Compensator Design:

Assume $V_{osc}^{peak} = 1.8V$

$TF = \frac{TF}{1.8}$

Crossover frequency: $f_{sw}$'nin $\frac{1}{10}$ ve $\frac{1}{5}$ arası

Choose it $\frac{1}{5}$ of the $f_{sw} \Rightarrow f_{crossover} = 8kHz$

- Location of pole and zeros:

$f_{LC} = 918 Hz$

$\frac{f_{sw}}{2} = 20kHz$

$f_{ESR} = 32.2kHz$

$f_{RHPz} = 17kHz$

$f_{cross}$ 8kHz

$\boxed{f_{ESR} > \frac{f_{sw}}{2} > f_{cross} > f_{LC}}$

Type 3-B

At crossover freq

phase $= -180°$

Gain $= -5.46$ dB

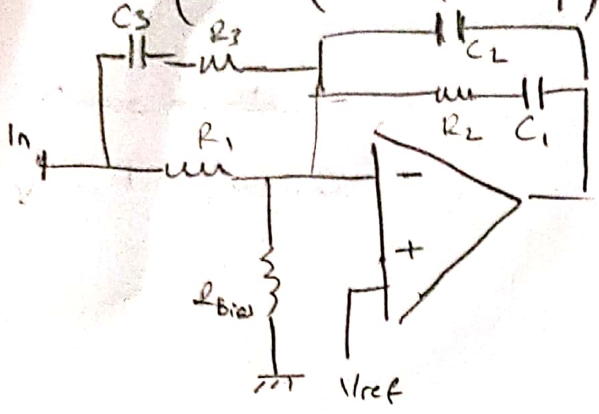
45° phase margin yapalım

$\theta_{comp} = 45 - (-180) = 235°$

Needed Gain $= 5.4$ dB $= 1.862$ gain

K method:

$$K = \left( \tan\left( \frac{\theta_{camp} + 90}{4} \right) \right)^2 = 42.212$$




$R_1 = 1k\ \Omega$

$$R_2 = \frac{|G(j\omega_{crossover})| R_1}{\sqrt{K}} = \frac{1.862 \times 1000}{\sqrt{42.212}} = 286.59\ \Omega$$

↳ 270Ω seçilebilir.

$$C_1 = \frac{\sqrt{K}}{2\pi f_{crossover} R_2} = \frac{\sqrt{42.212}}{2\pi(8000)(270)} = 478.96\ nF$$

↳ 470 nF

$$C_2 = \frac{1}{2\pi f_{cros} R_2 \sqrt{K}} = \frac{1}{2\pi(8000)(270)\sqrt{42.212}} = 11.35\ nF$$

↳ 10 nF

$$C_3 = \frac{\sqrt{K}}{2\pi f_{cross} R_1} = \frac{\sqrt{42.212}}{2\pi(8000)\ 1000} = 129\ nF$$

↳ Bunu ne seçebiliriz bilemedim

100 nF

$$R_3 = \frac{1}{2\pi f_{cross} \sqrt{K}\ C_3} = \frac{1}{2\pi \times 8000 \times \sqrt{42.212} \times 100 \times 10^{-9}} = 306\ \Omega$$

↳ 30Ω vardır

$$V_{ref} = V_{out} \frac{R_{bias}}{R_{bias}+R_1}$$

$$2.5 = 15 \times \frac{R_{bias}}{1+R_{bias}} \Rightarrow 200\Omega = R_{bias}$$

TF of compensator:

$$(s+7.88\times10^3) \qquad (s+9.708\times10^3)$$

$$G(s) = -\frac{R_1+R_3}{R_1R_3C_2} * \frac{\left(s+\frac{1}{R_2C_1}\right)\left(s+\frac{1}{(R_1+R_3)C_3}\right)}{s\left(s+\frac{C_1+C_2}{R_2C_1C_2}\right)\left(s+\frac{1}{R_3C_3}\right)}$$

$$s(s+3.783\times10^5)(s+3.333\times10^5)$$

$$-\frac{1030}{1000\times30\times10\times10^{-9}} = -0.00343\times10^9$$

$$G(s) = -0.00343\times10^9 \times \frac{(s^2+17.588\times10^3 s+76.5\times10^6)}{s^3+7.116\times10^5 s^2+12.608739\times10^{10} s}$$