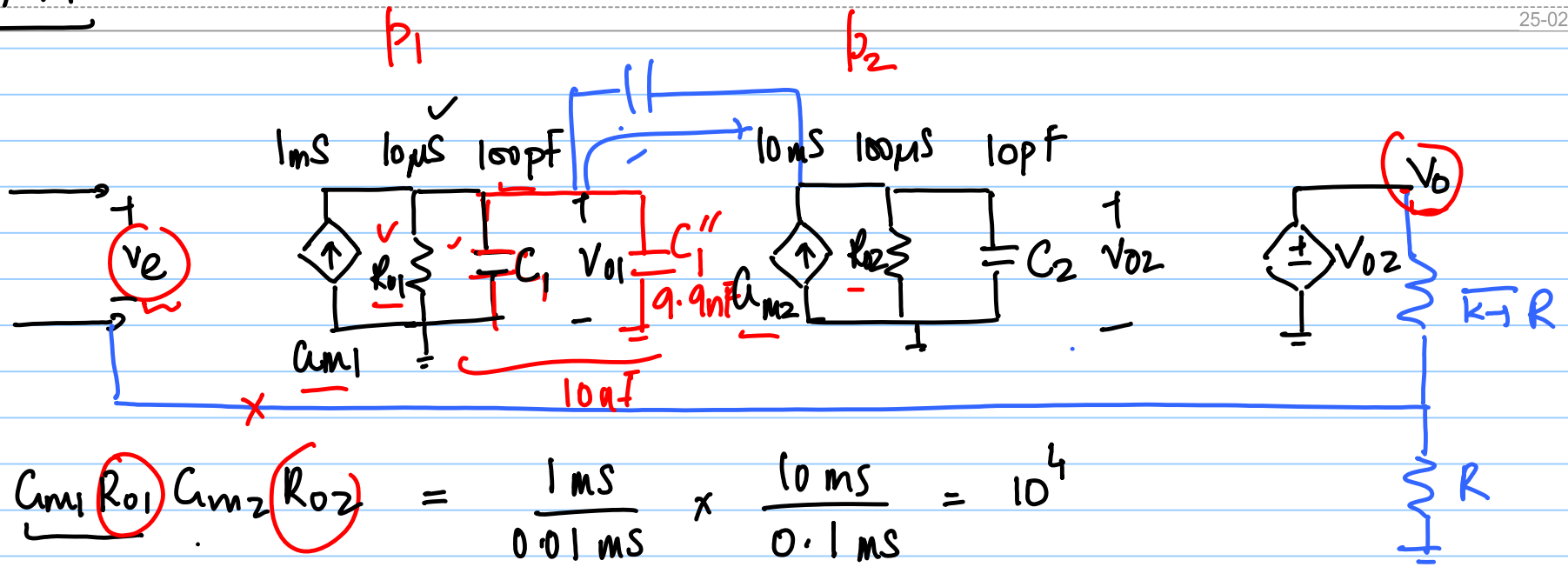
Lecture # 19

Note Title 25-02-2020

Ex.



$$A_0 = G_{m1} R_{01} G_{m2} R_{02} = \frac{1\,mS}{0.01\,mS} \times \frac{10\,mS}{0.1\,mS} = 10^4$$

$$p_1 = \frac{1}{R_{01} C_1} = \frac{10^{-6}}{100 \times 10^{-12}} = 10^5 \text{ rad/s.}$$

$$p_2 = \frac{1}{R_{02} C_2} = \frac{100 \times 10^{-6}}{10 \times 10^{-12}} = 10^7 \text{ rad/s}$$

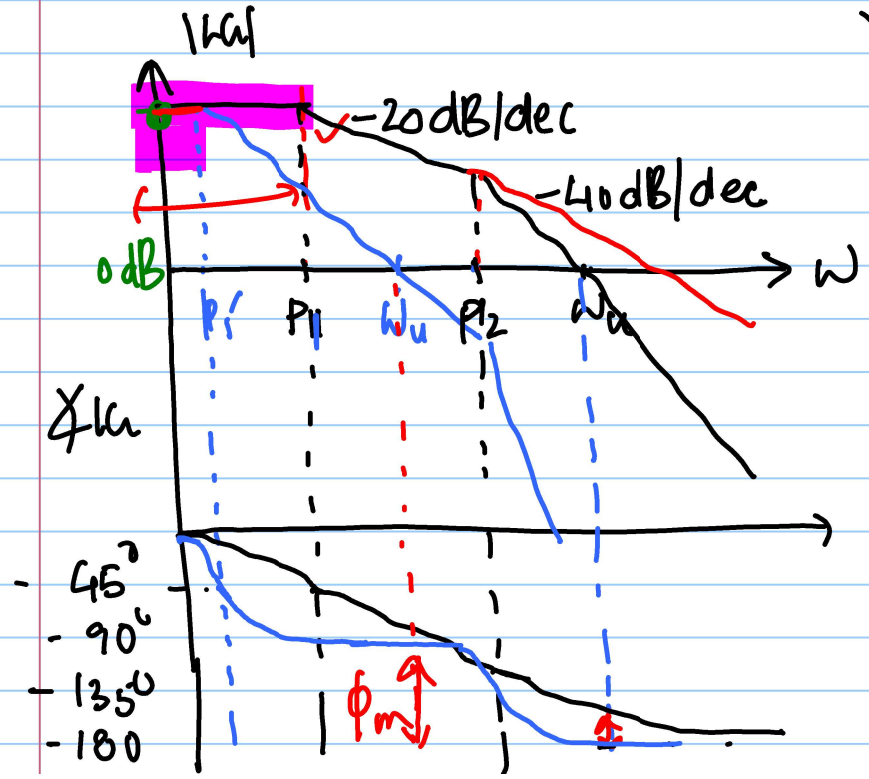
$$H(s) = \frac{(1 + s/z_1)}{(1 + \frac{s}{p_1})(1 + \frac{s}{p_2})}$$

K = 4,

$$LG(s) = \frac{A_0}{\left(1+\frac{s}{p_1}\right)\left(1+\frac{s}{p_2}\right)} \times \frac{1}{K} \qquad |LG(s)| = 1$$

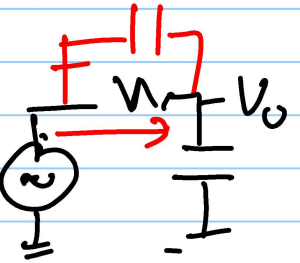
$\omega_u > p_1, p_2 \Rightarrow$ $\omega_u = \sqrt{\frac{A_0 \cdot p_1 \cdot p_2}{K}}$

$$= \sqrt{\frac{10^4 \times 10^5 \times 10^7}{4}} = \frac{10^8}{2} = 5\times10^7 \text{ rad/s}$$



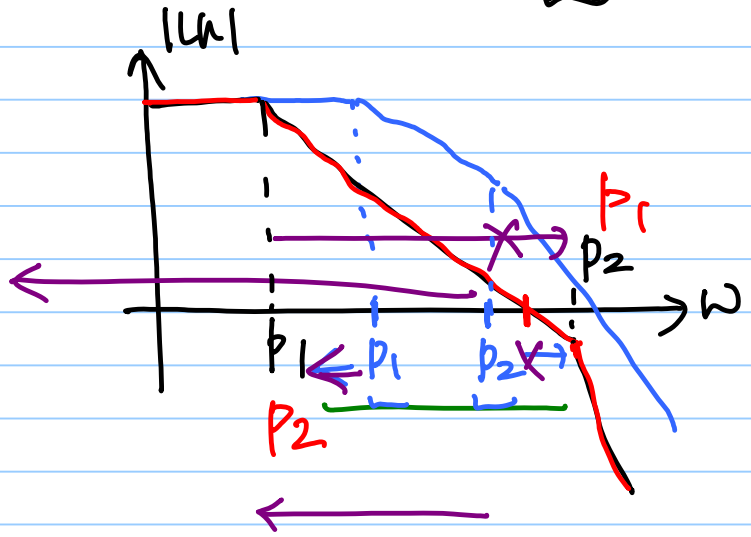
$$\phi_m = 180^\circ - \tan^{-1}\left(\frac{\omega_u}{p_1}\right) - \tan^{-1}\left(\frac{\omega_u}{p_2}\right)$$

$$\frac{-V_o}{V_i} = \frac{1}{1+s/p_1}$$



$$\frac{V_o}{V_i} = \frac{1+s/z_1}{1+s/p_2}$$

$\Phi_m = 76^0$, $p_2 = 4\omega_u = 4 \cdot \frac{A_0 p_1}{K} = \frac{4A_0}{K} \cdot p_1$



$$p_1' = \frac{p_2}{(4 \cdot A_0/K)} = \frac{10^7}{4 \cdot 10^4/K} = 10^3 \text{ rad/s}$$

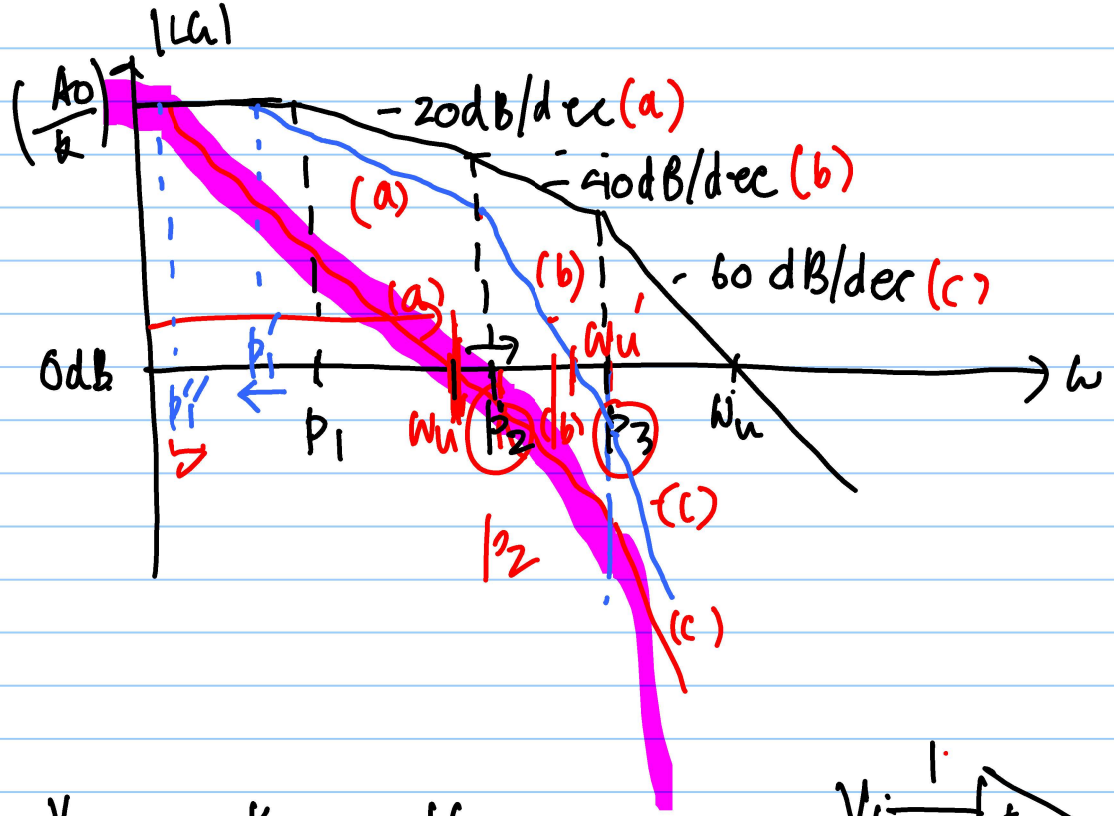
$$\omega_u = \frac{p_2}{4} = \frac{A_0 p_1'}{K} = \frac{10^7}{4} = 2.5 \times 10^6 \text{ rad/s}$$ ✓

$$p_1' = \frac{1}{R_{01} C_1'} = \frac{10 \times 10^{-6}}{C_1'} = 10^3$$

$$C_1' = 10 \text{ nF}$$

"Dominant Pole" Compensation

$$L_u(s) = \frac{A_0}{K\left(1+\frac{s}{p_1}\right)\left(1+\frac{s}{p_2}\right)\left(1+\frac{s}{p_3}\right)}$$



Cost: — Area of cap.

$2\,ff/\mu m^2$

10 nf

$\frac{10\,nF}{2\,ff}\,\mu m^2$

— Reduced bandwidth

$$\frac{V_o}{V_i} = K \cdot \frac{L_u}{1+L_u}$$

$1+L_u$