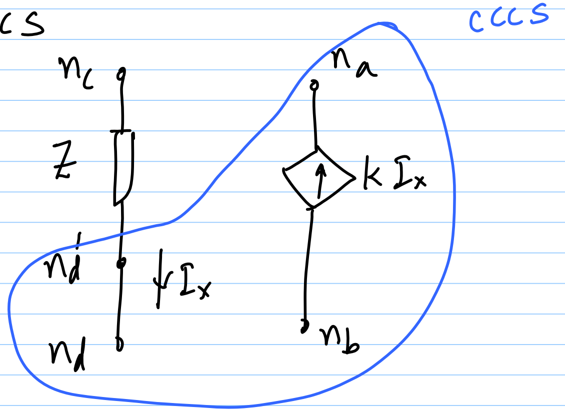
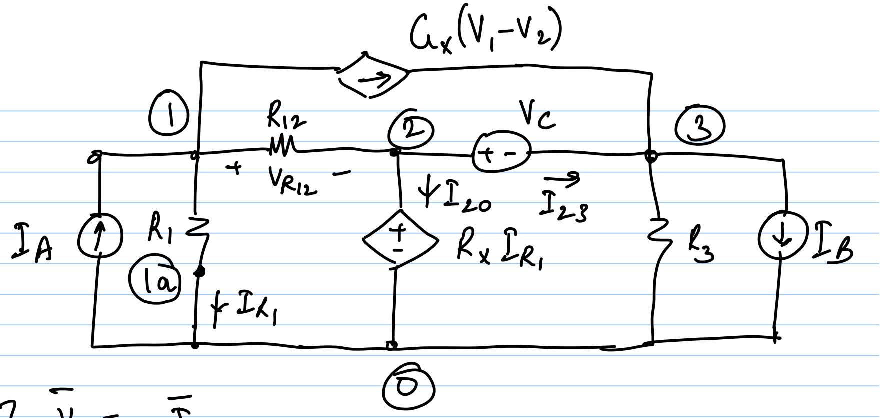
31-1-15

Lec 9

7) CCCS



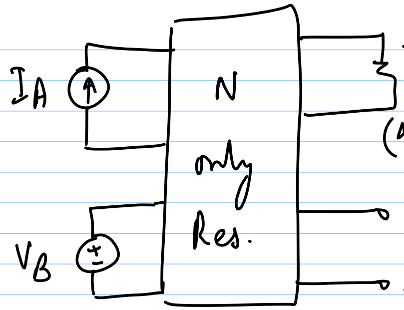
$$
\begin{array}{l}
\text{KCL @ } n_a \\
n_b \\
n_d' \\
n_d \\
\\
\end{array}
\begin{bmatrix}
0 & 0 & 0 & 0 & -k \\
0 & 0 & 0 & 0 & +k \\
0 & 0 & 0 & 0 & +1 \\
0 & 0 & 0 & 0 & -1 \\
0 & 0 & +1 & -1 & 0
\end{bmatrix}
\begin{bmatrix}
V_a \\ V_b \\ V_d' \\ V_d \\ I_x
\end{bmatrix}
= [0]
$$



$$[G] \cdot \bar{V} = \bar{I}$$

$$
V = \begin{bmatrix}
V_1 \\ V_2 \\ V_3 \\ V_{1a} \\ I_{23} \\ I_{20} \\ I_{R_1}
\end{bmatrix}
$$

$$
\begin{array}{l}
n_1 \\ n_2 \\ n_3 \\ \\ \\ \\ \\
\end{array}
\underbrace{\begin{bmatrix}
G_x + G_{12} & -G_x - G_{12} & & & & & \\
-G_{12} & G_{12} & & & & & \\
-G_x & G_x & & & & & \\
 & & & & & & \\
 & & & & & & \\
 & & & & & & \\
 & & & & & &
\end{bmatrix}}_{G}
\underbrace{\begin{bmatrix}
V_1 \\ V_2 \\ V_3 \\ V_{1a} \\ I_{23} \\ I_{20} \\ I_{R_1}
\end{bmatrix}}_{V}
=
\underbrace{\begin{bmatrix}
 \\ \\ \\ \\ \\ \\ \\
\end{bmatrix}}_{I}
$$



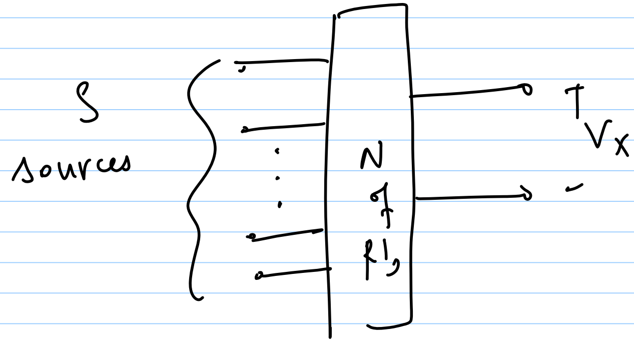
$I_x = \alpha_2 I_A + \beta_2 V_B$

(α_2, β_2) $(\alpha_1, \beta_1) \rightarrow$ char. of N

$V_x = (\alpha_1) I_A + (\beta_1) V_B$

$$\left.\begin{array}{l} (I_{A_1}, V_{B_1}) \rightarrow V_{x_1} \\ (I_{A_2}, V_{B_2}) \rightarrow V_{x_2} \end{array}\right\} \text{given} \Rightarrow \text{find out } \alpha_1, \beta_1$$

$(I_{A_3}, V_{B_3}) \Rightarrow$ Can find out V_{x_3}

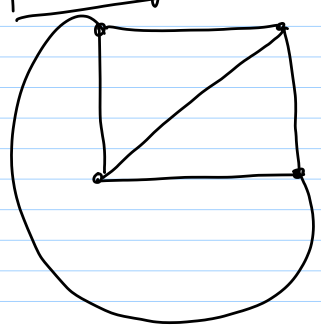


If V_x is known for S unique values of source

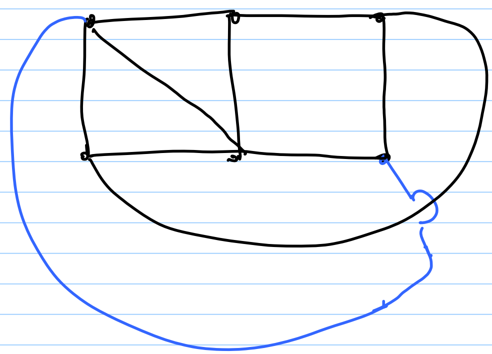
For a linear network ⇒ "Superposition" is applicable

Mesh ~~Loop~~ Analysis

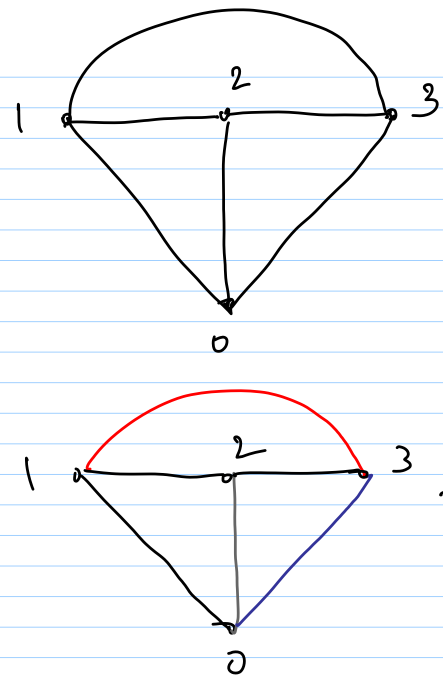
planar graph



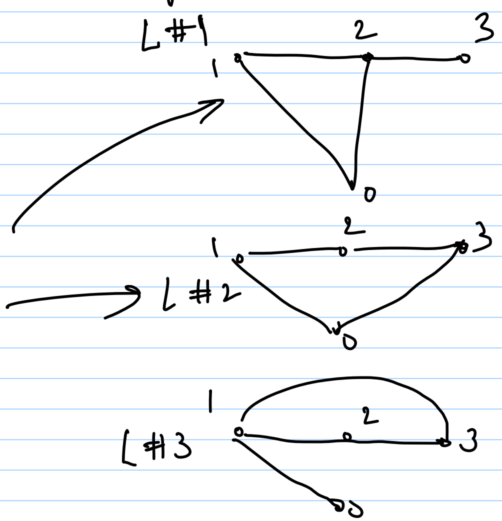
Mesh – planar loop

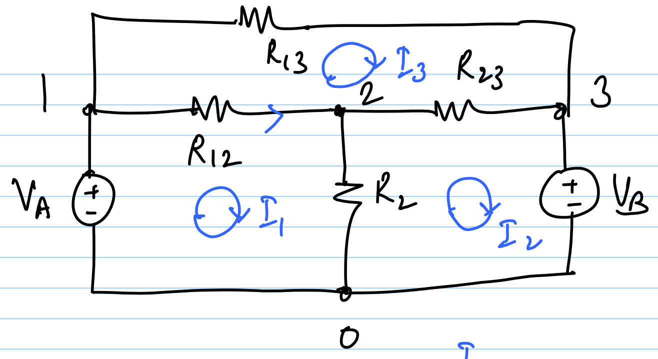


$$\left.\begin{array}{ll} B & \text{branches} \\ N & \text{nodes} \end{array}\right\} B - N + 1$$

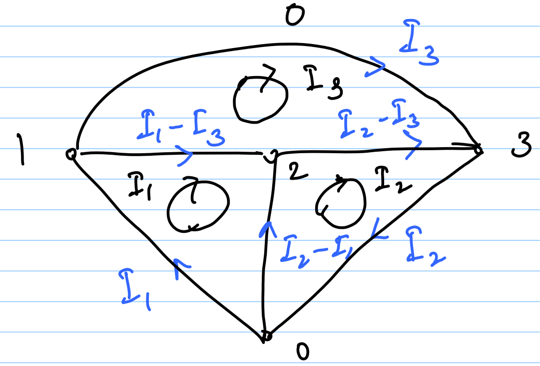


$B - N + 1$ KVL equations





1
2
3
0
R_{13}
R_{12}
R_{23}
R_2
V_A
V_B
I_1
I_2
I_3



1
2
3
0
I_1
I_2
I_3
$I_1 - I_3$
$I_2 - I_3$
$I_2 - I_1$