10.1 $A_f = \dfrac{A}{1 + A\beta} = 100$

$\Rightarrow A\beta = \dfrac{10^4}{100} - 1 = 99$

$\Rightarrow \beta = \dfrac{99}{10^4} = 9.9 \times 10^{-3}$

If $A = 10^3$, then

$A_f = \dfrac{10^3}{1 + 10^3 \times 9.9 \times 10^{-3}} = 91.74$

$\dfrac{\Delta A_f}{A_f} = \dfrac{91.74 - 100}{100} = -8.26\%$

10.7 A: 5 mV $\rightarrow$ 10 V $\Rightarrow$

$A = \dfrac{10}{5\text{ m}}$ 5 2000 i.e 66 dB

A_F: 200 mV $\rightarrow$ 10 V $\Rightarrow$

$A_f = \dfrac{10}{200\text{ m}}$ 5 50 i.e 34 dB

$A_f = \dfrac{A}{1 + A\beta} = \dfrac{2000}{1 + 2000\beta} = 50$

$\Rightarrow 1 + 2000\beta = 40$

$\beta = 0.0195$, i.e -34.2 dB

$A\beta = 2000 \times 0.0195 = 39$, i.e 31.8 dB

$1 + A\beta = 40$, i.e 32 dB

10.10 $A_f = 25;\ \dfrac{\partial A_f}{A_f} = 1\%;\ \dfrac{\partial A}{A} = 10\%$

$\dfrac{\partial A_f}{A_f} = \dfrac{1}{1 + A\beta} \cdot \dfrac{\partial A}{A} \Rightarrow 1 = \dfrac{10}{1 + A\beta} \Rightarrow A\beta = 9$

Since

$A_f = \dfrac{A}{1 + \beta A} \Rightarrow 25 = \dfrac{A}{1 + 9} \rightarrow A = 250$ V/V

thus $\beta = \dfrac{9}{250} = 0.036$

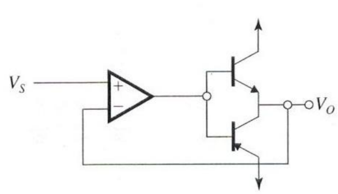
10.16 $A_f = \dfrac{A}{1 + A\beta} = 10$

$\rightarrow 10 = \dfrac{1000}{1 + A\beta} \Rightarrow (1 + A\beta) = 100$

$f_L' = f_L / (1 + A\beta) = 100/100 = 1$ Hz

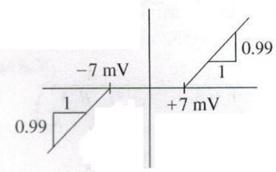
$f_H' = f_H \times (1 + A\beta) = 10\text{ K} \times 100 = 1$ MHz

10.22



Dead band with be narrowed by the factor $1 + A\beta = 1 + A$ since $\beta = 1$ and since $A >> 1$, $1 + A \rightarrow A$

$\therefore$ new limits are $\pm\dfrac{0.7}{A} = \pm\dfrac{0.7}{100} = \pm 7$ mV



New slope ≡ gain $= A_f = \dfrac{A}{1 + A}$

$\Rightarrow \dfrac{100}{1 + 100} = 0.99$

10.23 $A_2 = \dfrac{A_1}{10}$, we want after feed-back

$1.1 \times A_{f2} = A_{f1} \quad A_{f1} = \dfrac{A_1}{1 + \beta A_1}$ and

$A_{f2} = \dfrac{A_2}{1 + \beta A_2} \Rightarrow \dfrac{A_{f1}}{A_{f2}} = \dfrac{A_1}{A_2}\left(\dfrac{1 + \beta A_2}{1 + \beta A_1}\right)$

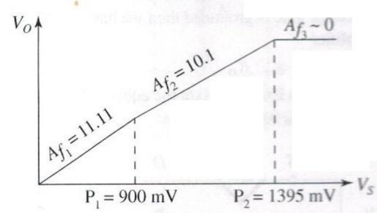
$1.1 = \dfrac{1000}{100}\left(\dfrac{1 + \beta \cdot 100}{1 + \beta 1000}\right) \rightarrow \beta = 0.089$

Then: $A_{f1} = \dfrac{10^3}{1 + 0.089 \times 10^3} = 11.11$ V/V

$A_{f2} = \dfrac{100}{1 + 0.089 \times 100} = 10.1$

$A_{f1}/A_{f2} = 1.1$

Part II. Curve intersection point



in open crop case:

$Q_1 = 10$ mV, $A_1 = 1000$

$Q_2 = 60$ mV $\quad A_2 = 100$ from Part I.

$A_3 = 0$

$\beta = 0.089$

in close case

$P_1 = Q_1(1 + A \cdot B) = 10\text{ mV} \times (1 + 0.089 \times 1000)$

$= 900$ mV

$= 900\text{ mV} + 50\text{ mV} \times 9.9$

$= 1395$ mV