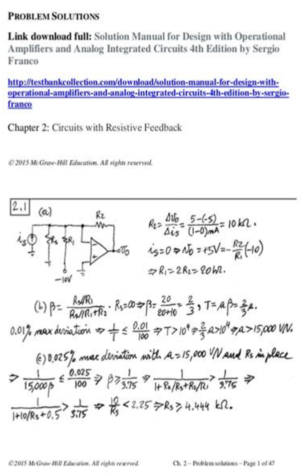

PROBLEM SOLUTIONS

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Chapter 2: Circuits with Resistive Feedback

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2.1 (a)

$R_2 = \frac{\Delta v_O}{\Delta i_S} = \frac{5-(-5)}{(1-0)\text{mA}} = 10\ \text{k}\Omega.$

$i_S = 0 \Rightarrow v_O = +5\text{V} = -\frac{R_2}{R_1}(-10)$

$\Rightarrow R_1 = 2R_2 = 20\ \text{k}\Omega.$

(b) $\beta = \frac{R_S /\!/ R_1}{R_S /\!/ R_1 + R_2}$. $R_S = \infty \Rightarrow \beta = \frac{20}{20+10} = \frac{2}{3}$, $T = a\beta = \frac{2}{3}a$.

0.01% max deviation $\Rightarrow \frac{1}{T} \le \frac{0.01}{100} \Rightarrow T > 10^4 \Rightarrow \frac{2}{3}a > 10^4 \Rightarrow a > 15{,}000$ V/V.

(c) 0.025% max deviation with $a = 15{,}000$ V/V and R_S in place

$\Rightarrow \frac{1}{15{,}000\beta} \le \frac{0.025}{100} \Rightarrow \beta \ge \frac{1}{3.75} \Rightarrow \frac{1}{1 + R_2/R_S + R_2/R_1} > \frac{1}{3.75} \Rightarrow$

$\frac{1}{1 + 10/R_S + 0.5} > \frac{1}{3.75} \Rightarrow \frac{10}{R_S} < 2.25 \Rightarrow R_S > 4.444\ \text{k}\Omega.$

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