ANALYTIC SOLUTION OF A CLASS-A TRIODE AMPLIFIER

Complete circuit transfer function

$$H(f)=\frac{V_{out}(f)}{V_{in}(f)}=\frac{\rho}{\tau\pi+\mu}=$$

$$=\frac{\dfrac{1}{\theta Z_{Cin}R_b}}{\dfrac{\dfrac{-1}{R_L}-\lambda\sigma}{\dfrac{-\xi\delta}{\varepsilon}+\gamma}\left(\dfrac{\xi}{\theta\varepsilon R_b^{\,2}}+\dfrac{-\xi\chi}{\varepsilon}+\dfrac{1}{Z_{Cgk}}\right)+\lambda\left(\dfrac{1}{Z_{Cga}}+\eta\left(\dfrac{-1}{\theta\varepsilon R_b^{\,2}}+\dfrac{\chi}{\varepsilon}\right)\right)}=$$

$$=\frac{\dfrac{1}{\left(\dfrac{-1}{Z_{Cin}}+\dfrac{-1}{R_g}+\dfrac{-1}{R_b}\right)Z_{Cin}R_b}}{\dfrac{\dfrac{-1}{R_L}-\left(1+\dfrac{Z_{Co}}{R_L}\right)\left(\beta-\dfrac{\alpha}{R_a}+\dfrac{\eta\delta}{\varepsilon}\right)}{\dfrac{-\xi\delta}{\varepsilon}+\gamma}\left(\dfrac{\xi}{\left(\dfrac{-1}{Z_{Cin}}+\dfrac{-1}{R_g}+\dfrac{-1}{R_b}\right)\varepsilon R_b^{\,2}}+\dfrac{-\xi\chi}{\varepsilon}+\dfrac{1}{Z_{Cgk}}\right)+\left(1+\dfrac{Z_{Co}}{R_L}\right)\left(\dfrac{1}{Z_{Cga}}+\eta\left(\dfrac{-1}{\left(\dfrac{-1}{Z_{Cin}}+\dfrac{-1}{R_g}+\dfrac{-1}{R_b}\right)\varepsilon R_b^{\,2}}+\dfrac{\chi}{\varepsilon}\right)\right)}=$$

$$=\frac{\dfrac{1}{\left(\dfrac{-1}{Z_{Cin}}+\dfrac{-1}{R_g}+\dfrac{-1}{R_b}\right)Z_{Cin}R_b}}{\left(\begin{array}{l}\dfrac{\dfrac{-1}{R_L}-\left(1+\dfrac{Z_{Co}}{R_L}\right)\left(\left(\dfrac{1}{Z_{Cga}}+\dfrac{1}{R_i}+\dfrac{1}{Z_{Cak}}+\dfrac{1}{R_a}\right)-\dfrac{1}{R_aR_a\left(\dfrac{1}{R_{ps}}+\dfrac{1}{Z_{Cps}}+\dfrac{1}{R_a}\right)}+\dfrac{\left(\dfrac{-1}{R_i}+\dfrac{-1}{Z_{Cak}}\right)\left(\dfrac{-1}{Z_{Cga}}+g_m\right)}{\left(\dfrac{1}{Z_{Cgk}}+g_m\right)}\right)}{\dfrac{-\left(\dfrac{-1}{Z_{Cgk}}-g_m+\dfrac{-1}{R_i}+\dfrac{-1}{Z_{Cak}}+\dfrac{-1}{Z_{Ck}//R_k}\right)\left(\dfrac{-1}{Z_{Cga}}+g_m\right)}{\left(\dfrac{1}{Z_{Cgk}}+g_m\right)}+\left(-gm+\dfrac{-1}{R_i}+\dfrac{-1}{Z_{Cak}}\right)}\left(\dfrac{\dfrac{-1}{Z_{Cgk}}-g_m+\dfrac{-1}{R_i}+\dfrac{-1}{Z_{Cak}}+\dfrac{-1}{Z_{Ck}//R_k}}{\left(\dfrac{-1}{Z_{Cin}}+\dfrac{-1}{R_g}+\dfrac{-1}{R_b}\right)\left(\dfrac{1}{Z_{Cgk}}+g_m\right)R_b^{\,2}}+\dfrac{-\left(\dfrac{-1}{Z_{Cgk}}-g_m+\dfrac{-1}{R_i}+\dfrac{-1}{Z_{Cak}}+\dfrac{-1}{Z_{Ck}//R_k}\right)\left(\dfrac{-1}{Z_{Cga}}+\dfrac{-1}{R_b}+\dfrac{-1}{Z_{Cgk}}\right)}{\left(\dfrac{1}{Z_{Cgk}}+g_m\right)}+\dfrac{1}{Z_{Cgk}}\right)+\\ \left(1+\dfrac{Z_{Co}}{R_L}\right)\left(\dfrac{1}{Z_{Cga}}+\left(\dfrac{-1}{R_i}+\dfrac{-1}{Z_{Cak}}\right)\left(\dfrac{-1}{\left(\dfrac{-1}{Z_{Cin}}+\dfrac{-1}{R_g}+\dfrac{-1}{R_b}\right)\left(\dfrac{1}{Z_{Cgk}}+g_m\right)R_b^{\,2}}+\dfrac{\left(\dfrac{-1}{Z_{Cga}}+\dfrac{-1}{R_b}+\dfrac{-1}{Z_{Cgk}}\right)}{\left(\dfrac{1}{Z_{Cgk}}+g_m\right)}\right)\right)\end{array}\right)}$$