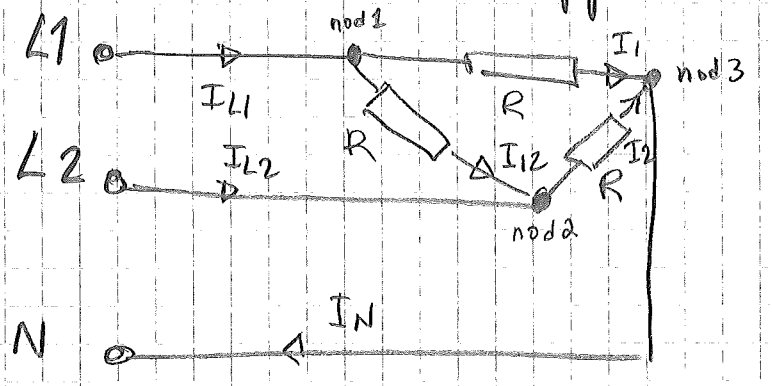
FÖ:4

2.15

Δ-kopplad Värmeapparat

Egentligen
$\begin{cases} P_N = 9\,kW \\ U_H = 400\,V \end{cases}$



$$\begin{cases} P_N = 3\dfrac{U_H^2}{R} \\ R = \dfrac{3\cdot U_H^2}{P_N} \approx 53{,}3\,\Omega \end{cases}$$

vid felfri anslutning

a) $P_{tot} = \dfrac{U_H^2}{R} + \dfrac{U_f^2}{R} + \dfrac{U_f^2}{R} =$

$= \dfrac{400^2}{53{,}3} + 2\cdot\dfrac{230^2}{53{,}3} \approx 4{,}99\,kW$

b) $I_{12} = \dfrac{U_H}{R} \approx 7{,}50\,e^{j30^\circ}\,A$

$I_2 = \dfrac{U_f}{R} = \dfrac{230\,e^{j120^\circ}}{53{,}3} \approx 4{,}3\,e^{-j120^\circ}\,A$

$I_1 = \dfrac{U_f}{R} = \dfrac{230 e^{j0^\circ}}{53{,}3} \approx 4{,}3\,e^{-j0^\circ}$

Kirchoffs strömlag (KCL)

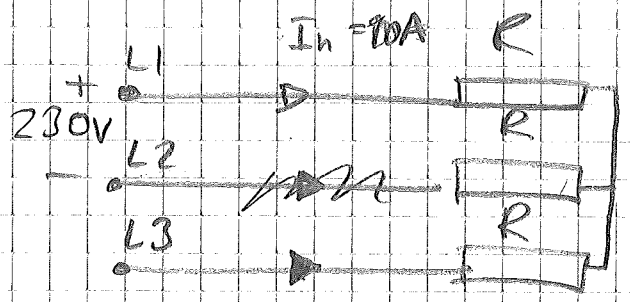
nod1:
$\bar{I}_{L1} = \bar{I}_1 + \bar{I}_{12} = 4{,}3(\cos 0^\circ + j\sin 0^\circ) + 7{,}50(\cos 30^\circ + j\sin 30^\circ)$
$\approx 10{,}8 + j\,3{,}75 \approx 11{,}4\,e^{j19{,}1^\circ}\,A$

nod2:
$\bar{I}_{L2} = \bar{I}_2 - \bar{I}_{12} =$
$4{,}3(\cos 120^\circ - j\sin 120^\circ) - 7{,}5(\cos 30^\circ + j\sin 30^\circ) \approx 11{,}4\,e^{j139^\circ}$

$\bar{I}_N = \bar{I}_1 + \bar{I}_2$
$= 4{,}3 + 4{,}3(\cos 120^\circ - j\sin 120^\circ) = 2{,}15 - j\,3{,}72 = 4{,}3\,e^{j60^\circ}\,A$

Fö:4

2.17



[Från 2.16

$R = 39{,}8\ \Omega$]

a) = b) Om det sker ett avbrott i en fasledare eller i en resistor är samma sak!

$$P = \frac{U_H^2}{2R} = \frac{230^2}{2 \cdot 39.8} \approx 665\ W$$

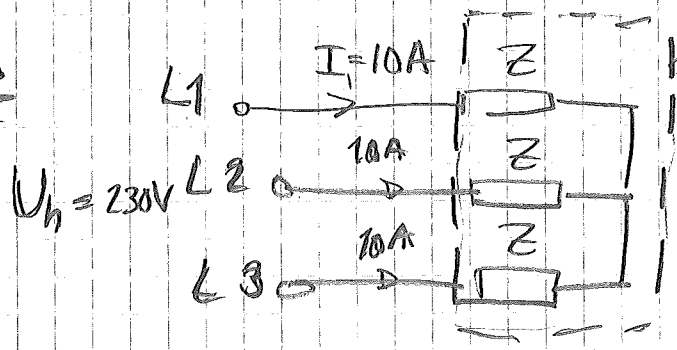
Samma ström som går i ena fasledaren måste gå i den andra

$$|I_{h1}| = |I_{h3}| = \frac{U_{13}}{2R} = \frac{230}{2 \cdot 39.8} \approx 2{,}89\ A$$

$$|I_{h2}| = 0$$

Fö:4

2.23



$\cos\varphi = 0{,}6$ (ind)

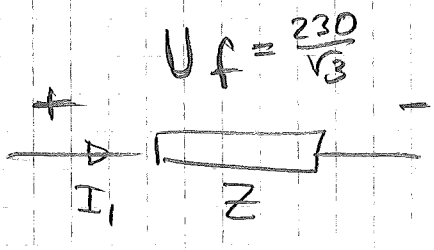
$Z = R + jX$ [Ω]

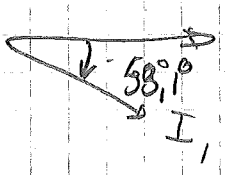
resistans, reaktans

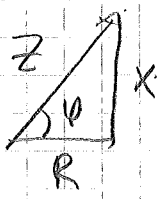
b) $Z = \frac{U_f}{I_1} = \frac{230/\sqrt{3} \cdot e^{j0°}}{10 \cdot e^{-j53{,}1°}} =$

$= 13{,}3\, e^{j53{,}1°} = |Z| \cdot e^{j\arg|Z|}$

$Z = \underbrace{7{,}98}_{R} + j\underbrace{10{,}6}_{X}$

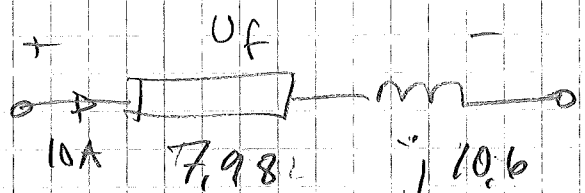






$R = |Z| \cdot \cos\varphi$ ($\cos\varphi = 0{,}6$)

$X = |Z| \cdot \sin\varphi$ ($\sin\varphi = 0{,}8$)



a) $P = \sqrt{3} \cdot U_h \cdot I_h \cdot \cos\varphi = \sqrt{3} \cdot 230 \cdot 10 \cdot 0.6 = 2390$ W

$S = \sqrt{3} \cdot U_h \cdot I_h = 3984$ VA

$Q = \sqrt{3} \cdot U_h \cdot I_h \cdot \sin\varphi = 3187$ VAr

$P = 3 \cdot R \cdot I_h^2$