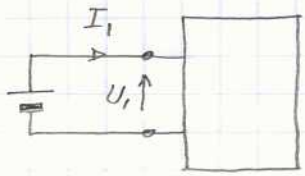
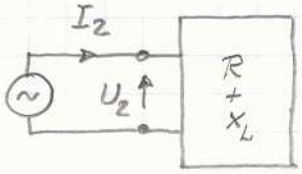
Opg. nr. 1





$U_1 = 45{,}5\ V$

$I_1 = 1{,}75\ A$

$U_2 = 230\ V$

$f = 50\ Hz$

$I_2 = 7{,}65\ A$

a) $R = \frac{U_1}{I_1} = \frac{45{,}5}{1{,}75} = 26{,}00 \cong$ **26,0 Ω**

b) $Z = \frac{U_2}{I_2} = \frac{230}{7{,}65} = 30{,}07\ \Omega$

$X_L = \sqrt{Z^2 - R^2} = \sqrt{30{,}07^2 - 26{,}00^2} = 15{,}11\ \Omega$

$X_L = 2\pi f L$

$L = \frac{X_L}{2\pi f} = \frac{15{,}11}{2 \cdot \pi \cdot 50} = 0{,}0481 \cong$ **0,048 H**

c) $P_1 = I_1^2 \cdot R = 1{,}75^2 \cdot 26{,}0 = 79{,}63 \cong$ **79,6 W**

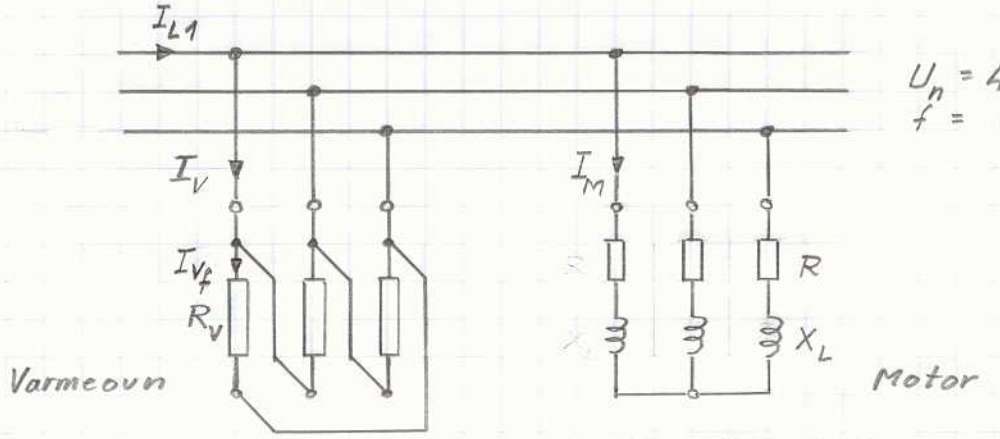
d) $P_2 = I_2^2 \cdot R = 7{,}65^2 \cdot 26{,}0 = 1521{,}6 \cong$ **1522 W**

e) $P_2 = U_2 \cdot I_2 \cdot \cos\varphi$

$\cos\varphi = \frac{P_2}{U_2 \cdot I_2} = \frac{1521{,}6}{230 \cdot 7{,}65} = 0{,}8648 \cong$ **0,865**

Opg. nr. 2

a)



P_{1V} = 12,0 kW

P_2 = 7,50 kW
$\cos\varphi$ = 0,84
η = 90,1 %

b)

$$P_{1V} = \sqrt{3} \cdot U_n \cdot I_V$$

$$I_V = \frac{P_{1V}}{\sqrt{3} \cdot U_n} = \frac{12000}{\sqrt{3} \cdot 400} = 17{,}321 \cong \underline{\underline{17{,}3\ A}}$$

c)

$$P_{1V} = 3 \cdot I_{V_f}^2 \cdot R_V = 3 \cdot \left(\frac{I_V}{\sqrt{3}}\right)^2 \cdot R_V = I_V^2 \cdot R_V$$

$$R_V = \frac{P_{1V}}{I_V^2} = \frac{12000}{17{,}321^2} = 40{,}00 \cong \underline{\underline{40{,}0\ \Omega}}$$

d)

$$\eta = \frac{P_2}{P_{1M}}$$

$$P_{1M} = \frac{P_2}{\eta} = \frac{7500}{0{,}901} = 8324 \cong \underline{\underline{8{,}32\ kW}}$$

e)

$$P_{1M} = \sqrt{3} \cdot U_n \cdot I_M \cdot \cos\varphi$$

$$I_M = \frac{P_{1M}}{\sqrt{3} \cdot U_n \cdot \cos\varphi} = \frac{8324}{\sqrt{3} \cdot 400 \cdot 0{,}84} = 14{,}30 \cong \underline{\underline{14{,}3\ A}}$$

f)

$$P_1 = P_{1V} + P_{1M} = 12000 + 8324 = 20324 \cong \underline{\underline{20{,}3\ kW}}$$

g)

$$\left.\begin{array}{l} P_{1M} = S_M \cdot \cos\varphi \\ Q_M = S_M \cdot \sin\varphi \end{array}\right\} \frac{Q}{P} = \tan\varphi \;;\; Q = Q_V + Q_M = 0 + Q_M$$

$$Q = Q_M = P_{1M} \cdot \tan\varphi = 8324 \cdot \tan(\cos^{-1} 0{,}84) = 5377 \cong \underline{\underline{5{,}38\ kVAr}}$$

h)

$$S = \sqrt{P^2 + Q^2} = \sqrt{20324^2 + 5377^2} = 21023 \cong \underline{\underline{21{,}0\ kVA}}$$

i)

$$I_{L1} = \frac{S}{\sqrt{3} \cdot U_n} = \frac{21023}{\sqrt{3} \cdot 400} = 30{,}34 \cong \underline{\underline{30{,}3\ A}}$$

Eksamen, 28. maj 2003

Opg. nr. 3

4-polet asynkronmotor ($p = 2$)

Mærkedata: $U_n = 400\ V$

$f = 50\ Hz$

$P_2 = 75\ kW$

$I_n = 140\ A$

$\cos\varphi = 0{,}85$

$n_2 = 1485\ min^{-1}$

a) $n_1 = \frac{f}{p} \cdot 60 = \frac{50}{2} \cdot 60 = 1500\ min^{-1}$

$n_s = n_1 - n_2 = 1500 - 1485 = 15\ min^{-1}$

$s = \frac{n_s}{n_1} \cdot 100\% = \frac{15}{1500} \cdot 100\% =$ **1,00 %**

b) $P_1 = \sqrt{3} \cdot U_n \cdot I_n \cdot \cos\varphi = \sqrt{3} \cdot 400 \cdot 140 \cdot 0{,}85 = 82446\ W \cong$ **82,4 kW**

c) $\eta = \frac{P_2}{P_1} = \frac{75000}{82446} = 0{,}9097 \cong$ **91,0 %**

d) $P_2 = M \cdot \omega = M \cdot 2\pi \frac{n_2}{60}$

$M = \frac{P_2 \cdot 60}{2\pi \cdot n_2} = \frac{75000 \cdot 60}{2\pi \cdot 1485} = 482{,}29 \cong$ **482 Nm**