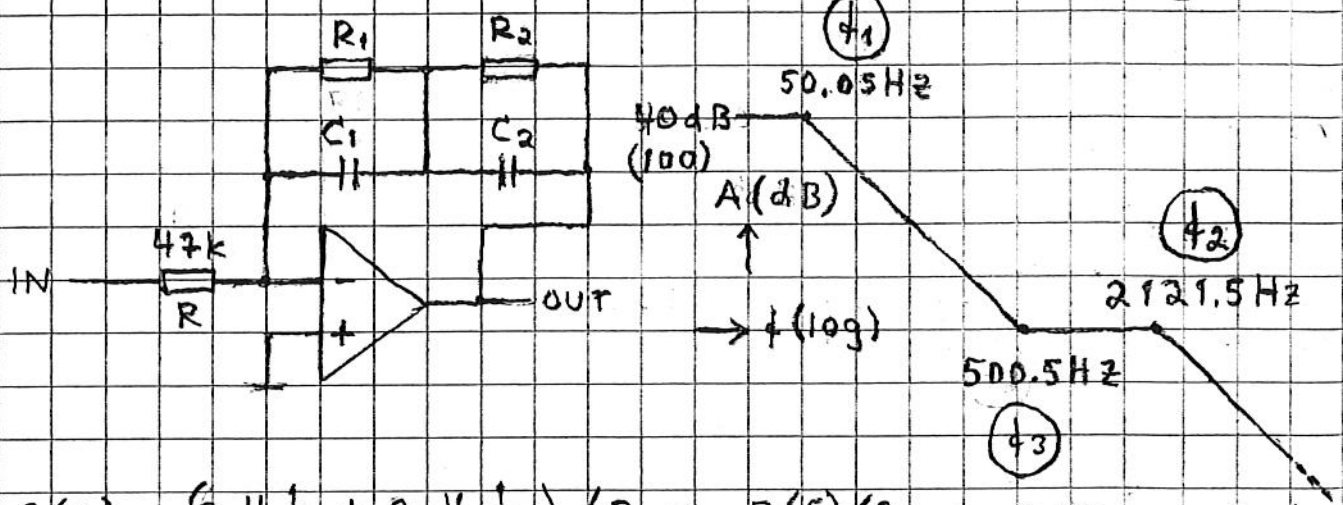


19.1.2014 MK

# ACTIVE RIAA (SHUNT FEEDBACK)

SFB

1



$$G(s) = - \left( R_1 \parallel \frac{1}{C_1 s} + R_2 \parallel \frac{1}{C_2 s} \right) / R = - Z(s) / R$$

No Neumann zero!

$$Z(s) = \frac{R_1 / (C_1 s)}{R_1 + \frac{1}{C_1 s}} + \frac{R_2 / (C_2 s)}{R_2 + \frac{1}{C_2 s}} = \frac{R_1}{T_1 s + 1} + \frac{R_2}{T_2 s + 1} \quad \left| \begin{array}{l} T_1 = R_1 C_1 \\ T_2 = R_2 C_2 \end{array} \right.$$

$$= \frac{R_1 (T_2 s + 1) + R_2 (T_1 s + 1)}{(T_1 s + 1) (T_2 s + 1)}$$

$$= (R_1 + R_2) \frac{T_3 s + 1}{(T_1 s + 1) (T_2 s + 1)} \quad \left| \begin{array}{l} T_3 = \frac{R_1 T_2 + R_2 T_1}{R_1 + R_2} \\ = R_1 \parallel R_2 (C_1 + C_2) \end{array} \right.$$

$$T_1 = 1 / (2\pi f_1) \quad T_2 = 1 / (2\pi f_2) \quad T_3 = 1 / (2\pi f_3)$$

$$G(s) = - \frac{R_1 + R_2}{R} \frac{(T_3 s + 1)}{(T_1 s + 1) (T_2 s + 1)} \quad \left| \begin{array}{l} T_1 = 3180 \text{ ms} \\ T_2 = 75 \text{ ms} \\ T_3 = 318 \text{ ms} \end{array} \right.$$

$$\frac{R_1 + R_2}{R} = 100 \Rightarrow R_1 + R_2 = 100 R$$

$$T_3 = \frac{R_1 T_2 + R_2 T_1}{R_1 + R_2} \Rightarrow R_2 = \frac{T_3 - T_2}{T_1 - T_3} R_1$$

$$100R = R_1 + R_2 = \left(1 + \frac{T_3 - T_2}{T_1 - T_3}\right) R_1 = \frac{T_1 - T_2}{T_1 - T_3} R_1$$

SFB  
2

⇒

$$R_1 = 100 \frac{T_1 - T_3}{T_1 - T_2} R = 100 \frac{1 - T_3/T_1}{1 - T_2/T_1} R = 100 \frac{1 - 41/43}{1 - 41/42} R$$

$$= 4.3322 M \approx \underline{3.9M + 100k + 330k} \text{ (4.33M)}$$

$$R_2 = \frac{T_3 - T_2}{T_1 - T_3} R_1 = \frac{1 - T_2/T_3}{T_1/T_3 - 1} R_1 = \frac{1 - 43/42}{43/41 - 1} R_1$$

$$= 367.80 k \approx \underline{330k + 39k} \text{ (369k)}$$

$$C_1 = \frac{T_1}{R_1} = \frac{1}{2\pi f_1 R_1}$$

$$= 734.02 pF \approx \underline{680pF + 56pF} \text{ (736pF)}$$

$$C_2 = \frac{T_2}{R_2} = \frac{1}{2\pi f_2 R_2}$$

$$= 203.97 pF \approx \underline{180pF + 22pF} \text{ (202pF)}.$$

