Ασκήσεις ΣΗΕ - Τμήμα 2

Χρήστος Τσουφής
03117176

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Α' ΟΜΑΔΑ

Κεφάλαιο 2

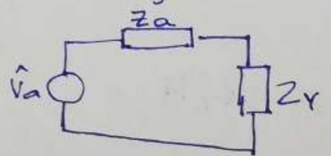
Άσκηση 3

1) $V_n = 400V$

$V_a = \frac{400}{\sqrt{2}} = 230,9\ V$

Πρέπει να μετατραπεί το τρίγωνο αντιστάσεων σε αστέρα για να γίνει το ισοδύναμο κατά φάση κύκλωμα.

$Z_Y = \frac{Z_\Delta}{3} = 8,3 + j5\ \Omega$



με $\hat{V}_a = 230,9\angle 0^\circ\ V$

Οπότε $\hat{I}_a = \frac{\hat{V}_a}{Z_Y + Z_a} = \frac{230,9}{8,4 + j5,5} = 23\angle -33,2^\circ\ A$

Άρα $I_{rms} = 23A$, $I_{max} = \sqrt{2} = 32,5A$, $I_\Delta = \frac{23}{\sqrt{3}} = 13,3A$, $I_{\Delta max} = I_\Delta \cdot \sqrt{2} = 18,8A$

2) Για την μιγαδική ισχύ της πηγής βρίσκουμε: $S = 3\hat{V}_a \cdot \hat{I}_a^* = 13.331,4 + j8.723,8 =$

$= 15.932,1\angle 33,2^\circ$

Οπότε $P = 13.331,4\ W$, $Q = 8.723,8\ Var$, $S = 15.932,1\ VA$, $\Sigma I = \cos(33,2) = 0,84$

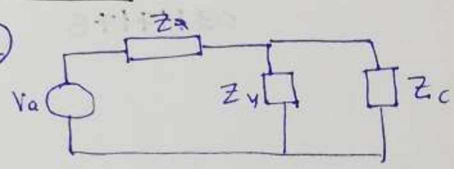
3) Για το φορτίο βρίσκουμε: $\hat{V}_Y = \frac{Z_Y}{Z_Y + Z_a} \cdot \hat{V}_a = 222,7 - j8,4$

και $S = 3\hat{V}_Y \cdot \hat{I}_a^* = 13.175,3 + j7929 = 15.377,2\angle 31^\circ$.

Άρα, $P = 13175,3\ W$, $Q = 7929\ Var$, $S = 15.377,2\ VA$, $\Sigma I = \cos(31^\circ) = 0,85$

Άσκηση 4

1)



$Z = Z_Y // Z_C = \frac{V}{I} \angle \theta^\circ$, $Z_C = -jX_C$

Για $Z = R + jX \Rightarrow \tan\theta = \frac{X}{R}$, $\theta = \cos^{-1}(0{,}95) = 18{,}2^\circ$

$Z = \frac{Z_Y \cdot Z_C}{Z_Y + Z_C} = \frac{5X_C - j\,8{,}3X_C}{8{,}3 + j(5 - X_C)} = \frac{1}{8{,}3^2 + (5-X_C)^2} \cdot \left[8{,}3X_C^2 - j(93{,}89X_C - 5X_C^2)\right]$

οπότε, $-\frac{93{,}89X_C - 5X_C^2}{8{,}3X_C^2} = \tan(18{,}2^\circ) \Rightarrow$

$\Rightarrow -\frac{93{,}89X_C - 5X_C}{8{,}3X_C} \Rightarrow 7{,}73X_C = 93{,}89 \Rightarrow X_C = \frac{93{,}89}{7{,}73} \Rightarrow X_C = 12{,}14$

οπότε $\frac{1}{\omega C} = 12{,}14 \Rightarrow C = \frac{1}{2\pi \cdot 50 \cdot 12{,}14} \Rightarrow C = 262\,\mu F$

και $Z_C = -j\,12{,}14\,\Omega$, $Y_C = j\,0{,}08\,\Omega^{-1}$

2) $Z_{ολ} = Z_a + Z_Y // Z_C = 0{,}1 + j0{,}5 + \frac{0{,}07 - j\,100{,}8}{8{,}3 - j\,7{,}14} = 10{,}3 - j\,2{,}9\,\Omega$

$\hat{I}_a = \frac{\hat{V}_a}{Z_{ολ}} = 21{,}6A \angle 15{,}5^\circ$ και $I_L = 21{,}6\,A$

3) $\hat{V}_C = \frac{Z_Y // Z_C}{Z_{ολ}} \hat{V}_a = 232 \angle -2{,}5^\circ\,V$ και $V_n = 232\sqrt{3}\,V$

Οπότε $S = \frac{232^2 \cdot \sqrt{3}^2}{j12{,}14} = -j\,\frac{232^2 \cdot 3}{12{,}14}$ και $Q = -13.300{,}6\,Var$

4) Έστω διαφορετικό X_C ώστε $S_{φορτίου} = 13.175{,}3 + j\,7.929$

· $S = \frac{3V_Y^2}{Z_Y^*} = S_{φορτίου}$, $Z_C = -jX_C$

· $\hat{V}_Y = \frac{Z_Y // Z_C}{Z_a + Z_Y // Z_C} \cdot \hat{V}_a = 230{,}9\,\frac{5X_C - j\,8{,}3X_C}{(5{,}5X_C - 1{,}67) + j(4{,}7 - 8{,}4X_C)}$

$V_Y^2 = V_Y \cdot V_Y^* = 230{,}9^2 \cdot \frac{25X_C^2 + 8{,}3^2X_C^2}{(5{,}5X_C - 1{,}67)^2 + (4{,}7 - 8{,}4X_C)^2}$

Άρα, $S = \frac{3V_Y^2}{8{,}3 - j5} = 3 \cdot 0{,}083\,V_Y^2 + j\,30{,}05\,V_Y^2$

Άρα $V_y^2 = \frac{146.392}{3} \Rightarrow$

$\Rightarrow 25X_c^2 + 8,3^2 X_c^2 = 0,93\,(5,5X_c - 1,67)^2 + 0,93\,(4,7 - 8,5X_c)^2 \Rightarrow$

$\Rightarrow -0,1367X_c^2 - 90X_c + 23,14 = 0 \Rightarrow X_c = -658$, απορρ. ή $X_c = 0,26$ V

(1) Άρα $\frac{1}{\omega C} = 0,26 \Rightarrow C = \frac{1}{2\pi \cdot 50 \cdot 0,26} = 12,2$ mF

και $Z_C = -j0,26\ \Omega$, $Y_C = j\,3,8\ \Omega^{-1}$

(2) $Z_{o\lambda} = Z_a + Z_Y \| Z_C = Z_a + \frac{1,3 - j2,158}{8,3 + j\,4,74} = 0,11 + j0,24$

$\hat{I}_a = \frac{\hat{V}_a}{Z_{o\lambda}} = 890,8\angle -65,8^\circ$ A και $I_L = 890,8$ A

(3) $\hat{V}_c = \frac{Z_Y \| Z_C}{Z_{o\lambda}} \hat{V}_a = 230,5\angle -154^\circ$ και $V_n = 230,5\sqrt{3}$ V

Οπότε $S_C = -j\frac{3 \cdot 230,5^2}{0,26} = -j613.041$ και $Q = 613$ kVar

Κεφάλαιο 3

Άσκηση 4

α) $\cdot\ R = \frac{g}{\mu_0 A} = \frac{2 \cdot 10^{-3}}{4\pi \cdot 10^{-7} \cdot 10^{-3}} = \frac{10^7}{2\pi} \frac{A-\varepsilon}{Wb}$

$\cdot\ F = R\varphi \Rightarrow \varphi = \frac{NI}{R} \Rightarrow \varphi = \frac{\pi}{10^3}$ Wb για κάθε διάκενο

· Το φ περνάει από 2 αντιστάσεις σε κάθε πυρήνα άρα η συνολική αντίσταση είναι $2R$.

$L_{max} = \frac{N^2}{2R} = \frac{10^6}{2 \cdot 10^7 / 2\pi} \Rightarrow L_{max} = \frac{\pi}{10}$ H

β) $\cdot\ L_{min} = \frac{1}{10} L_{max} = \frac{\pi}{100}$ H

$\cdot\ L_{min} = \frac{N^2}{2R'} \Rightarrow \frac{\pi}{100} = \frac{10^6}{2R'} \Rightarrow R' = \frac{5}{\pi} \cdot 10^7 \frac{A-\varepsilon}{Wb}$

$\cdot\ \varphi' = \frac{NI}{R'} = \frac{\pi}{10^4}$ Wb

Άρα $W_{45^\circ} = \frac{1}{2}(2R') \cdot \varphi'^2 = 10\pi$ J

$W_{90^\circ} = \frac{1}{2}(2R)\varphi^2 = 5\pi$ J

Άσκηση 3.3 (βιβλίου)

α) Για σίδηρο: $l_g = 2(3+8,1)-0,2 = 22cm$

Για διάκενο: $l_0 = 0,1cm$

Οπότε $R_g = \frac{l_g}{\mu_r \cdot \mu_0 \cdot A}$, $R_0 = \frac{l_0}{\mu_0 A'}$

Λόγω θυσάνωσης: $A' = (1+0,1)(1+0,1) = 1,1^2 \cdot 10^{-4}\ m^2$

Χωρίς θυσάνωση: $A = 10^{4}\ m^2$

Οπότε $R_g = \frac{11}{2\pi} \cdot 10^6\ \frac{A-\varepsilon}{Wb}$, $R_0 = \frac{20,7}{\pi} \cdot 10^6\ \frac{A-\varepsilon}{Wb}$

και $R_{ολ} = R_g + 2R_0 = \frac{11}{2\pi}\cdot 10^6 + \frac{20,7}{\pi}\cdot 10^6 \Rightarrow R_{ολ} = \frac{47}{\pi}\ 10^6\ \frac{A-\varepsilon}{Wb}$

$NI = R_{ολ}\cdot\varphi \Rightarrow N = \frac{\frac{47}{\pi}\cdot 10^6 \cdot 10^{-4}}{1} \Rightarrow N = \frac{4700}{\pi} \simeq 1496$ περιελίξεις

β) $L = \frac{N^2}{R} = \frac{1496^2}{\frac{47}{\pi}\cdot 10^6} \Rightarrow L = 0,15H$

Κεφάλαιο 4

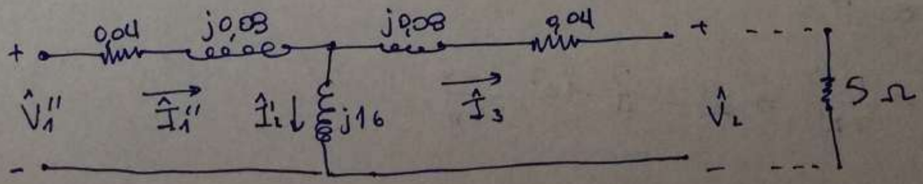
Άσκηση 2

α) $a = \frac{250}{25} = 5$

· Πυρήνα χωρίς απώλειες $\Rightarrow b_m'' = a^2 b_m' \Rightarrow X_m'' = \frac{X_m'}{a^2} \Rightarrow X_m'' = 16\Omega$

· $Z_1'' = \frac{Z_1}{a^2} = \frac{1+2j}{25} = 0,04 + j\,0,08\ \Omega$

· $Z_2 = \frac{Z_2'}{a^2} = \frac{1+2j}{25} = 0,04 + j\,0,08\ \Omega$



β) $R = 5\Omega$, $V_2 = 42V$

· ΝΤΚ: $\hat{V}_1'' = (0,01 + j\,0,08)\cdot \hat{I}_1'' + j16\cdot \hat{I}_2$

· $\hat{V}_2 = \hat{I}_3 \cdot 5 \Rightarrow \hat{I}_3 = \frac{42}{5}$ A

· $\hat{I}_1'' = \hat{I}_2 + \frac{42}{5}$

· ΝΤΚ: $j16\hat{I}_2 = (j\,0,08 + 5,04)\hat{I}_3 \Rightarrow \hat{I}_2 = 0,042 - j2,646$

και $\hat{I}_1'' = \frac{42}{5} + \hat{I}_2 = 8,442 - j2,646 = 8,8\angle -17,4°$

Άρα $\hat{V}_1'' = 42,9 + j1,24 = 42,9\angle 1,7°$

Οπότε $V_1'' = 42,9V \Rightarrow V_1 = a\cdot V_1'' \Rightarrow V_1 = 214,5V$

γ) Η γωνία θ ανάμεσα σε $\hat{I}_1, \hat{V}_1$ είναι ίδια με τη γωνία ανάμεσα στα V_1'', I_1'' που είναι $1,7 + 17,4 = 19°$

Οπότε, $I_1 = \frac{I_1''}{5} = 1,76$ A

$V_1 = 214,5V$

$\cos\theta = 0,94$, $\sin\theta = 0,32$

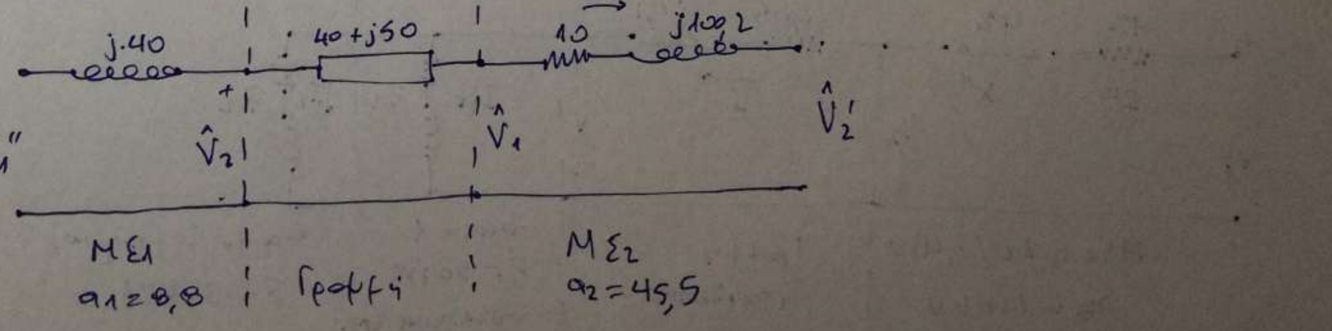
και $P = V_1 I_1 \cos\theta = 355$ W , $Q = V_1 I_1 \sin\theta = 120$ Var

Άσκηση 4.8 (βιβλίου)

· Μεταφέρουμε το ΜΕ2 στο πρωτεύον $\left(a_2 = \frac{10\cdot 10^3}{220} = 45,5\right)$

$Z_{ισ}'' = \frac{Z_{ισ}'}{a_2^2} \Rightarrow Z_{ισ}' = 45,5^2\,(R_{ισ}'' + jX_{ισ}'') \Rightarrow Z_{ισ}' = 10 + j\,100,2$ Ω

Οπότε,



· Στον ΜΕ2 : $S_{φορτίου} = 90 \cdot 10^3$ άρα $I = \frac{S_{φορτ.}}{V_2'}$

· $V_2' = a_2 \cdot V_2 = 45{,}5 \cdot 210 = 9555\,V$

οπότε $I = \frac{90 \cdot 10^3}{9555} \Rightarrow I = 9{,}4A$

· $\cos\theta = 0{,}9$ επαγ. $\Rightarrow \theta = 25{,}8^\circ$

$\Rightarrow \hat{I} = 9{,}4\angle -25{,}8^\circ$ A

· $Z_{ολ} = 50 + j190{,}2 = 196{,}6\angle 75^\circ$

· ΝΤΚ : $\hat{V}_1'' = \hat{I} \cdot Z_{ολ} + V_2' \Rightarrow \hat{V}_1'' = 9{,}4\angle -25{,}8^\circ \cdot 196{,}6\angle 75^\circ + 9555 \Rightarrow$

$\Rightarrow \hat{V}_1'' = 10.854\angle 7{,}4^\circ$ V

Άρα $\hat{V}_1 = a_1 \cdot \hat{V}_1'' = 95.513\,V\angle 7{,}4^\circ$

Άρα $V_1 = 95{,}5$ kV

β) Για τον ΜΕ2: $\hat{V}_1 = \hat{I}\,(10 + j100{,}2) + \hat{V}_2' \Rightarrow \hat{V}_1 = 10.082\angle 4{,}5^\circ$

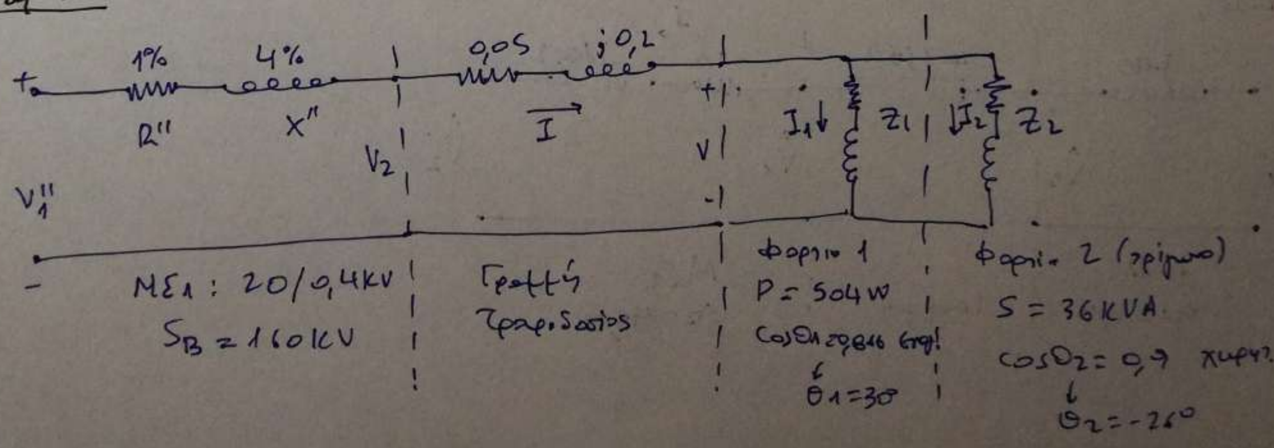
Άρα $V_1 = 10.082$ V , $V_2 = 210$V , $a_2 = 45{,}5$

και $r = \frac{\frac{V_1}{a} - V_2}{\frac{V_1}{a}} \cdot 100\% = 5{,}2\%$ πτώση τάσης

$n = \frac{P_2}{P_2 + I^2 R_{ολ}''} \xrightarrow{P_2 = V_2 \cdot I_2 \cdot 0{,}9} 0{,}997$ απόδοση

Κεφάλαιο 5

Άσκηση 1



α) $\cdot V = 400V$ (πολική), $V_\varphi = \frac{400}{\sqrt{3}} = 231V$

$\cdot \Phi_1$: $\cdot P = \sqrt{3}\, V I_1 \cos\theta_1 = \sqrt{3}\, 400 I \cdot 0{,}866 \Rightarrow I_1 = 83{,}3A$

$\cdot Z_1 = \frac{V_\varphi}{I_1} \angle \theta_1^\circ \Rightarrow Z_1 = 2{,}77\angle 30^\circ$

$\cdot \Phi_2$: $\cdot Z_2 = \frac{Z_{2\Delta}}{3}$

$\cdot S = \sqrt{3}\, V I_2 \Rightarrow I_2 = 52A$

$\cdot Z_2 = \frac{V_\varphi}{I_2} \angle \theta_2^\circ = 4{,}44\angle -26^\circ \Rightarrow Z_{2\Delta} = 13{,}33\angle -26^\circ$

β) Αν $\hat{V} = V\angle 0^\circ$ τότε $\hat{I}_1 = 83{,}3\angle -30^\circ$, $\hat{I}_2 = 52\angle +26^\circ$

Άρα $\hat{I} = \hat{I}_1 + \hat{I}_2 = 120{,}4\angle -9^\circ$ A

γ) $\cdot$ ΝΚΤ: $\hat{V}_2 = \hat{I}(Z_\gamma + Z_1 // Z_2) = 120{,}4\angle -9^\circ \cdot (2{,}577\angle 25^\circ) \Rightarrow$

$\Rightarrow \hat{V}_2 = 310{,}3\angle 16^\circ$ και $V_2 = 310{,}3V$

$\cdot V_{B2} = 400V$ άρα $Z_{B2} = \frac{V_{B2}^2}{S_B} = 1$

$\cdot Z'' = Z_{B2}(1\% + j\,4\%) = 0{,}01 + j\,0{,}04$

$\cdot$ ΝΚΤ: $\hat{V}_1'' = \hat{I}\cdot Z'' + \hat{V}_2 = 310{,}3\angle 16^\circ + \hat{I}\cdot Z'' \Rightarrow \hat{V}_1'' = 313{,}5\angle 16{,}7^\circ$

και $V_1 = a\cdot V_1'' \Rightarrow V_1 = 15{,}7kV$

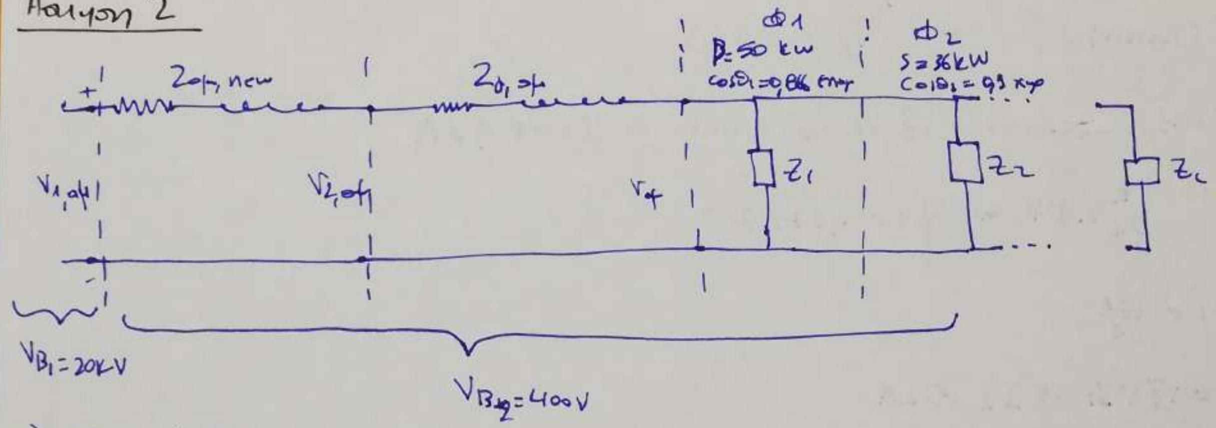
δ) Για τη γωνία θ° μεταξύ $\hat{V}_1, \hat{I}$ ισχύει:

$\theta^\circ = 16{,}7 - (-9) = 25{,}7^\circ$

και $P = \sqrt{3} V_1 \cdot I \cos\theta = 2950\ kW$

$Q = \sqrt{3} V_1 \cdot I \cdot \sin\theta = 1420\ kVar$

Άσκηση 2



a). $Z_B = \frac{V_{B_2}^2}{S_B} = 1,6$

$V_{1,σφ}=1$
$V_{B_2}=400V$

$I_B = \frac{S_B}{\sqrt{3}V_{B_2}} = 144,34$

$Z_{γ1,σφ} = \frac{0,05+j0,2}{1,6} = 0,031 + j0,125$

$Z_{σφ,new} = Z_{σφ,old}\cdot\frac{100}{160} = 0,006+j0,025$

$\hat{V}_{1,σφ} = 1\angle 0°$

$\hat{V}_{σφ} = V_{σφ}\angle 0°$

Φ1: $S_1 = \frac{P_1}{\cos θ_1} = 57.737$

$\hat{S}_{1,σφ} = \frac{57.737(0,866+j\cdot\frac{1}{2})}{100k} = 0,5+j0,29 = V_{σφ}\cdot \hat{I}_{1,σφ}^*$

Άρα $\hat{I}_{1,σφ} = \frac{0,5-j0,29}{V_{σφ}}$

Φ2: $\hat{S}_{2,σφ} = \frac{36.000(0,9-j0,44)}{100k} = 0,324 - 0,16j$

$\hat{S}_{2,σφ} = \hat{V}_{σφ}\cdot\hat{I}_{2,σφ}^* \Rightarrow \hat{I}_{2,σφ} = \frac{0,324+j0,16}{V_{σφ}}$

$\hat{I}_{σφ} = \hat{I}_{1σφ}+\hat{I}_{2σφ} = \frac{0,824 - j0,13}{V_{σφ}}$

NTK: $\hat{V}_{1,σφ} = (Z_{γ1,σφ}+Z_{σφ,new})\cdot \hat{I}_{σφ} + \hat{V}_{σφ} \Rightarrow$

$\Rightarrow \hat{V}_{1,σφ} = \frac{10^{-3}(37,5+j150)(0,824-j0,13)}{V_{σφ}} + V_{σφ} \Rightarrow$

$\Rightarrow V_{σφ}\cdot \hat{V}_{1,σφ} = 10^{-3}(50,4+j117) + V_{σφ}^2$

Άρα $V_{o\mu} \cdot \hat{V}_{1,o\mu} = (0{,}05 + V_{o\mu}^2) + j\,0{,}119 \Rightarrow$

$\Rightarrow (V_{o\mu} \cdot \hat{V}_{1,o\mu})^2 = (0{,}05 + V_{o\mu}^2)^2 + 0{,}119^2 \Rightarrow$

$\Rightarrow V_{o\mu}^2 = V_{o\mu}^4 + 0{,}1 V_{o\mu}^2 + 0{,}05^2 + 0{,}119^2$

$\Rightarrow V_{o\mu}^4 - 0{,}9 V_{o\mu}^2 + 0{,}0167 = 0$

$$\Rightarrow V_{o\mu} = \begin{cases} 0{,}93864 \longrightarrow \text{λύση κοντινότερη στις αναμενόμενες} \\ \ldots \\ \ldots \\ 0{,}13767 \end{cases}$$

οπότε $\hat{I} = 0{,}878 - 0{,}138j = 0{,}888 \angle -8{,}9°$

$\hat{V}_{2,o\mu} = Z_y \cdot \hat{I} + \hat{V}_{o\mu} \Rightarrow \hat{V}_{2o\mu} = 0{,}989 \angle 6{,}12°$

Άρα $V = V_{o\mu} \cdot 400 = 375{,}5\,V$ και $V_2 = V_{2o\mu} \cdot 400 = 395{,}6\,V$

β) $\hat{V}_{1,o\mu} = \hat{I}_o (0{,}006 + j\,0{,}025) + \hat{V}_{2o\mu} = 1 \angle 7{,}27°$

Άρα, η γωνία τάσης - ρεύματος είναι $\theta = 7{,}27 + 8{,}9 = 16{,}17$

και $P = \sqrt{3} \cdot 20k \cdot 0{,}888 \cos(16{,}17) = 29{,}5\,kW$

$Q = \sqrt{3} \cdot 20k \cdot 0{,}888 \sin(16{,}17) = 8{,}6\,kVar$

γ) $Z_{1,o\mu} = \dfrac{V_{o\mu}}{I_{1,o\mu}} = 1{,}52 \angle 30{,}11°$

$Z_{2,o\mu} = \dfrac{V_{o\mu}}{I_{2,o\mu}} = 2{,}44 \angle -24{,}3°$

$Z_{φορτίου} = Z_{1,o\mu} \,//\, Z_{2,o\mu} = 1{,}05 \angle 9°$

Θα πρέπει $Z_{φορτίου,o\mu} \,//\, Z_C = R + 0j \Rightarrow$

$\Rightarrow (1{,}05 \angle 9°) \,//\, \left(-j \dfrac{X_C}{1{,}6}\right) = R + 0j \Rightarrow$

$$\Rightarrow \frac{(1{,}04 + j\,0{,}16) \cdot \left(-\frac{X_C}{1{,}6}\right)}{1{,}04 + j\left(0{,}16 - \frac{X_C}{1{,}6}\right)} = R + 0j$$

Θ- κρίνει $Im\left\{ \left[1{,}04 + j\left(-0{,}16 + \frac{X_c}{1{,}6}\right)\right] (1{,}04 + j0{,}16)\cdot\left(-j\,\frac{X_c}{1{,}6}\right)\right\} = 0$

$\Rightarrow Im\{(\alpha + j\beta)(\gamma + j\delta)\} = 0 \Rightarrow Im(\alpha\gamma + j\beta\gamma + j\alpha\delta - \beta\delta) = 0 \Rightarrow \beta\gamma + \alpha\delta = 0$

οπότε

$Im\left\{ (\ ) \left(\frac{X_C}{1{,}6}\cdot 0{,}16 - j\,\frac{1{,}04}{1{,}6} X_C \right)\right\} = 0 \Rightarrow$

$\Rightarrow \left(\frac{X_C}{1{,}6} - 0{,}16 \right) 0{,}1 X_C - 1{,}04 \cdot \frac{1{,}04}{1{,}6} X_C = 0 \Rightarrow$

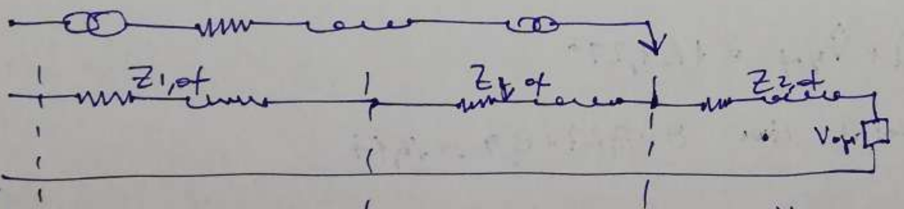
$\Rightarrow \frac{X_C^2}{16} - 0{,}016 X_C - 0{,}676 X_C = 0 \Rightarrow$

$\Rightarrow X_C\left(\frac{X_C}{16} - 0{,}016 - 0{,}676 \right) = 0 \Rightarrow X_C = 16(0{,}016 + 0{,}676) \Rightarrow X_{CY} = 11{,}1$

και $X_{C\Delta} = 3 X_{CY} = 33{,}3$

Άρα $C = 95{,}6\ \mu F$

Άσκηση 5.5 (βιβλίου)



$\cos\theta = 0{,}9$
$\theta = 26°$

$V_{B_3} = 380V$

$V_{1,\alpha\mu} = 1{,}1$ $\quad V_{B_2} = 13{,}3k$

$V_{B_1} = 0{,}94k$ $\quad Z_B$

$\hat{V}_{1,\alpha\mu} = Z_{o\lambda}\cdot \hat{I} + V_{\alpha\mu}$

$S_B = 750kVA$

$Z_B = \frac{V_{B_2}^2}{S_B} = \frac{(17{,}36)^2}{750k} = 400$

$Z_{1,\alpha\mu} = j0{,}1$

$Z_{\gamma,\alpha\mu} = \frac{40 + j50}{400} = 0{,}1 + j0{,}125$

$Z_{2,\alpha\mu} = Z_{2,\alpha\mu,\pi\alpha\lambda} \frac{750}{300} = (0{,}01 + j0{,}1)\cdot\frac{75}{30} = 0{,}025 + j0{,}25$

$Z_{o\lambda} = 0{,}125 + j0{,}475$

$\hat{S}_{\alpha\mu} = \frac{270k(0{,}9 + j0{,}436)}{750k} = 0{,}324 + j0{,}157 = V_{\alpha\mu}\cdot\hat{I}^*_{\alpha\mu} \Rightarrow$

$\Rightarrow \hat{I}_{\alpha\mu} = \frac{0{,}324 - j0{,}157}{V_{\alpha\mu}}$

Άρα $1{,}1 V_{\alpha\mu}\angle\theta° = 0{,}115 + j0{,}134 + V_{\alpha\mu}^2 \rightarrow (1{,}1 V_{\alpha\mu})^2 = (0{,}115 + V_{\alpha\mu}^2)^2 + 0{,}134^2$ (*)

$(*) \Rightarrow 0{,}115^2 + 0{,}134^2 + 2\cdot 0{,}115\cdot V_{\alpha\mu}^2 + V_{\alpha\mu}^4 + (-1{,}1^2 V_{\alpha\mu}^2) = 0$

$\Rightarrow V_{\alpha\mu}^4 - (1{,}1^2 - 2\cdot 0{,}115)\cdot V_{\alpha\mu}^2 + (0{,}115^2 + 0{,}134^2) = 0$

$\Rightarrow V_{\alpha\mu}^4 - 0{,}98 V_{\alpha\mu}^2 + 0{,}031 = 0$

$\rightarrow V_{\alpha\mu} = 0{,}97328$

Άρα $V = 0{,}9732\cdot 380 = 370V$