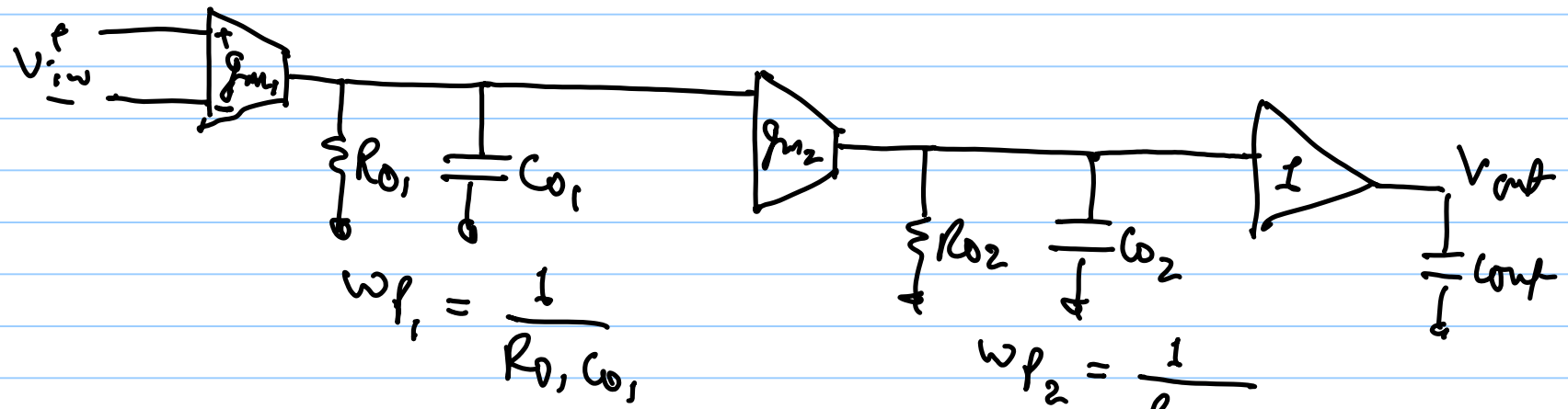
EE2019

Note Title 2/22/2019

Compensation Techniques

① Dominant pole compensation.



$$\omega_{p_1} = \frac{1}{R_{O_1} C_{O_1}}$$

$$\omega_{p_2} = \frac{1}{R_{O_2} C_{O_2}}$$

$$A_0 = g_{m_1} g_{m_2} R_{O_1} R_{O_2}$$

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$$A(s) = \frac{A_0}{(1+s/\omega_{p_1})(1+s/\omega_{p_2})}$$

$g_{m_1} = 100\,\mu A/V$, $R_{O_1} = 1\,M\Omega$, $C_{O_1} = 10\,pF$

$g_{m_2} = 100\,\mu A/V$, $R_{O_2} = 1\,M\Omega$, $C_{O_2} = 10\,pF$

$\omega_{p_1} = \omega_{p_2}$

$A_0 = 10^4 \rightarrow 80\,dB$

$$\omega_{p_1} = \omega_{p_2} = \frac{1}{1M \times 10pF} = \frac{1}{10^6 \times 10^{-11}} = 10^5 = 100K\ rad/sec$$

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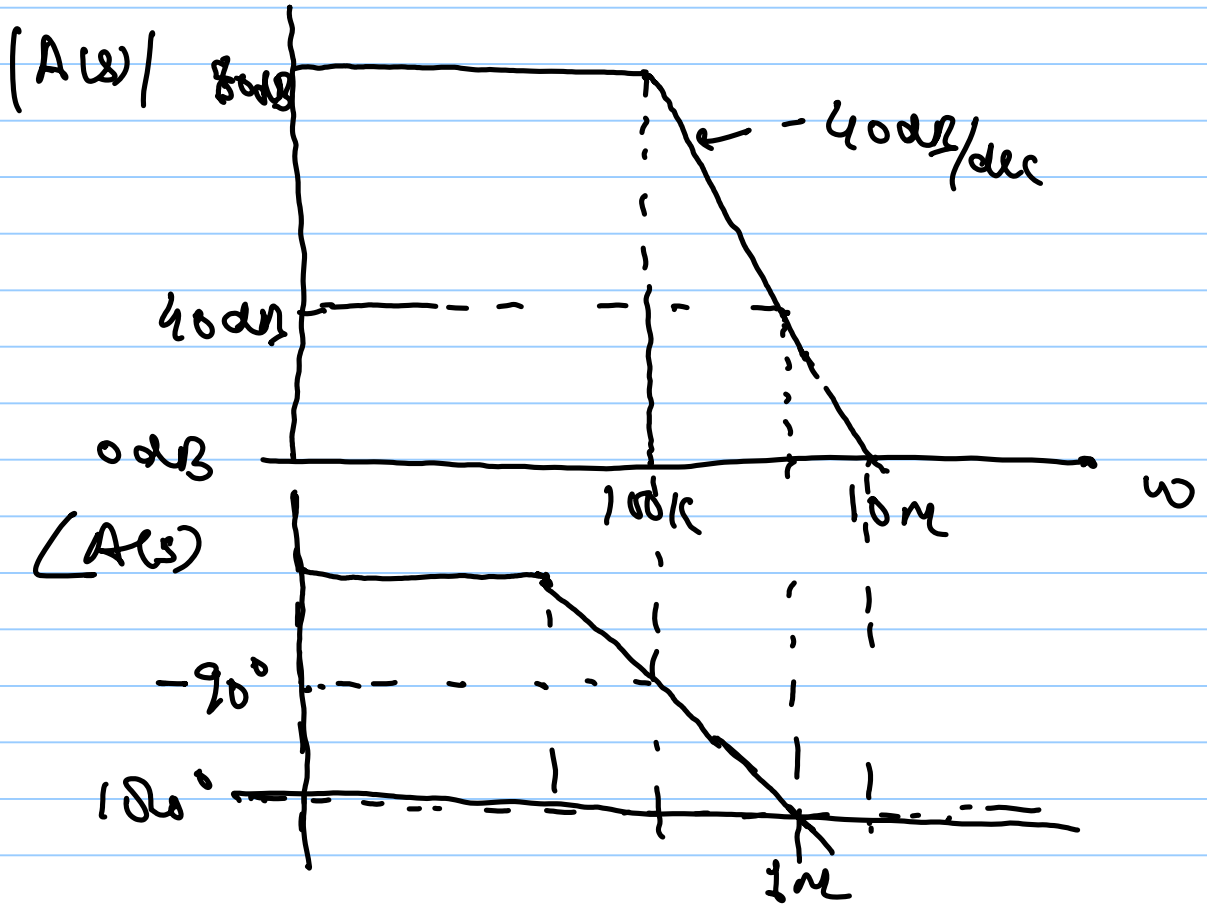

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For PM of 60° $\omega_{p_2} \approx 1.7\,\omega_{ugb}$ — (1)

$\omega_{ugb} = A_0\,\omega_{p_1}$ — (2)

from (1) & (2)

$$A_0\,\omega_{p_1} = \frac{\omega_{p_2}}{1.7} \Rightarrow \omega_{p_1} = \frac{\omega_{p_2}}{1.7\,A_0}$$

$\omega_{p_2} = 100\text{K}$ rad/sec

$$\omega_{p_1} = \frac{100\text{K}}{1.7\times10^4} = \frac{10^5}{1.7\times10^4} = \frac{10}{1.7} = 5.88 \text{ rad/sec}$$

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$$\omega_{p_1} = \frac{1}{R_{o_1} C_{o_1}} = 5.88$$

$$C_{o_1} = \frac{1}{R_{o_1} \times 5.88} = \frac{1}{1M \times 5.88} \simeq 170\,nF$$