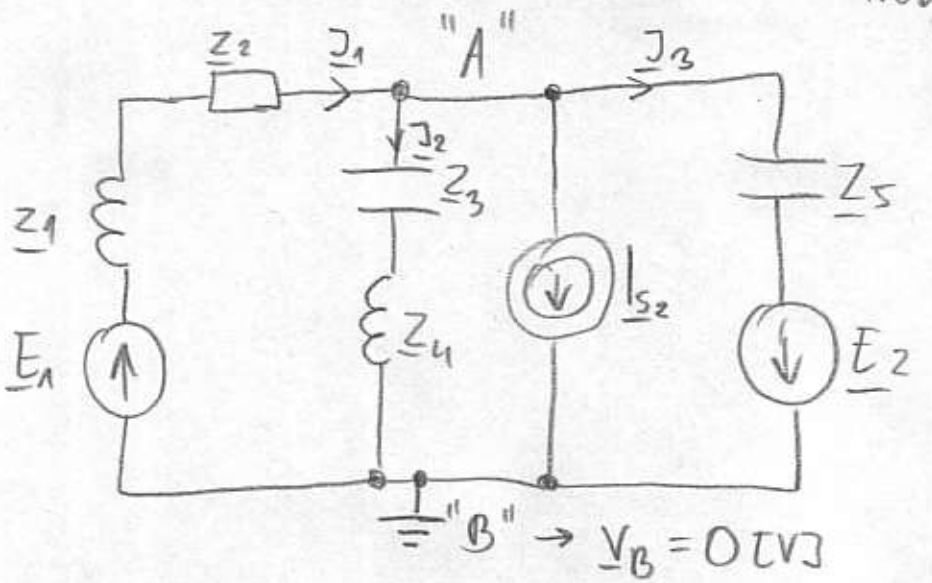
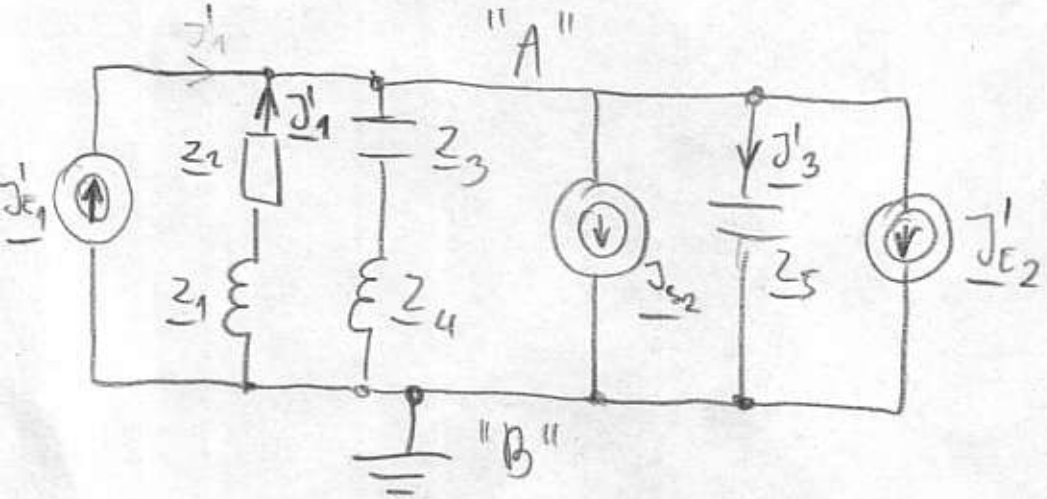
NODE VOLTAGE METHOD

$z_u = 1\,[\Omega]$

$u = \{1,2,3,4,5\}$



CIRCUIT AFTER TRANSFORMATION



$$\underline{J}'_{E_1} = \underline{E}_1 \cdot \underline{Y}_{12}$$

$$\underline{Y}_{12} = \frac{1}{\underline{Z}_{12}} = \frac{1}{\underline{Z}_1 + \underline{Z}_2}$$

$$\underline{J}'_{E_2} = \underline{E}_2 \cdot \underline{Y}_5$$

$$\underline{Y}_{34} = \frac{1}{\underline{Z}_{34}} = \frac{1}{\underline{Z}_3 + \underline{Z}_4}$$

$$\Sigma(\underline{I}_S)_{"A"} = \underline{J}'_{E_1} - \underline{J}_{S_2} - \underline{J}'_{E_2} = \underline{V}_A(\underline{Y}_{12} + \underline{Y}_{34} + \underline{Y}_5) - \underline{V}_B \cdot (\underline{Y}_{12} + \underline{Y}_{34} + \underline{Y}_5)$$

$$\underline{J}'_{E_1} - \underline{J}_{S_2} - \underline{J}'_{E_2} = \underline{V}_A \cdot (\underline{Y}_{12} + \underline{Y}_{34} + \underline{Y}_5)$$

"0" → $\underline{V}_B = 0$

$$\underline{E}_1 \cdot \underline{Y}_{12} - \underline{J}_{S_2} - \underline{E}_2 \cdot \underline{Y}_5 = \underline{V}_A \cdot (\underline{Y}_{12} + \underline{Y}_{34} + \underline{Y}_5)$$

$$\underline{V}_A = \frac{\underline{E}_1 \cdot \underline{Y}_{12} - \underline{J}_{S_2} - \underline{E}_2 \cdot \underline{Y}_5}{\underline{Y}_{12} + \underline{Y}_{34} + \underline{Y}_5}$$

$$\underline{J}_1 = \underline{J}'_1 + \underline{J}'_{E_1} = (\underline{V}_A - \underline{V}_B) \cdot \underline{Y}_{12} + \underline{E}_1 \cdot \underline{Y}_{12} = \underline{V}_A \cdot \underline{Y}_{12} + \underline{E}_1 \cdot \underline{Y}_{12}$$

$$\underline{J}_2 = (\underline{V}_A - \underline{V}_B) \cdot \underline{Y}_{34} = \underline{V}_A \cdot \underline{Y}_{34}$$

$$\underline{J}_3 = \underline{J}'_3 + \underline{J}'_{E_2} = (\underline{V}_A - \underline{V}_B) \cdot \underline{Y}_5 + \underline{E}_2 \cdot \underline{Y}_5 = \underline{V}_A \cdot \underline{Y}_5 + \underline{E}_2 \cdot \underline{Y}_5$$