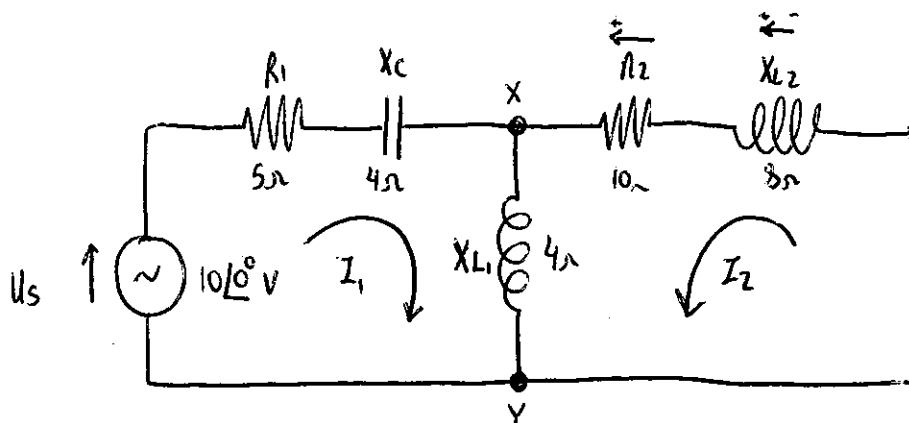


1 חלק



$$K) 1. \begin{cases} (R_1 - jX_c + jX_{L1}) \bar{I}_1 + jX_{L1} \bar{I}_2 = \bar{u}_s \\ jX_{L1} \bar{I}_1 + (R_2 + jX_{L1} + jX_{L2}) \bar{I}_2 = 0 \end{cases}$$

$$2. \begin{bmatrix} (R_1 - jX_c + jX_{L1}) & jX_{L1} \\ jX_{L1} & (R_2 + jX_{L1} + jX_{L2}) \end{bmatrix} \begin{bmatrix} \bar{I}_1 \\ \bar{I}_2 \end{bmatrix} = \begin{bmatrix} \bar{u}_s \\ 0 \end{bmatrix}$$

$$2) \begin{bmatrix} 5 & j4 \\ j4 & 10 + j12 \end{bmatrix} \begin{bmatrix} \bar{I}_1 \\ \bar{I}_2 \end{bmatrix} = \begin{bmatrix} 10 \\ 0 \end{bmatrix}$$

$$\Delta = \begin{vmatrix} 5 & j4 \\ j4 & 10 + j12 \end{vmatrix} = 5(10 + j12) - j4 \cdot j4 = (66 + j60)$$

$$\Delta_{I_1} = \begin{vmatrix} 10 & j4 \\ 0 & 10 + j12 \end{vmatrix} = 10(10 + j12) - j4 \cdot 0 = (100 + j120)$$

$$\Delta_{I_2} = \begin{vmatrix} 5 & 10 \\ j4 & 0 \end{vmatrix} = 5 \cdot 0 - 10 \cdot j4 = -j40$$

$$\bar{I}_1 = \frac{\Delta I_1}{\Delta} = \frac{100 + j120}{66 + j60} = 1.751 \angle 7.92^\circ (A)$$

$$\bar{I}_2 = \frac{\Delta I_2}{\Delta} = \frac{-j40}{66 + j60} = 0.448 \angle -132.273^\circ (A)$$

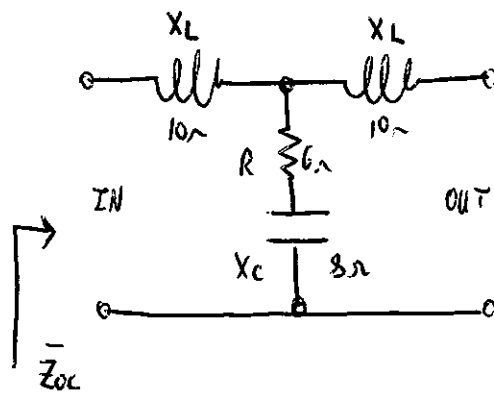
$$c) \quad \bar{U}_{xy} = \bar{U}_{R_2} + \bar{U}_{L_2}$$

$$\bar{U}_{xy} = \bar{I}_2 \cdot R_2 + \bar{I}_2 \cdot jX_{L_2}$$

$$\bar{U}_{xy} = \bar{I}_2 (R_2 + jX_{L_2}) = 0.448 \angle -132.273^\circ (10 + j8)$$

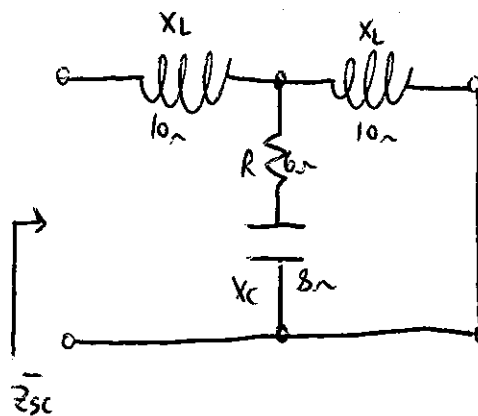
$$\bar{U}_{xy} = 5.737 \angle -93.613^\circ (V)$$

2. del



0.1 (K)

$$\bar{Z}_{oc} = jX_L + R + (-jX_C) = j10 + 6 - j8 = (6 + j2) \Omega$$



0.2

$$\bar{Z}_{sc} = [(R - jX_C) \parallel jX_L] + jX_L$$

$$\bar{Z}_{sc} = \frac{(6 - j8) \cdot j10}{6 - j8 + j10} + j10 = (15 + j15) \Omega$$

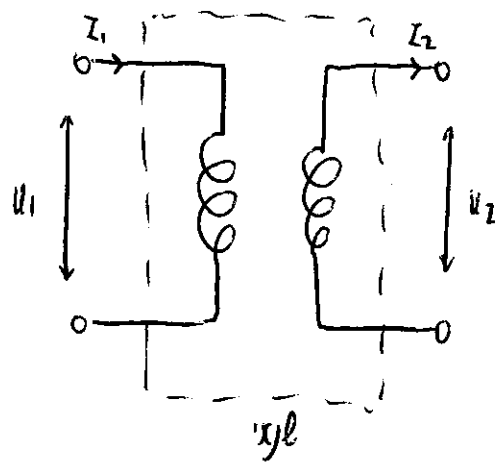
$$\bar{Z}_0 = \sqrt{\bar{Z}_{oc} \cdot \bar{Z}_{sc}}$$

0.3

$$\bar{Z}_0 = \sqrt{(6 + j2)(15 + j15)} = \sqrt{134.164 \angle 63.434^\circ} \Omega$$

$$\bar{Z}_0 = \sqrt{134.164} \angle \frac{63.434}{2} = 11.582 \angle 31.717^\circ \Omega$$

(2) (העברת) האנרגיה $\bar{z}_0$ של תא $\bar{z}_0$ (זה מראה (ההעברת) של (העברת) האנרגיה).



(1)

לדוגמה 3

כאשר נתון המודל של המערכת $\Delta \rightarrow \lambda$

עקרון המערכת סימטרי :

$$\bar{Z}'_{\lambda} = \frac{\bar{Z}_{\Delta}}{3} = \frac{(120 + j90)}{3}$$

$$\bar{Z}'_{S_{\lambda}} = (40 + j30) \Omega$$

נחשב את ערכי הקו והקו השקול (וסימטרי) :

$$\bar{Z}_{LS'} = \bar{Z}_L + \bar{Z}'_{S_{\lambda}} = (0.5 + j1.5) + (40 + j30) = (40.5 + j31.5) \Omega$$

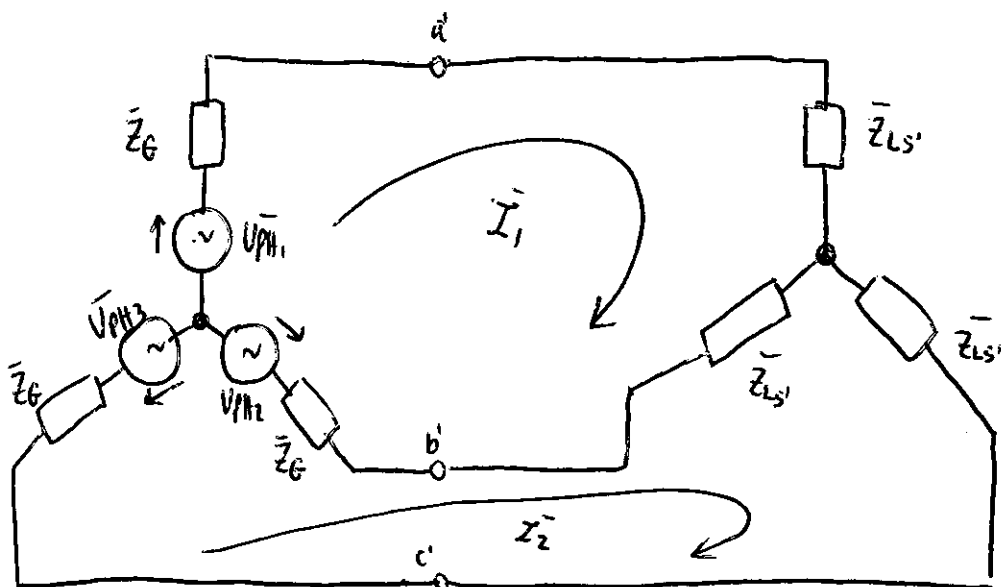
כאשר המערכת התפתחה מופע דרייב מתקדם $(U_{ab} = 415.3V)$

מכאן נודע שהמערכת הפכה למערכת של מודל המערכת החדשה :

$$|\bar{U}_{PH}| = \frac{|\bar{U}_L|}{\sqrt{3}} = \frac{415.3}{\sqrt{3}} = 240V$$

$$\bar{U}_{PH1} = 240 \angle 0^\circ V ; \bar{U}_{PH2} = 240 \angle 120^\circ V ; \bar{U}_{PH3} = 240 \angle -120^\circ V$$

(סימטרי) והכלל של המערכת מופע מתקדם (מאזן) :



$$\begin{bmatrix} +(\bar{Z}_G + \bar{Z}_G + \bar{Z}_{LS'} + \bar{Z}_{LS'}) & -(\bar{Z}_{LS'} + \bar{Z}_G) \\ -(\bar{Z}_{LS'} + \bar{Z}_G) & +(\bar{Z}_G + \bar{Z}_G + \bar{Z}_{LS'} + \bar{Z}_{LS'}) \end{bmatrix} \begin{bmatrix} \bar{I}_1 \\ \bar{I}_2 \end{bmatrix} = \begin{bmatrix} \bar{V}_{PH1} - \bar{V}_{PH2} \\ \bar{V}_{PH2} - \bar{V}_{PH3} \end{bmatrix}$$

$$\begin{bmatrix} (81.6 + j64.2) & -(40.8 + j32.1) \\ -(40.8 + j32.1) & (81.6 + j64.2) \end{bmatrix} \begin{bmatrix} \bar{I}_1 \\ \bar{I}_2 \end{bmatrix} = \begin{bmatrix} 415.7 \angle -30^\circ \\ 415.7 \angle 90^\circ \end{bmatrix}$$

$$\Delta = \begin{vmatrix} (81.6 + j64.2) & (-40.8 - j32.1) \\ (-40.8 - j32.1) & (81.6 + j64.2) \end{vmatrix} = (1902.69 + j858.03)$$

$$\Delta_{I_1} = \begin{vmatrix} 415.7 \angle -30^\circ & (-40.8 - j32.1) \\ 415.7 \angle 90^\circ & (81.6 + j64.2) \end{vmatrix} = (29376.551 + j23112.434)$$

$$\Delta_{I_2} = \begin{vmatrix} (81.6 + j64.2) & 415.7 \angle -30^\circ \\ (-40.8 - j32.1) & 415.7 \angle 90^\circ \end{vmatrix} = (-5327.679 + j36997.053)$$

$$\bar{I}_1 = \frac{\Delta_{I_1}}{\Delta} = 4.623 \angle -38.194^\circ \text{ A} ; \quad \bar{I}_2 = \frac{\Delta_{I_2}}{\Delta} = 4.623 \angle 21.805^\circ \text{ A}$$

$$\bar{I}_{La} = \bar{I}_1 = 4.623 \angle -38.194^\circ \text{ A} \quad (K)$$

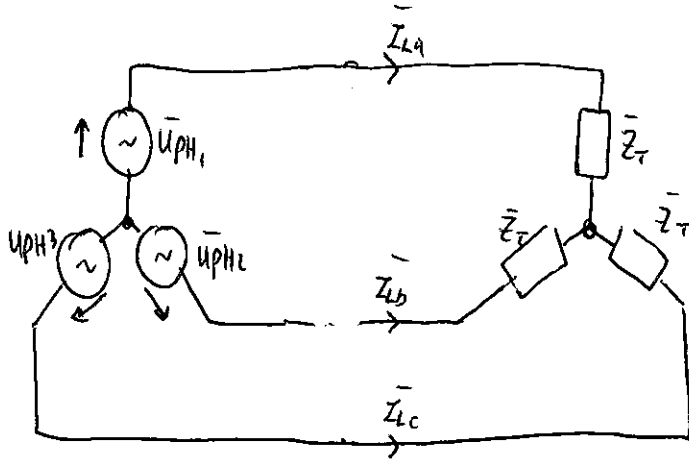
$$\bar{I}_{Lc} = -\bar{I}_2 = -(4.623 \angle 21.805^\circ) = 4.623 \angle -158.194^\circ \text{ A}$$

$$\bar{I}_{Lb} = \bar{I}_2 - \bar{I}_1 = 4.623 \angle 21.805^\circ - 4.623 \angle -38.194^\circ = 4.623 \angle 81.804^\circ \text{ A}$$

* אגרות מחילוק פאטרי צוט' ויין דפין (נומער:

הערה: הנתונים הם בערך.

$$\vec{Z}_T = \vec{Z}_G + \vec{Z}_{L'} = (0.3 + j0.6) + (40.5 + j31.5) = (40.8 + j32.1) \Omega$$



א. חזקו וקצו חסידים

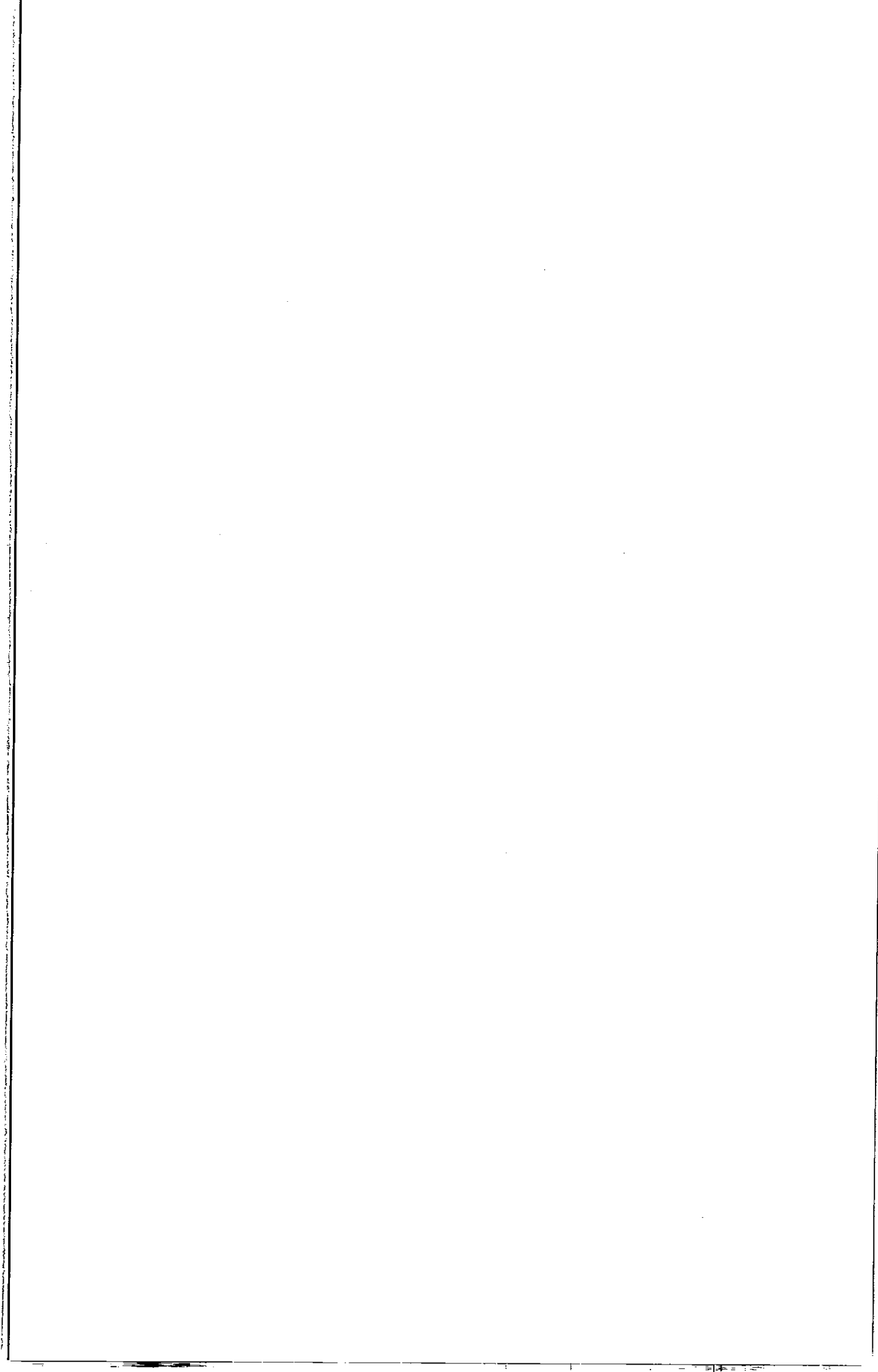
$$|U_{PH}(\bar{z}_T)| = 240 \text{ V}$$

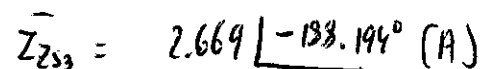
$$\bar{I}_{PH1} = \bar{I}_{La} = \frac{\bar{V}_{PH1}}{Z_T} = \frac{240 \angle 0}{(40.8 + j32.1)} = 4.623 \angle -38.194^\circ \text{ A}$$

$$I_{PH2} = I_{L0} = \frac{\bar{u}_{PH2}}{\bar{z}_T} = \frac{240 \angle 120}{(40.8 + j32.1)} = 4.623 \angle 81.804^\circ \text{ A}$$

$$I_{PH3} = \bar{I}_{LC} = \frac{\bar{V}_{PH3}}{Z_T} = \frac{240 \angle -120^\circ}{(40.8 + j32.1)} = 4.623 \angle -158.194^\circ \text{ A}$$

(2) (Coo) מל $d(x_n)$ אל ∞ ונניח:





$$\bar{U}_{ab} = -\bar{I}_{La} \cdot \bar{Z}_0 + \bar{U}_{PH1} - \bar{U}_{PH2} + \bar{Z}_{Lb} \cdot \bar{Z}_0 \quad (3)$$

$$\bar{U}_{ab} = \bar{Z}_0 (\bar{Z}_{Lb} - \bar{Z}_{La}) + \bar{U}_{PH1} - \bar{U}_{PH2}$$

$$\bar{U}_{ab} = (0.3 + j0.6) (4.623 \angle 81.804^\circ - 4.623 \angle -38.194^\circ) + 240 \angle 0^\circ - 240 \angle 120^\circ$$

$$\bar{U}_{ab} = 410.84 \angle -30.94^\circ (V)$$

$$\bar{U}_{bc} = 410.84 \angle 89.68^\circ (V)$$

$$\bar{U}_{ac} = 410.84 \angle -150.94^\circ (V)$$

1 (K) והתנאי שכלל הנתון של $3M$ נתון.

$$X_{C0} = X_{L0} //$$

$$X_{C0} = \frac{1}{\omega_0 C} = \frac{1}{10^5 \cdot 0.1 \cdot 10^{-6}} = 100 \Omega$$

c2

$$X_{C0} = X_{L0} = 100$$

$$X_{L0} = \omega_0 L$$

$$L = \frac{X_{L0}}{\omega_0} = \frac{100}{10^5} = 1 \text{ (mH)} //$$

$$\bar{I}_0 = \frac{\bar{U}}{Z_0} = \frac{\bar{U}}{R}$$

(P)

$$U(t) = 20 \sin(10^5 t + 30^\circ) \text{ (V)}$$

$$|\bar{U}_{rms}| = \frac{U_{max}}{\sqrt{2}} = \frac{20}{\sqrt{2}} = 14.142 \text{ V}$$

$$\bar{U}_r = 14.142 \angle 30^\circ \text{ V}$$

$$\bar{I}_0 = \frac{14.142 \angle 30^\circ}{10} = 1.414 \angle 30^\circ \text{ (A)} //$$

(P)

$$Q_0 = \frac{X_{L0}}{R} = \frac{100}{10} = 10 //$$

$$BW = \frac{f_0}{Q_0}$$

$$\omega_0 = 2\pi f_0$$

$$f_0 = \frac{\omega_0}{2\pi} = \frac{10^5}{2\pi} = 15.915 \text{ KHz}$$

$$BW = \frac{f_0}{Q_0} = \frac{15.915 \cdot 10^3}{10} = 1591.549 \text{ [Hz]}$$

13

