

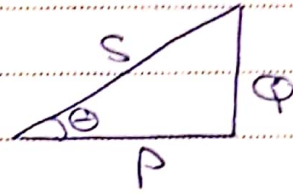
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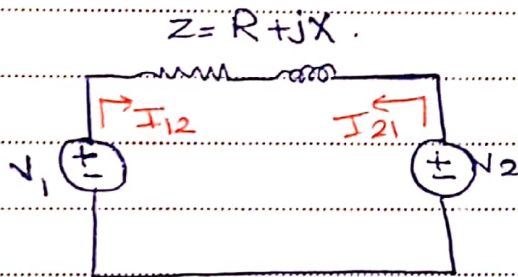
$$\star \cos \theta = \frac{P}{S}$$

$$\star \sin \theta = \frac{Q}{S}$$

$$\star \tan \theta = \frac{Q}{P}$$



Section (2.5) :- Ex (2.5) :-



if $V_1 = 120 \angle -5^\circ \text{ V}$

$V_2 = 100 \angle 0^\circ \text{ V}$

$Z = 1 + j7 \, \Omega$

$$\therefore I_{12} = \frac{V_1 - V_2}{Z} = \frac{(120 \angle -5^\circ) - (100 \angle 0^\circ)}{1 + j7} = 3.135 \angle -110.02^\circ \text{ A}$$

$$\therefore I_{21} = \frac{V_2 - V_1}{Z} = \frac{(100 \angle 0^\circ) - (120 \angle -5^\circ)}{1 + j7} = 3.135 \angle 69.98^\circ \text{ A}$$

$$S_{12} = V_1 \cdot I_{12}^* = (120 \angle -5^\circ) (3.135 \angle 110.02^\circ) = 376.2 \angle 105.02^\circ$$

$$\therefore S_{12} = -97.5 \text{ W} + j363.3 \text{ VAR}$$

reactive power $\leftarrow$ $j363.3$ $\rightarrow$ real power $\leftarrow$ -97.5 $\rightarrow$ Source 1

$$S_{21} = V_2 \cdot I_{21}^* = 107.32 - j294.5$$

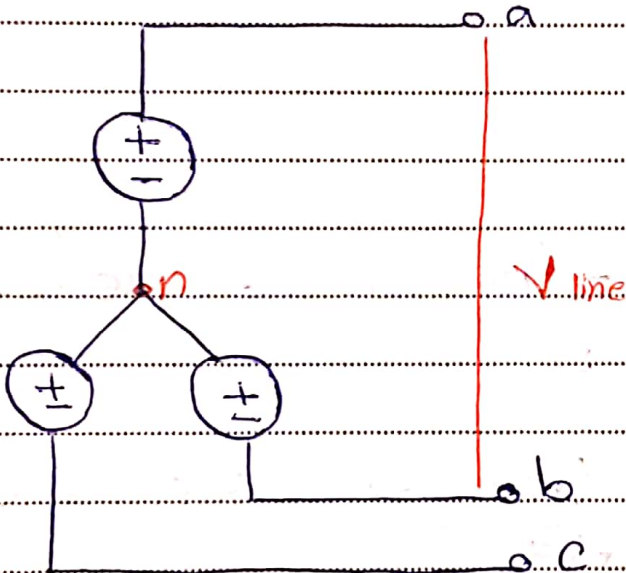
real power $\leftarrow$ 107.32 $\rightarrow$ reactive power $\leftarrow$ $-j294.5$ $\rightarrow$ Source 2

$$S_{\text{line}}(\text{loss}) = S_{12} + S_{21} = 9.82 \text{ W} + j 68.8 \text{ Var}$$

line losses

القدرة المفقودة في المقاومة $I^2 R$ من $S_{12} + S_{21}$ $\leftarrow$ I_1 و I_2 $\leftarrow$ $R = 1 \Omega$ (3.125) $\leftarrow$ $I^2 R$

Three Phase Connection :



(Y-Connection) :

$$1) I_{\text{phase}} = I_{\text{line}}$$

$$2) V_{\text{line}} = \sqrt{3} V_{\text{phase}} \angle 30^\circ$$

Positive Sequence

$$V_a = |V_m| \angle 0$$

$$V_b = |V_m| \angle -120$$

$$V_c = |V_m| \angle 120$$

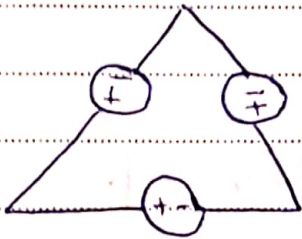
على التوالي
للمحركات

Negative Sequence

$$V_a = |V_m| \angle 0$$

$$V_b = |V_m| \angle 120$$

$$V_c = |V_m| \angle -120$$



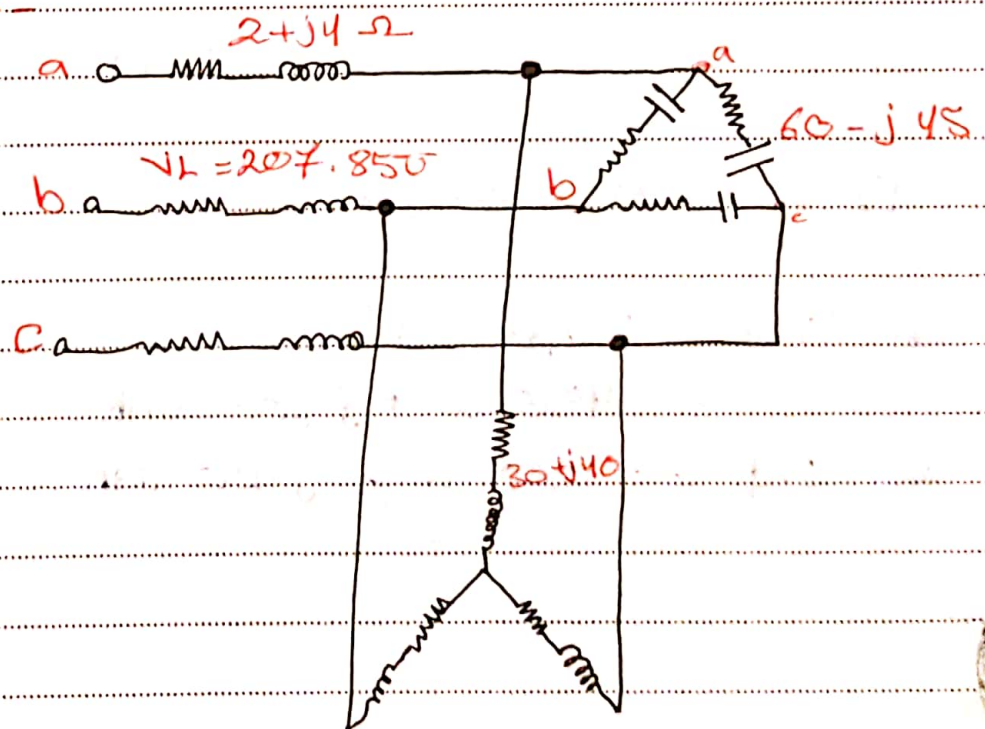
(Delta Connection) :-

$$1) I_{line} = \sqrt{3} I_{phase} \angle -30$$

$$2) V_{line} = V_{phase}$$

$$3) Z_{\Delta} = 3 Z_Y$$

Example (2.7) :-



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* تحويل Δ الى Y ليصبح Y-Y

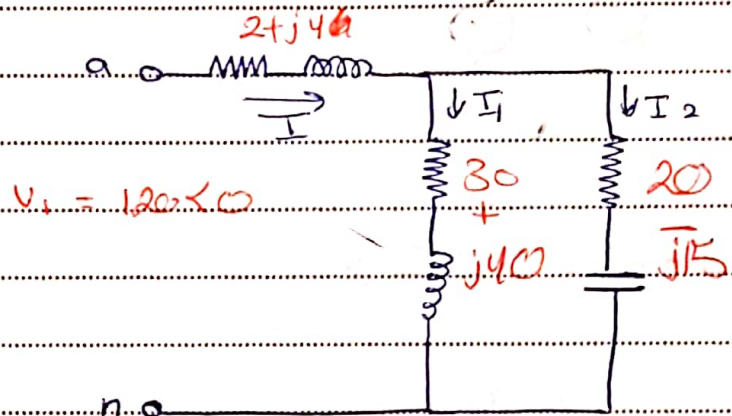
$$Z_Y = \frac{Z_{\Delta}}{3} = \frac{60 - j45}{3} = 20 - j15$$

* في المثال نأخذ الفولت مرجعي، بزاوية صفر إلا إذا كان بالسؤال زاوية معينة

$$Z_T = 24 \Omega$$

$$I = \frac{V_1}{Z} = \frac{120 \angle 0}{24} = 5A$$

$$S = 3V_1 I^* = 1800W + j0VAR$$



$$V_2 = 120 \angle 0 - (5 \angle 0 * 24 \angle 0) = 110 - j200V = 11.8 \angle -10.3^\circ V$$

$$V_{ab} = \sqrt{3} |V_2| \angle 30^\circ =$$

$$I_1 = \frac{V_2}{Z_1} = 2.236 \angle -63.4^\circ A$$

$$I_2 = 4.472 \angle 26.56^\circ A$$

$$* S_{3\phi} = 3V_{phase} I_{phase}^* = 450W + j600VAR$$

$$* S_{2\phi} = 1200W \ominus j900VAR$$

مجموع