$$[\underline{A}\,\underline{I}_s]^* = \underline{A}^*\,\underline{I}_s^*$$

$$\bar{S}_{3\phi} = \underline{V}_s^T\,\underline{A}^T\,\underline{A}^*\,\underline{I}_s^*$$

$$\bar{S}_{3\phi} = \begin{bmatrix} V_A^0 & V_a^+ & V_a^- \end{bmatrix} \begin{bmatrix} 1 & 1 & 1 \\ 1 & \alpha^2 & \alpha \\ 1 & \alpha & \alpha^2 \end{bmatrix} \begin{bmatrix} 1 & 1 & 1 \\ 1 & \alpha & \alpha^2 \\ 1 & \alpha^2 & \alpha \end{bmatrix} \begin{bmatrix} I_a^0 \\ I_a^+ \\ I_a^- \end{bmatrix}^*$$

but $\underline{A}^T\,\underline{A}^* = 3\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = 3\,\underline{U}$ ← unit matrix

$$\bar{S}_{3\phi} = 3\begin{bmatrix} V_a^0 & V_a^+ & V_a^- \end{bmatrix} \begin{bmatrix} I_a^0 \\ I_a^+ \\ I_a^- \end{bmatrix}^* = 3V_a I_a^{0*} + 3V_a^+ I_a^{+*} + 3V_a^- I_a^{-*}$$

we also know that

$$\bar{S}_{3\phi} = V_a I_a^* + V_b I_b^* + V_c I_c^*$$

EX: The zero and positive sequence components of an unbalanced set of voltages are.

$$V_a^0 = 0.5 - j0.866 \text{ p.u.}$$

$$V_a^+ = 2 \text{ p.u.}$$

$$V_a = 3 \text{ p.u.}$$

obtain the negative sequence component V_a^- and find the phase voltages. V_b and V_c.

$$V_a = V_a^0 + V_a^+ + V_a^-$$

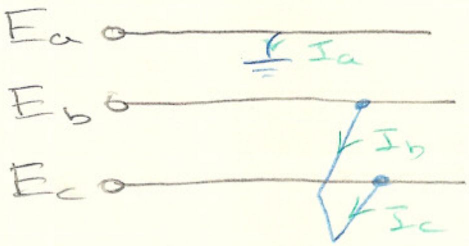
$$V_a^- = 1\angle 60^\circ$$

$$V_b = V_a^0 + \alpha^2 V_a^+ + \alpha V_a^- = 3\angle -120^\circ$$

$$V_c = V_a^0 + \alpha V_a^+ + \alpha^2 V_a^- = 0$$

Fault: a single line to ground on phase C.

EX:



simultanious faults.

Obtain the sequence network connection

SOL:

$$I_b + I_c = 0$$
$$V_a = 0$$
$$V_b = V_c$$

} given

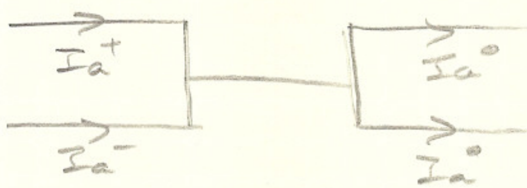
$$I_a^+ = \frac{1}{3}\left[I_a + (\alpha - \alpha^2) I_b \right]$$

$$I_a^- = \frac{1}{3}\left[I_a + (\alpha^2 - \alpha) I_b \right]$$

$$I_a^0 = \frac{1}{3}\left[I_a \right]$$

$$\therefore \quad I_a^+ + I_a^- = 2 I_a^0$$

which can be represenented by



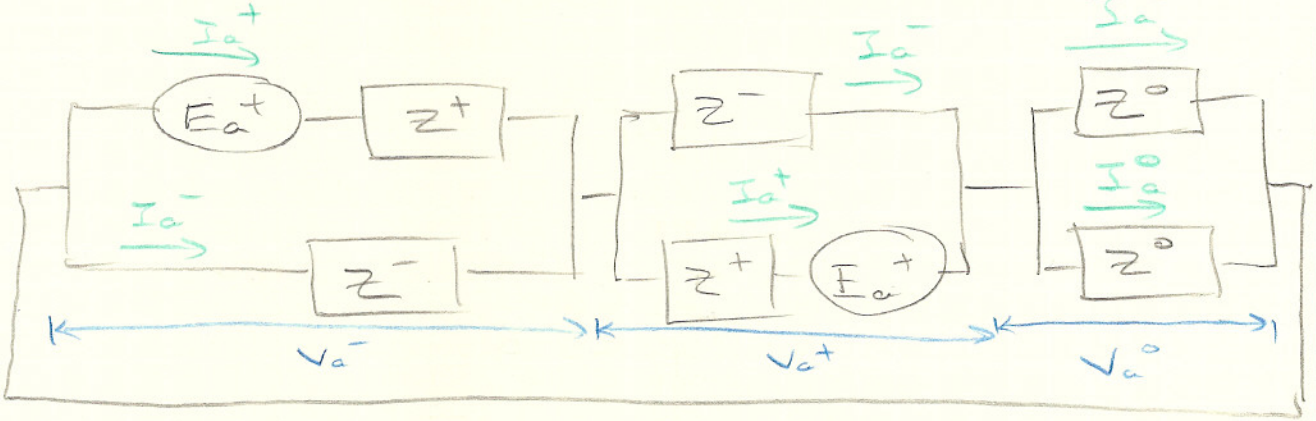
$$V_a^+ = \frac{1}{3}\left[(\alpha + \alpha^2) V_b \right] = -\frac{1}{3} V_b$$

$$V_a^- = \frac{1}{3}\left[(\alpha + \alpha^2) V_b \right] = -\frac{1}{3} V_b$$

$$V_a^0 = \frac{1}{3}\left[2 V_b \right]$$

since $V_a^+ = V_a^-$ and $V_a^0 + V_a^+ + V_a^- = V_a = 0$

hence the network becomes.



POWER SYSTEM STABILITY

Here we are concerned with the implecations of a major network disturbance such as a short circuit, open circuit or the switching on of a major load.

we are interested in how the system behaves following a disturbanc.