Solution - Problem Set 9

8.76

$f_1 = 2\text{MHz}$

$A_0 = 80\,\text{dB} \equiv 10^4$

$\Rightarrow f_p = f_1/A = (2\times10^6)/10^4 = 200\text{Hz}$

8.77

$f_{p1} = 2\text{MHz}, \quad f_{p2} = 10\text{MHz}$

$A_0 = 80\,\text{dB} \equiv 10^4$

$f_b = \dfrac{f_p}{A_0} = \dfrac{10\times10^6}{10^4} = 10^3\,\text{Hz}$

$f_b' = 1/(C_x + C_c)2\pi R_x \rightarrow C \times \dfrac{2\times10^6}{10^3} = 2000C$

8.80

$A_0 = 80\,\text{dB} \equiv 10^4$

$f_{p1} = 10^5 = \dfrac{1}{2\pi C_1 R_1} \Rightarrow R_1 = \dfrac{1}{2\pi f_{p1} C_1}$

$\Rightarrow R_1 = \dfrac{1}{2\pi \cdot 10^5 \cdot (150\times10^{-12})} = 10.62\,\text{K}\Omega$

$f_{p2} = 10^6 = \dfrac{1}{2\pi C_2 R_2}$

$\Rightarrow R_2 = \dfrac{1}{2\pi\, 10^6 (5\times10^{-12})} = 31.85\,\text{K}\Omega$

Assuming $f_{p2}' \gg f_{p3}$

$f_{p1}' = \dfrac{f_{p3}}{10^2} = \dfrac{2\times10^6}{10^4} = 200\text{Hz}$

and $f_{p1}' = \dfrac{1}{2\pi g_m R_1 R_2 C_f} \Rightarrow C_f = \dfrac{1}{2\pi g_m R_1 R_2 f_{p1}'}$

$\therefore C_f = \dfrac{1}{2\pi(40\times10^{-3})(10.62\times10^3)(31.85\times10^3)200}$

$= 58.8\,\text{pF}$

$f_{p2}' = \dfrac{1}{2\pi} \dfrac{g_m C_f}{C_1 C_2 + C_f(C_1 + C_2)}$

$= \dfrac{1}{2\pi} \dfrac{40\times10^{-3}(58.8\times10^{-12})}{(150\times5)10^{-24} + 58.8(155)10^{-24}} = 38.8\text{MHz}$