}$$

$$\therefore A_f = \left(\frac{A_m}{1+A_m\beta}\right) \frac{s/(\omega_L/1+A_m\beta)}{1+s/(\omega_L/1+A_m\beta)}$$

$$\therefore A_m \longrightarrow \frac{A_m}{1+A_m\beta}$$

$$\therefore \omega_L \longrightarrow \frac{\omega_L}{1+A_m\beta}$$

(4) Text 11.22



$$V_o = \underbrace{\frac{.9A_1}{1+.9A_1\beta}}_{=10} V_i \pm \frac{.9}{1+.9A_1\beta}$$

$$\frac{.9A_1}{1+.9A_1\beta} = 10 \Rightarrow \boxed{\beta = \frac{.9A_1 - 10}{9A_1}}$$

For all three cases 5

For ±100mV case:

$$\frac{.9}{1+.9A_1\beta} = .1 \Rightarrow \boxed{\begin{array}{l} A_1 = 100 \\ \beta = .089 \end{array}}$$

For ±10mV case:

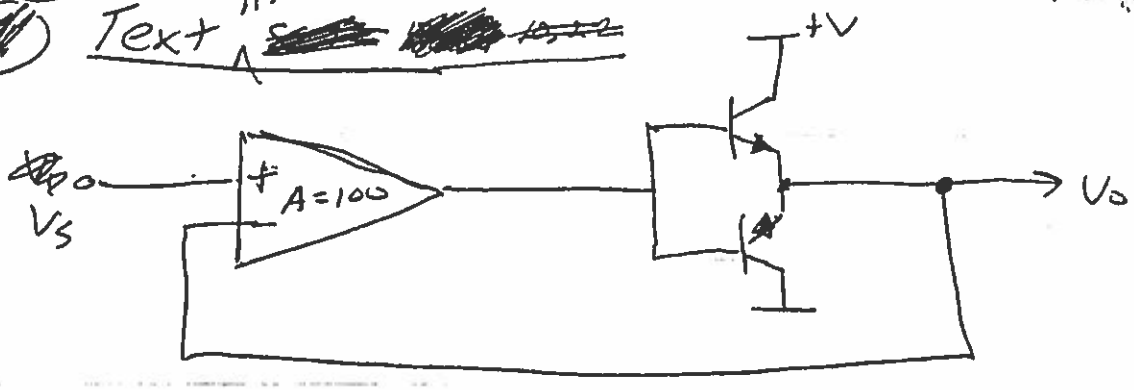
$$\frac{.9}{1+.9A_1\beta} = .01 \Rightarrow \boxed{\begin{array}{l} A_1 = 1000 \\ \beta = .099 \end{array}}$$

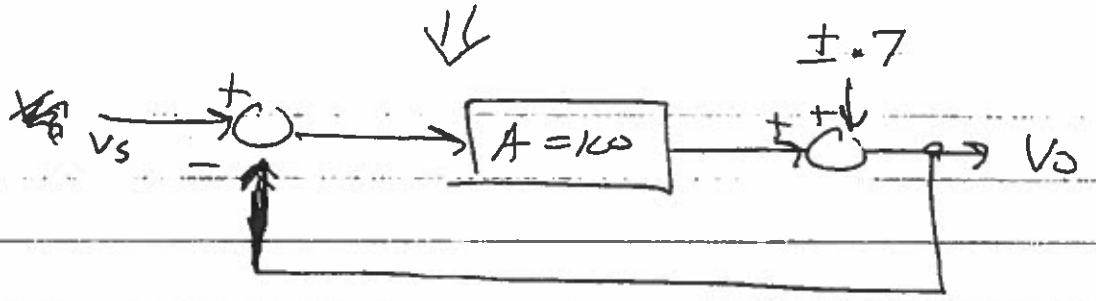
For ±1mV case:

$$\frac{.9}{1+.9A_1\beta} = .001 \Rightarrow \boxed{\begin{array}{l} A_1 = 10{,}000 \\ \beta = .0999 \end{array}}$$

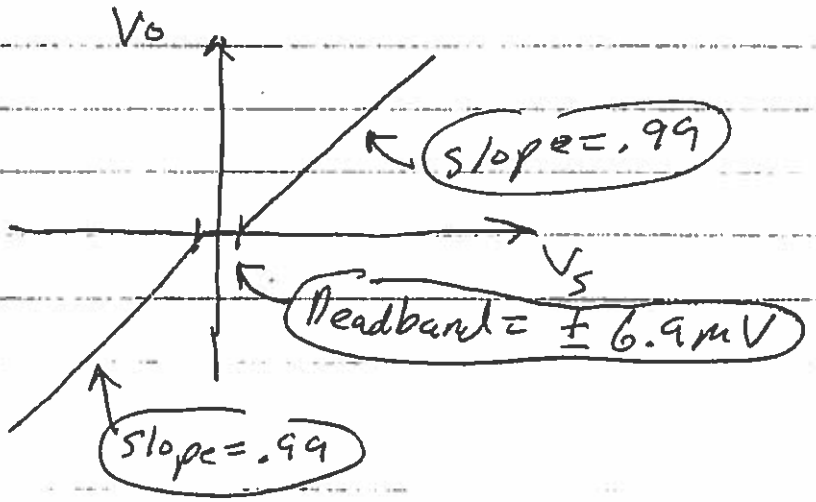
(5.)

Text 11.24





$$V_o = \frac{A}{1+A} V_s \pm \frac{.7}{1+A} = .99 V_i \pm 6.9mV$$



Note: Vast improvement from original DC Transfer Curve: