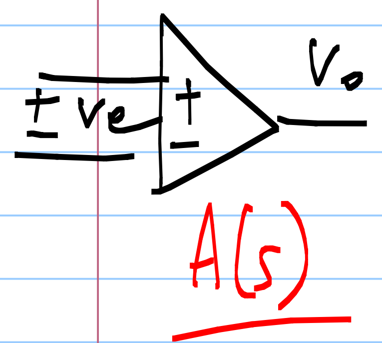
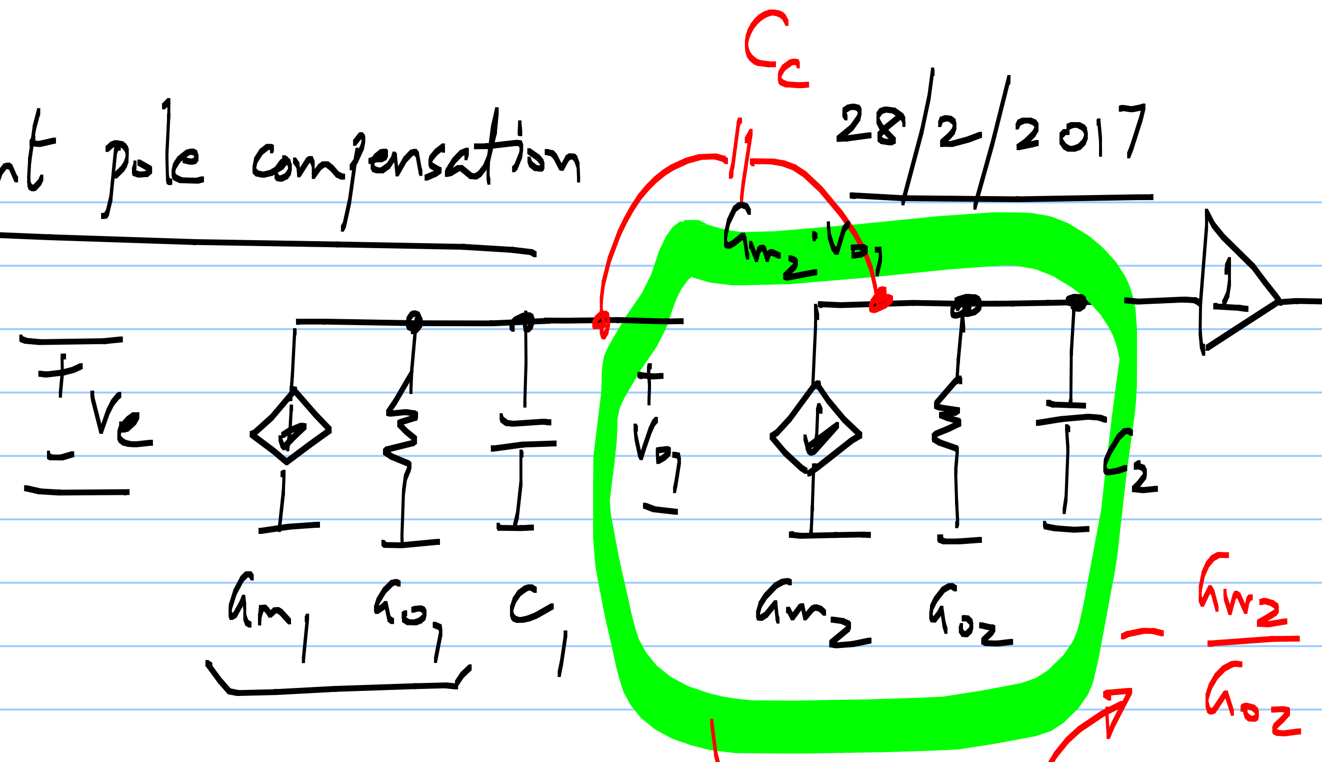
EE2019

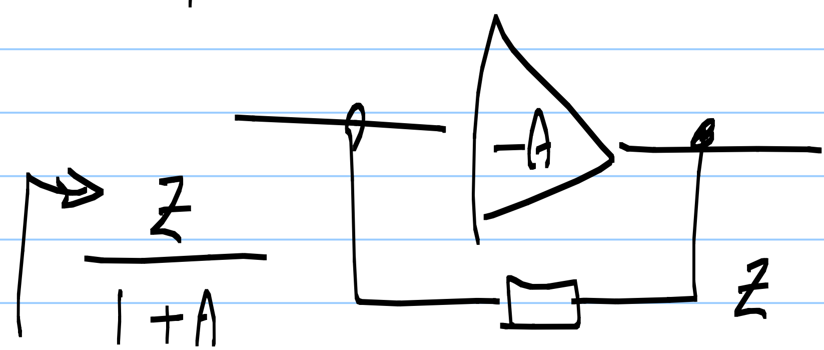
Dominant pole compensation

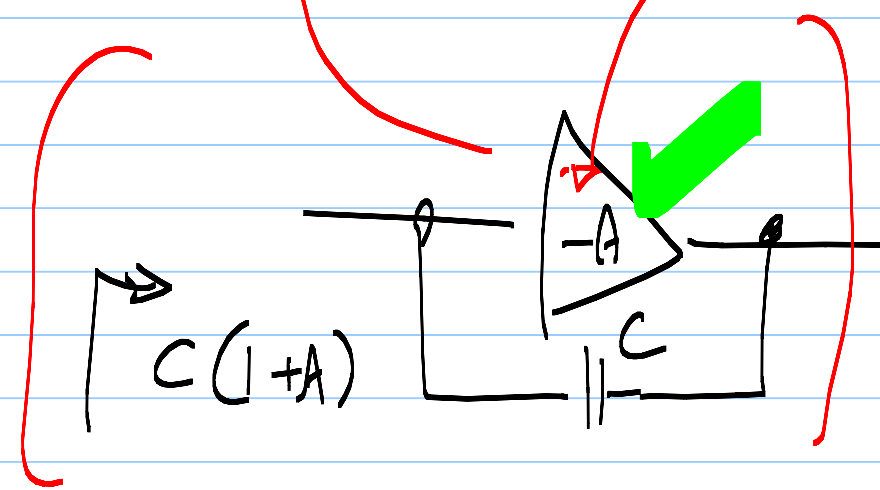
28/2/2017

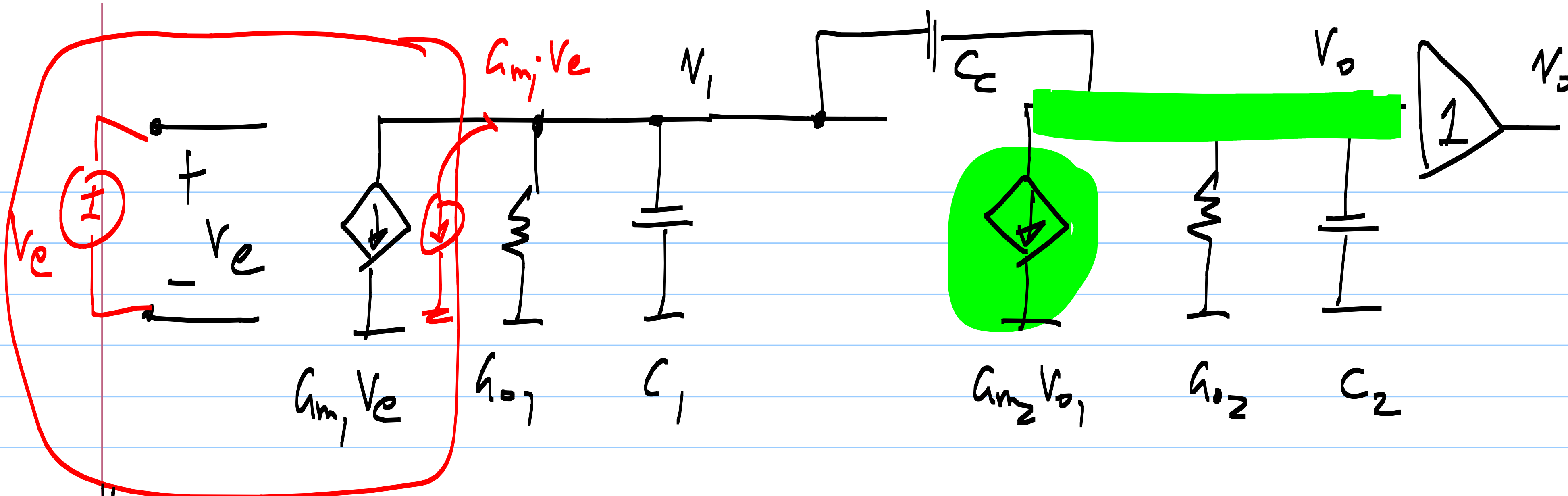




Miller effect







$$\begin{bmatrix} G_{o_1} + s(C_1 + C_c) & -sC_c \\ -sC_c + G_{m_2} & G_{o_2} + s(C_2 + C_c) \end{bmatrix} \begin{bmatrix} V_1 \\ V_o \end{bmatrix} = \begin{bmatrix} -G_{m_1} V_e \\ 0 \end{bmatrix}$$

2x2

N nodes $\qquad$ 2B variables

B branches

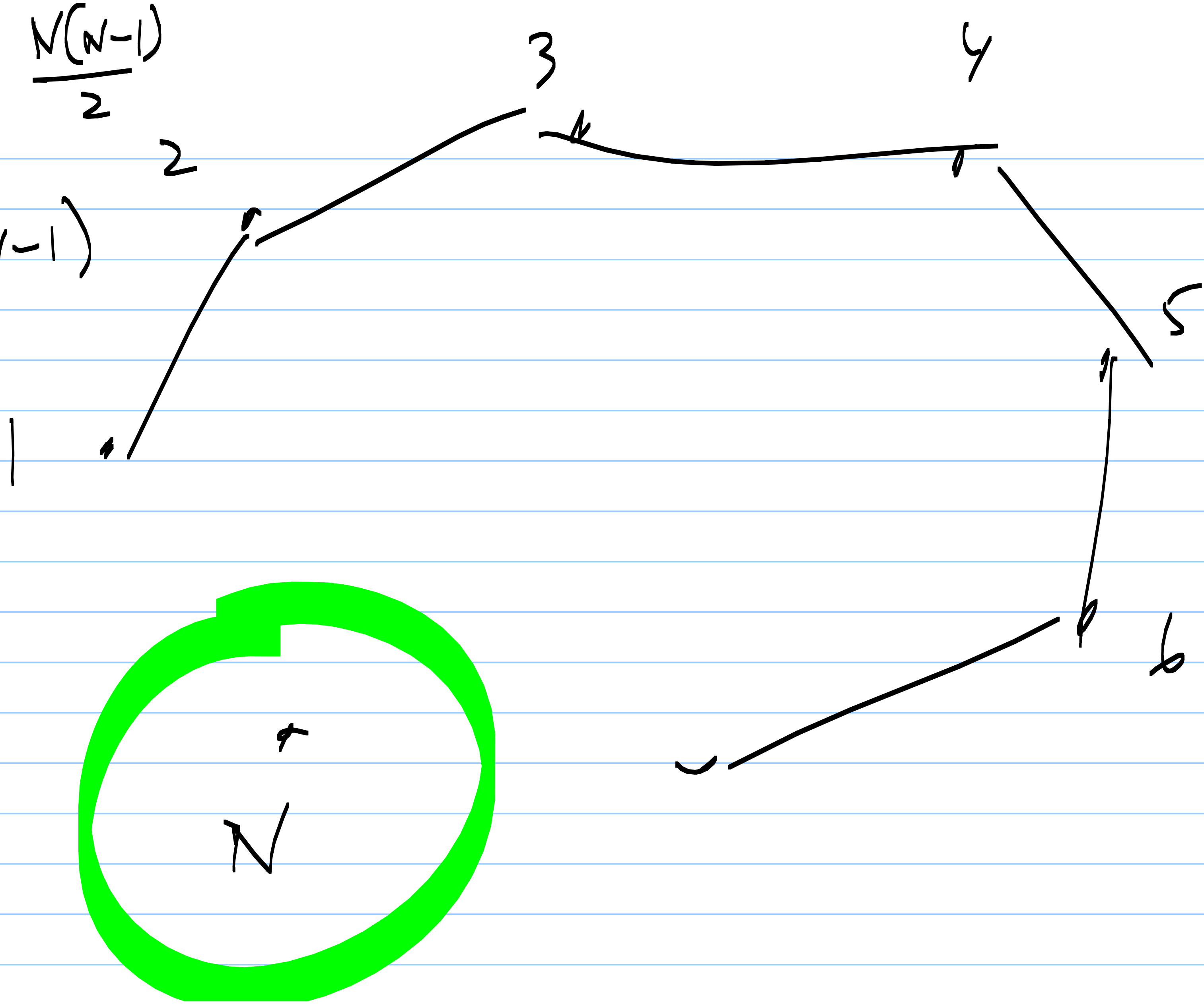
$N-1$ KCL eq.

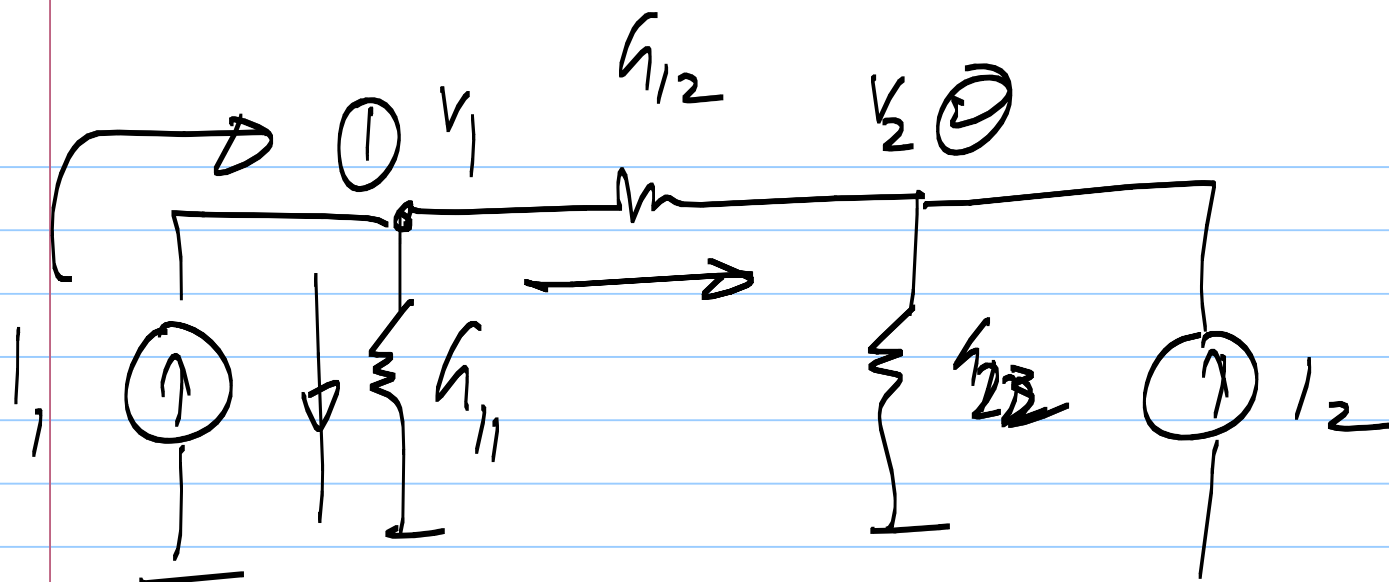
$B-N+1$ KVL eq

B Element relationship

$\boxed{B} < \frac{N(N-1)}{2}$

$B-(N-1)$





k,k :

k,l

l,k

@ ① : $\underbrace{V_1 \cdot G_{11}} + \underbrace{(V_1 - V_2)\, G_{12}} = I_1$

$$\begin{bmatrix} G_{11} + G_{12} & -G_{12} \\ -G_{12} & +G_{22} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \end{bmatrix} \begin{matrix} = I_1 \\ = I_2 \end{matrix}$$

@ ②

$$\begin{bmatrix} G_{o_1} + s(C_1 + C_c) & -sC_c \\ -sC_c + G_{m_2} & G_{o_2} + s(C_2 + C_c) \end{bmatrix} \begin{bmatrix} V_1 \\ V_o \end{bmatrix} = \begin{bmatrix} -G_{m_1} V_e \\ 0 \end{bmatrix}$$

2×2

$$V_o = \frac{+ G_{m_1} V_e \left(G_{m_2} - sC_c \right)}{s^2\left(C_1 C_2 + C_2 C_c + C_c C_1\right) + s\left(C_c\left(G_{m_2} + G_{o_2} + G_{o_1}\right) + C_1 \cdot G_{o_2} + C_2 \cdot G_{o_1}\right) + G_{o_1} G_{o_2}}$$

$$V_o = \frac{+ G_{m1} V_e (G_{m2} - sC_c)}{\left[s^2 (C_1 C_2 + C_2 C_c + C_c C_1) + s\left(C_c (G_{m2} + G_{o2} + G_{o1}) + C_1 \cdot G_{o2} + C_2 \cdot G_{o1}\right) + G_{o1} G_{o2} \right]}$$

$$(s + p_1)(s + p_2)$$

$$p_1 \simeq \frac{G_{o1} G_{o2}}{C_c (G_{m2} + G_{o2} + G_{o1}) + C_1 \cdot G_{o2} + C_2 \cdot G_{o1}} \qquad \frac{G_{o1}}{C_1}$$

$$p_2 \simeq \frac{C_c (G_{m2} + G_{o2} + G_{o1}) + C_1 G_{o2} + C_2 G_{o1}}{C_1 C_2 + C_2 C_c + C_c C_1} \qquad \frac{G_{o2}}{C_2}$$