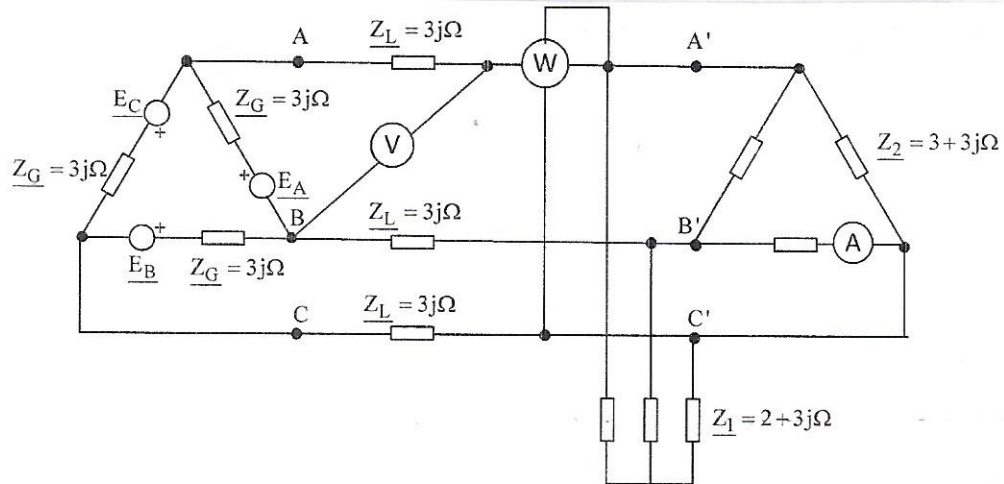


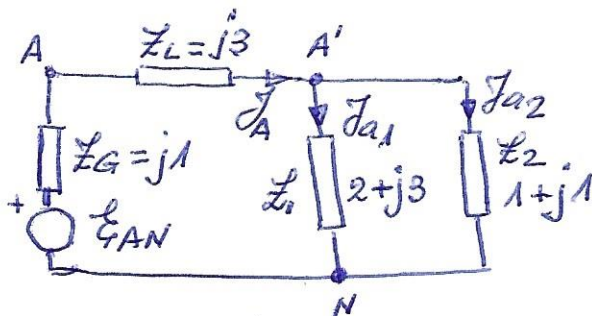
En el circuito trifásico equilibrado de secuencia directa de la figura. Determinar:

- 1.- La corriente que suministra el generador y la corriente en cada fase del mismo.
- 2.- Indicaciones de los aparatos de medida.
- 3.- Realiza el balance de potencias, es decir calcula la potencia que suministra la fuente, la que consumen cada una de las cargas y las pérdidas en la línea.

Datos: $E_A = 400 \text{ V} \angle 0^\circ$



$$1.- E_A = 400 \angle 0^\circ \text{ V} \Rightarrow E_{AN} = \frac{E_A}{\sqrt{3}} \angle -30^\circ = \frac{400}{\sqrt{3}} \angle -30^\circ = 230,94 \angle -30^\circ$$



$$Z_p = \frac{Z_1 \cdot Z_2}{Z_1 + Z_2} = \frac{(2+j3)(1+j1)}{2+j3+1+j1} = \frac{-1+j5}{3+j4} = 0,68 + j0,76 = 1,02 \angle 48,18^\circ$$

c. equivalente en λ $Z_{eq} = 1j + j3 + 0,68 + j0,76 = 0,68 + j4,76 = 4,81 \angle 81,87^\circ$

$$I_A = \frac{E_{AN}}{Z_{eq}} = \frac{230,94 \angle -30^\circ}{4,81 \angle 81,87^\circ} = 48,01 \angle -111,87^\circ \text{ A}$$

$$I_{A1} = \frac{I_A Z_2}{Z_1 + Z_2} = \frac{48,01 \angle -111,87^\circ (1+j1)}{3+j4} = \frac{48,01 \angle -111,87^\circ \cdot 1,41 \angle 45^\circ}{5 \angle 53,13^\circ} = 13,54 \angle -120^\circ \text{ A}$$

$$I_{A2} = \frac{I_A Z_1}{Z_1 + Z_2} = \frac{48,01 \angle -111,87^\circ (2+j3)}{5 \angle 53,13^\circ} = \frac{48,01 \angle -111,87^\circ \cdot 3,61 \angle 56,31^\circ}{5 \angle 53,13^\circ} = 34,66 \angle -108,69^\circ \text{ A}$$

$$\left. \begin{aligned} I_A &= 48,01 \angle -111,87^\circ \text{ A} \\ I_B &= 48,01 \angle 128,13^\circ \text{ A} \\ I_C &= 48,01 \angle 8,13^\circ \text{ A} \end{aligned} \right\} I_{BA} = \frac{I_A}{\sqrt{3}} \angle +30^\circ \Rightarrow \left\{ \begin{aligned} I_{BA} &= 27,72 \angle -81,87^\circ \text{ A} \\ I_{CB} &= 27,72 \angle 158,13^\circ \text{ A} \\ I_{AC} &= 27,72 \angle 38,13^\circ \text{ A} \end{aligned} \right.$$

$$2.- \quad \underline{E}_A - \underline{Z}_G \underline{I}_{BA} - \underline{Z}_L \underline{I}_A - V = 0$$

$$400 \angle 0^\circ - 3 \angle 90^\circ \cdot 27.72 \angle -81.87^\circ - 3 \angle 90^\circ \cdot 48.01 \angle -111.87^\circ = V$$

$$V = 400 \angle 0^\circ - 83.16 \angle 8.13^\circ - 144.03 \angle -21.87^\circ$$

$$= 400 - (82.32 + j11.76) - (133.66 - j53.65)$$

$$= 184.02 + j41.89 = 188.73 \angle 12.83^\circ \text{ V} \quad (\text{V}) \rightarrow \underline{188.73 \text{ V}}$$

$$\underline{I}_{a2} = \frac{I_{a2}}{\sqrt{3}} = \frac{34.66}{\sqrt{3}} = 20.01 \text{ A} \quad (\text{A}) \rightarrow \underline{20.01 \text{ A}}$$

$$\underline{S}_f = \underline{V}_{A'C'} \cdot \underline{I}_A^*$$

$$\underline{I}_{A'B'} = \frac{1}{\sqrt{3}} \underline{I}_{a2} \angle 30^\circ = \frac{34.66}{\sqrt{3}} \angle -108.69 + 30 = 20.01 \angle -78.69^\circ \text{ A}$$

$$\underline{I}_{B'C'} = \underline{I}_{A'B'} \angle -120^\circ = 20.01 \angle 161.31^\circ \text{ A}$$

$$\underline{I}_{C'A'} = \underline{I}_{A'B'} \angle +120^\circ = 20.01 \angle 41.31^\circ \text{ A}$$

$$\underline{V}_{C'A'} = \underline{Z}_2 \underline{I}_{C'A'} = (3 + j3) \cdot 20.01 \angle 41.31^\circ = 4.24 \angle 45^\circ \cdot 20.01 \angle 41.31^\circ = 84.84 \angle 86.31^\circ$$

$$\underline{V}_{A'C'} = -\underline{V}_{C'A'} = 84.84 \angle -93.69^\circ \text{ V}$$

$$\underline{S}_f = 84.84 \angle -93.69^\circ \cdot 48.01 \angle 111.87^\circ = 4073.17 \angle 18.18^\circ$$

$$= 3.870 + j1271 = P_f + jQ_f \rightarrow (\text{W}) \Rightarrow \underline{3.870 \text{ W}}$$

$$3.- \quad \underline{V}_{AN} = \underline{E}_{AN} - \underline{Z}_G \underline{I}_A = 230.94 \angle -30^\circ - 1 \angle 90^\circ \cdot 48.01 \angle -111.87^\circ = 155.45 - j98.02 = 183.77 \angle -32.23^\circ \text{ V}$$

$$\underline{S}_G = 3 \underline{V}_{AN} \underline{I}_A^* = 3 \cdot 183.77 \angle -32.23^\circ \cdot 48.01 \angle 111.87^\circ = 26468.39 \angle 79.64^\circ$$

$$= 4.760 + j26.037 = P_G + jQ_G \text{ GENERACIÓN}$$

$$\underline{S}_L = Q_L = 3 \cdot j3 \cdot 48.01^2 = j20.745 \text{ VAR. - LINEA}$$

$$\underline{S}_1 = 3(2 + j3) \cdot 13.54^2 = 1100 + j1.650 = P_1 + jQ_1 - \text{CARGA 1}$$

$$\underline{S}_2 = 3(1 + j1) \cdot 34.66^2 = 3.604 + j3.604 = P_2 + jQ_2 - \text{CARGA 2}$$

$$\text{COMPROBACIÓN: } P_G = P_L + P_1 + P_2 = 0 + 1100 + 3.604 = 4704 \quad (4.760)$$

$$Q_G = Q_L + Q_1 + Q_2 = 20.745 + 1.650 + 3604 = 25.999$$

$$\text{ERROR} \Rightarrow \Delta P = 1.18\% \quad \Delta Q = 0.15\% \quad (26.037)$$