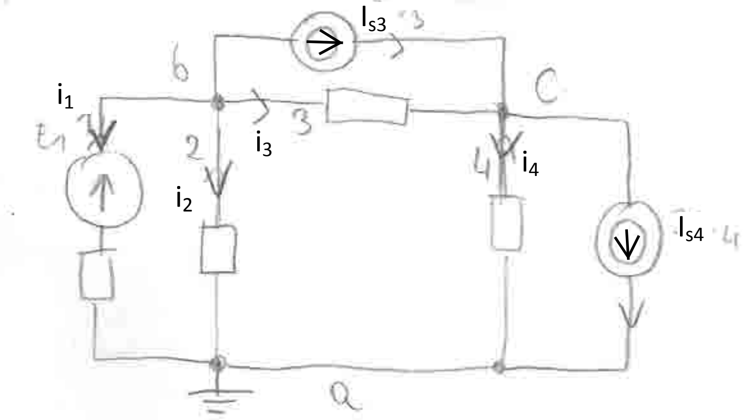


Current source is not a branch
n - number of nodes
m - number of branches

In node voltage method we have to assume that one of nodes has potential 0[V]. Symbolically we connect to that node ground potential.

Node voltage method uses Kirchhoff's current law (KCL). Node method does not see voltage sources.
Number of equations for the Kirchhoff's current law is given by formula:
equations for KCL = n-1
n-1=3-1=2

Ik.
n-1=3-1=2

Assumption V_a=0[V]

Contractions

1.

$$\left(\sum I_s\right)_b = E_1 \cdot G_1 - I_{s3} = V_b \cdot (G_1 + G_2 + G_3) - V_c \cdot G_3 - \underbrace{V_a \cdot G_2}_{=0}$$

Contractions

2.

$$\left(\sum I_s\right)_c = I_{s3} - I_{s4} = V_c (G_3 + G_4) - V_b \cdot G_3$$

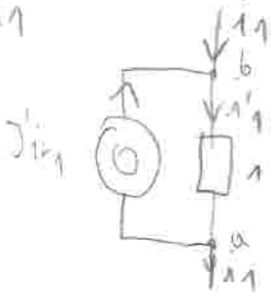
$$i_2 = (V_b - V_a) \cdot G_2$$

$$i_3 = (V_b - V_c) \cdot G_3$$

$$i_4 = (V_c - V_a) \cdot G_4$$

In node voltage method we have to transform physical voltage source to virtual current source.

i_1



$$i'_1 = (V_b - V_a) \cdot G_1$$

$$J'_{ir_1} = E_1 \cdot G_1$$

$$i_1 + J'_{ir_1} - i'_1 = 0$$

$$i_1 = i'_1 - J'_{ir_1}$$

$$i_1 = (V_b - V_a) \cdot G_1 - E_1 \cdot G_1$$