

Needed PM = ϕ
 What should p_2 be?

$$\omega_0 = Ap_1$$

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$$\angle H(j\omega) = -\tan^{-1}\left(\frac{\omega}{p_1}\right) - \tan^{-1}\left(\frac{\omega}{p_2}\right)$$

$$-180^\circ + \phi =$$

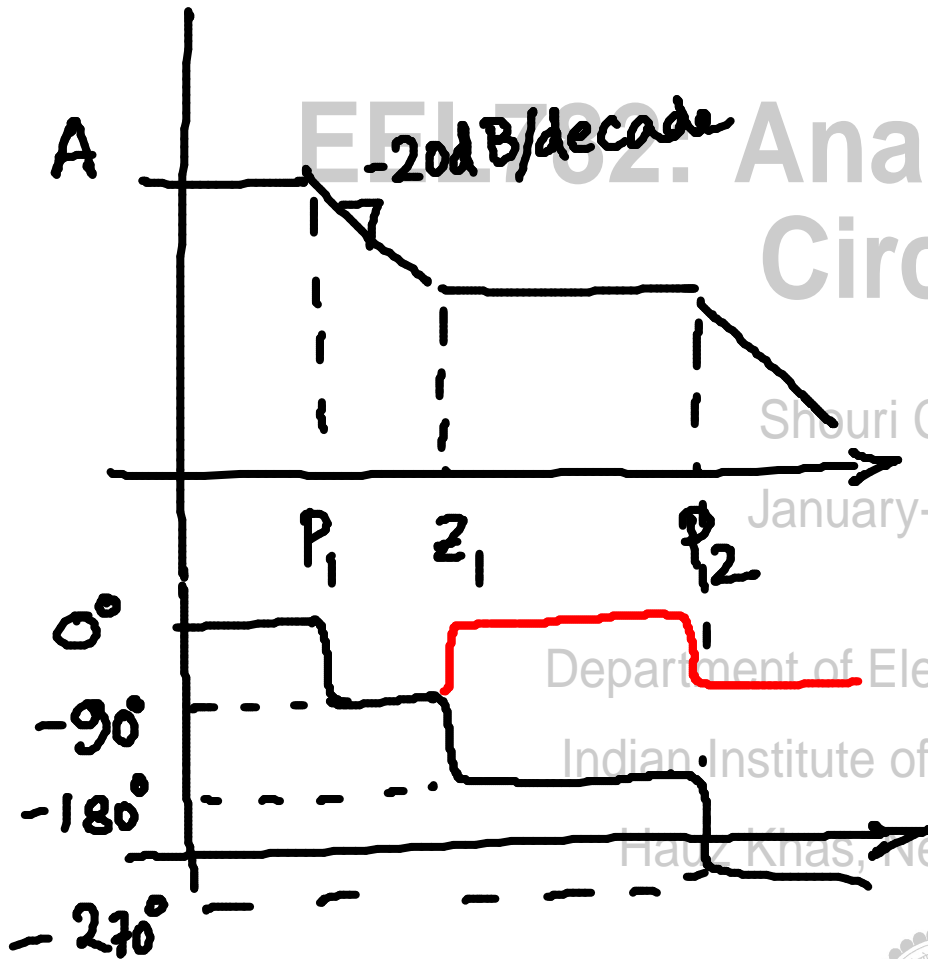
$$\tan^{-1}\left(\frac{\omega}{p_2}\right) = 90^\circ - \phi$$

$$Ap_1 = \frac{p_2}{\tan \phi}$$



Scenario : 2 pole, 1 RHP zero

$$P_1 \ll z \ll P_2$$



EEL732: Analog Integrated Circuits

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$$z_1 = AP_1 \tan \phi$$

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$$P_1 \ll P_2 \ll \text{RHP } z_1$$

$$P_2 = A p_1 \tan \phi$$

$$P_1 \ll \text{LHP } z_1 \ll P_2$$

$$P_1 \ll P_2 \ll \text{LHP } z_1$$

$$P_2 = A p_1 \tan \phi$$

$$P_1 \ll P_2, P_3$$

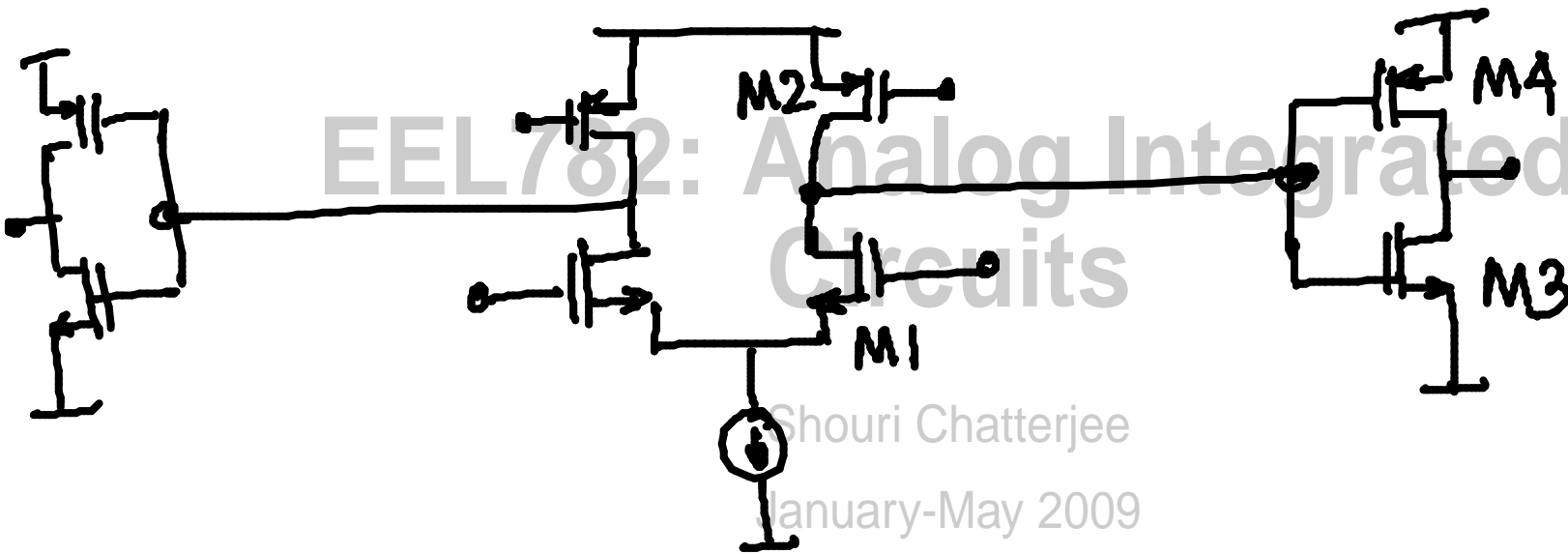
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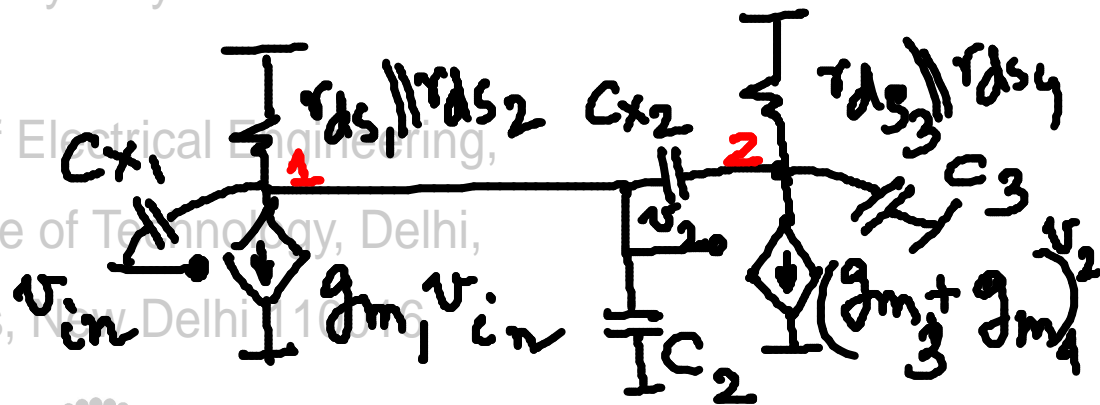


2 stage opamps



Poles ? 2

Zeros ?



$$C_{x1} = C_{gd1}$$

$$C_{x2} = C_{gd3} + C_{gd4}$$

$$C_2 = C_{db1} + C_{gd2} + C_{db2} + C_{gs3} + C_{gs4} + C_{gb3} + C_{gb4}$$

$$C_3 = C_{db3} + C_{db4}$$

Cap seen at 1 : $C_{x_1} + C_1 + C_{x_2}$

$$G_m(s) \rightarrow \text{DC } g_{m_1}(r_{ds_1} \parallel r_{ds_2})(g_{m_3} + g_{m_4}) \\ (r_{ds_1} \parallel r_{ds_2})(C_{x_1} + C_{x_2} + C_1)$$

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