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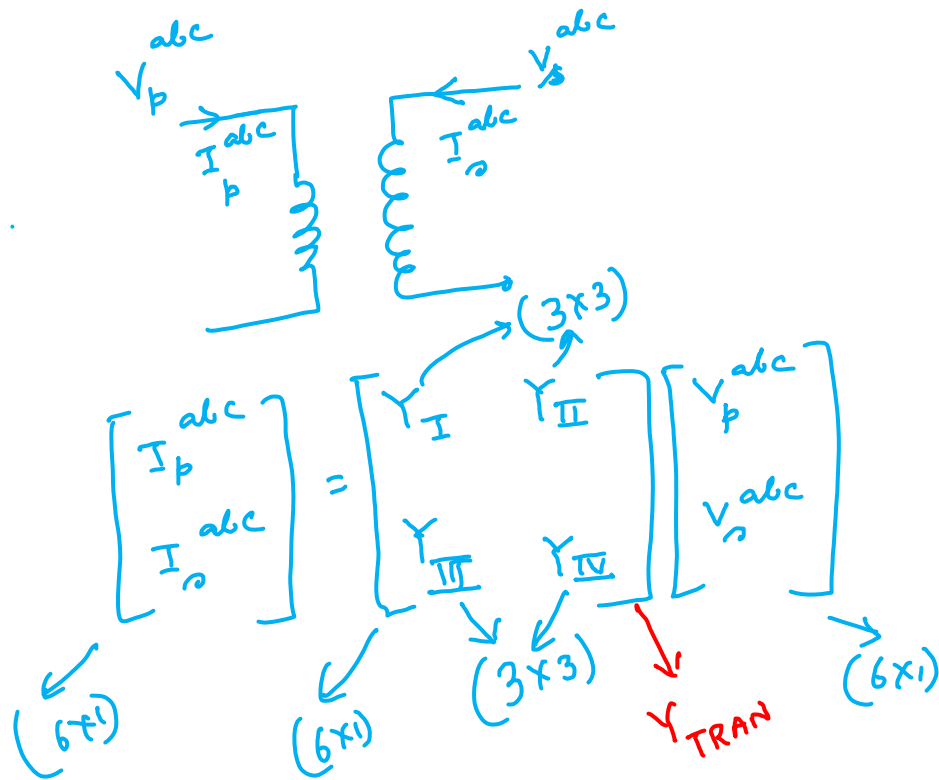
# Computer aided power system analysis

## Fault Analysis (Contd.)

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# Transformer



$Y_g \angle 0^\circ$

Primary side  $Y-g$       Secondary side  $Y-g$

$0 \times 30^\circ = 0^\circ$

$Y_g \angle 4^\circ$

$4 \times 30^\circ = 120^\circ$

(i)      (j)

$I_p^{abc}$        $I_s^{abc}$

$Y_{g0} \rightarrow$  Transformer.

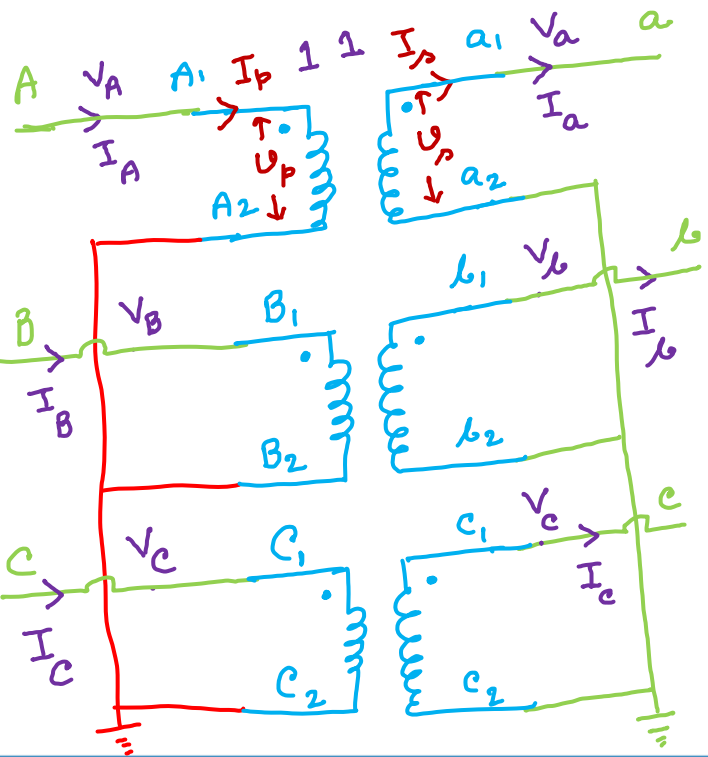
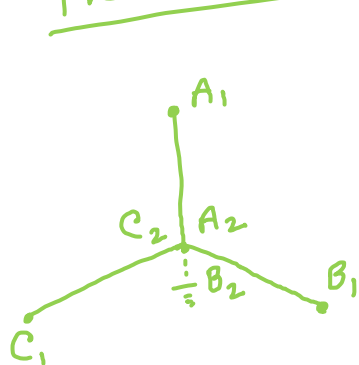
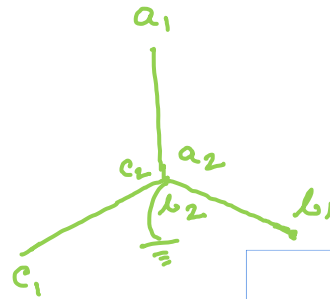
$V_p$  and  $V_s$  are in phase  
 $I_p$  and  $I_s$  are also in phase

dot convention.

Phasor diagram

$I_A$  &  $I_a$   
 $I_B$  &  $I_b$   
 $I_C$  &  $I_c$  } In phase.

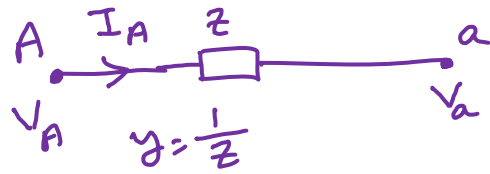
$I_A$  &  $I_a$   
 $I_B$  &  $I_b$   
 $I_C$  &  $I_c$  }  $y$   
 Tr. admittance



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Transformer magnetizing shunt branch is neglected.

$$I_A = y(V_A - V_a)$$

$$I_B = y(V_B - V_b)$$

$$I_C = y(V_C - V_c)$$

$$I_a = I_A = y(V_A - V_a)$$

$$I_b = I_B = y(V_B - V_b)$$

$$I_c = I_C = y(V_C - V_c)$$

$$I_p^{abc} = \begin{bmatrix} I_A & I_B & I_C \end{bmatrix}^T$$

$$I_s^{abc} = \begin{bmatrix} -I_a & -I_b & -I_c \end{bmatrix}^T$$

$$V_p^{abc} = \begin{bmatrix} V_A & V_B & V_C \end{bmatrix}^T$$

$$V_s^{abc} = \begin{bmatrix} V_a & V_b & V_c \end{bmatrix}^T$$



$$\begin{bmatrix} I_A \\ I_B \\ I_C \\ -I_a \\ -I_b \\ -I_c \end{bmatrix} = y \begin{bmatrix} 1 & 0 & 0 & -1 & 0 & 0 \\ 0 & 1 & 0 & 0 & -1 & 0 \\ 0 & 0 & 1 & 0 & 0 & -1 \\ -1 & 0 & 0 & 1 & 0 & 0 \\ 0 & -1 & 0 & 0 & 1 & 0 \\ 0 & 0 & -1 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} V_A \\ V_B \\ V_C \\ V_a \\ V_b \\ V_c \end{bmatrix}$$

$I_p^{abc} \leftarrow \begin{bmatrix} I_A \\ I_B \\ I_C \end{bmatrix}$   
 $I_p^{abc} \leftarrow \begin{bmatrix} -I_a \\ -I_b \\ -I_c \end{bmatrix}$   
 $Y_I \leftarrow$   
 $Y_{II} \rightarrow$   
 $V_p^{abc} \leftarrow \begin{bmatrix} V_A \\ V_B \\ V_C \end{bmatrix}$   
 $V_s^{abc} \leftarrow \begin{bmatrix} V_a \\ V_b \\ V_c \end{bmatrix}$   
 $Y_{III} \swarrow$   
 $Y_{IV} \swarrow$

$$\begin{aligned}
 Y_I &= I_3 \\
 Y_{II} &= -I_3 \\
 Y_{III} &= -I_3 \\
 Y_{IV} &= I_3 \\
 I_3 &\rightarrow (3 \times 3) \text{ identity matrix}
 \end{aligned}$$

