3) Klausur

2) ASM

Δ $I_{1str} = \frac{I_N}{\sqrt{3}} = \frac{15A}{\sqrt{3}}$ $U_N = 400V$

$n_n = 2870\,min^{-1}$ $\cos\varphi = 0{,}85$ $R_1 = 0{,}8\Omega$

a)

ges. P_{Cu2}

$P_{Cu1} = 3 \cdot \left(\frac{15A}{\sqrt{3}}\right)^2 \cdot 0{,}8\Omega = 180$ W

$P_1 = 3 \cdot 400V \cdot \frac{15A}{\sqrt{3}} \underbrace{\cos\varphi}_{0{,}85} = 8{,}833\,kW$

$P_L = P_1 - P_{Cu1} = 8653\,W$ $P_{FE} = 0$

$P_{Cu2} = s_n \cdot P_2$ $s_N = 0{,}04\overline{3}$

$= 0{,}04\overline{3} \cdot 8653W$

$= 374{,}96\,W$

$\approx 375\,W$

3) ASM

Δ $U_1 = 400\,V$ $f_1 = 50\,Hz$ $p = 1$ $P_{ab} = 5\,kW$

$R_1 = 1{,}3\Omega$ $\eta = 91\%$ $\cos\varphi_1 = 0{,}9$

ges.: $P_L = P_1 - P_{Cu1} - P_{FE}$

$P = \sqrt{3} \cdot U_{Netz} \cdot I_{Netz}$

$P = 3 \cdot U_{Str} \cdot I_{Str}$

$P_1 = \frac{P_{ab}}{\eta} = \frac{5\,kW}{0{,}91} = 5{,}495\,kW$

$I_{1str} = \frac{P_1}{3 \cdot U_1 \cdot \cos\varphi_1} = \frac{5{,}495\,kW}{3 \cdot 400 \cdot 0{,}9} = 5{,}08$ A

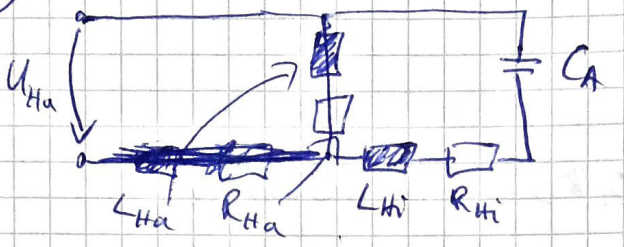
$P_{Cu1} = 3 \cdot (8{,}81A)^2 \cdot 1{,}3\Omega = 101$ W

$P_L = 5{,}495\,kW - 101\,W = 5394$ W

4) $U = 230V \quad f = 50Hz$

Stillst. $U_{Hi} = 50V \quad I_{Hi} = 4,35A \quad P_{Hi} = 145W$ Verluste

a)



b) ges. X_{Hi}, R_{Hi}

$Z = \frac{U}{I}$

$$Z_{Hi} = \frac{U_{Hi}}{I_{Hi}} = 11,5\,\Omega \qquad P = U \cdot I$$

$$P_{Hi} = U_{Hi} I_{Hi} \cos\varphi_{Hi}$$

$$\cos\varphi_{Hi} = \frac{P_{Hi}}{U_{Hi} \cdot I_{Hi}} = \frac{145W}{50 \cdot 4,35} = 0,6$$

$$\varphi_{Hi} = 48,19°$$

$$X_{Hi} = Z_{Hi} \cdot \sin\varphi_{Hi} = 11,5\,\Omega \cdot \sin(48,19) = \underline{8,57\,\Omega}$$

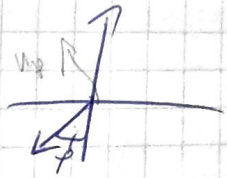
$$R_{Hi} = Z_{Hi} \cdot \cos\varphi_{Hi} = 11,5\,\Omega \cdot 0,6 = \underline{7,67\,\Omega}$$

c) $U = 230V$

$I_H = 20A$

$\varphi_{Hi} = \arccos\frac{145W}{230 \cdot 20A} = 80°$

5) Syn



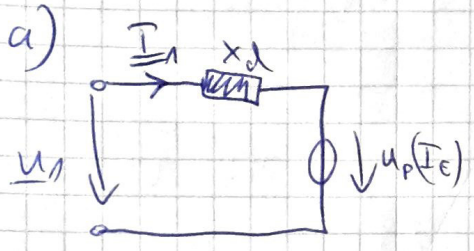
Gen. übeser.

$U_N = 460V$ $U_{Netz} = 400V$ $f_N = 50Hz$ $S_N = 3kVA$

$P_N = 2{,}2kW$ $p = 2$ $x_d = 1{,}4 p.u.$

VZS

a)



b)

$U_{Np.u} = \frac{400V}{460V} = 0{,}87 p.u$

$S_{Np.u} = \frac{S_{nom}}{S_N} = \frac{\sqrt{3}\cdot 400V \cdot 3{,}77A}{3kVA}$ $I_N = \frac{S_N}{\sqrt{3}U_N} = \frac{3kVA}{\sqrt{3}\cdot 460V} = 3{,}77A$

$= 0{,}87 p.u.$

c)

$\cos \varphi_N = \frac{P_N}{S_N} = 0{,}73$ $\varphi = 42{,}83°$

$U_1 = 0{,}87 p.u.$ (4,35 cm)

$I_1 = 1 p.u. \angle 137{,}17°$ (5 cm)

$U_p = U_1 - jx_d \cdot I_1 = 2{,}09_{p.u} \angle 29{,}4°$ (10,45 cm)

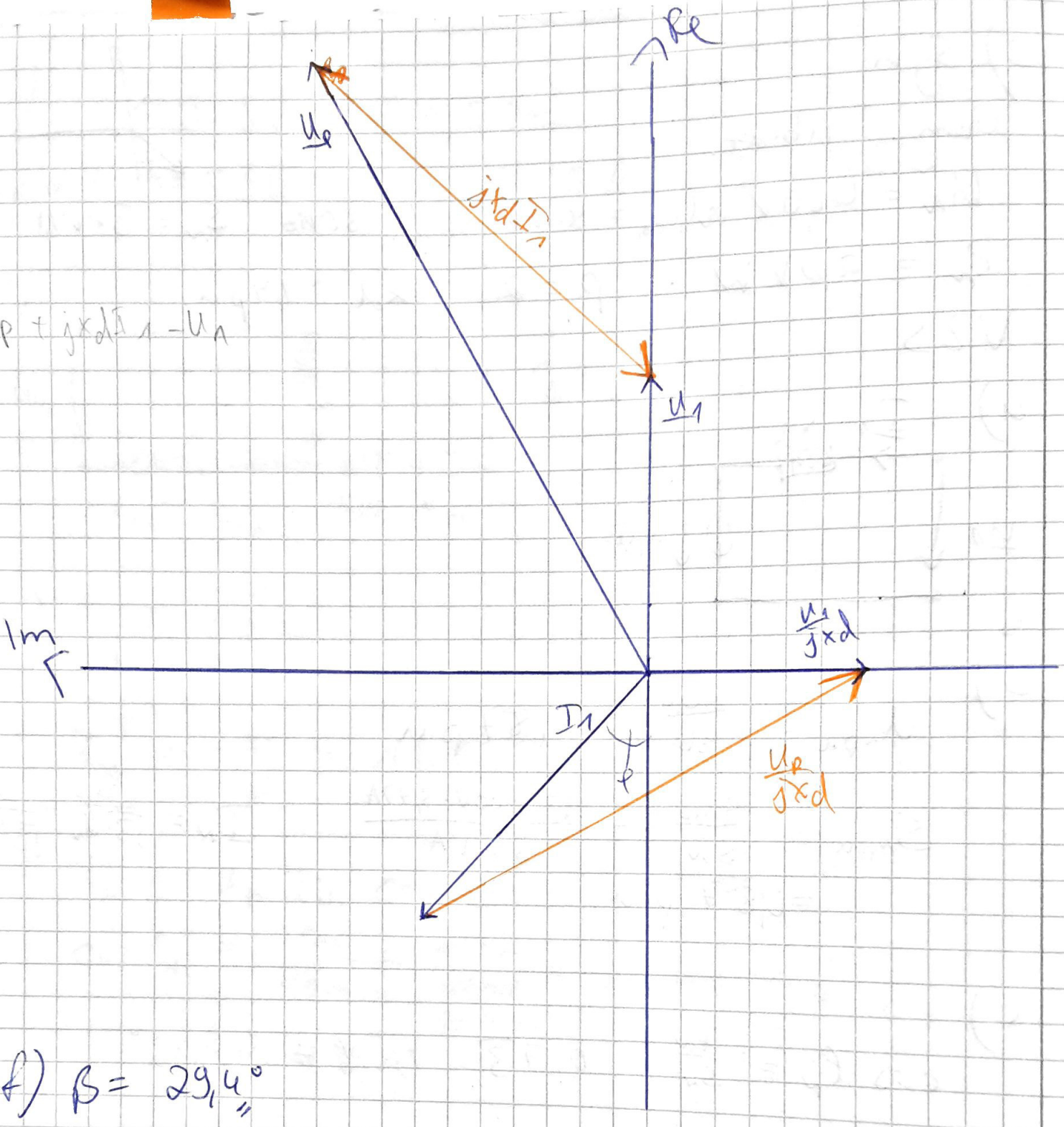
$jx_d \cdot I_1 = 1{,}4 p.u. \angle -132{,}83°$ (7 cm)

$S_{gen} = 3\frac{U_1 U_p}{jx_d} - 3\frac{U_1^2}{jx_d}$

$\frac{U_1}{jx_d} = 0{,}62 p.u. \angle -90°$ (3,1 cm)

$\frac{U_p}{jx_d} = 1{,}5 p.u. \angle -60{,}6°$ (7,5 cm) ✓

$= U_p + jx_d\underline{I}_1 - U_1$



f) $\beta = 29{,}4°$

g) $\varepsilon = \frac{U_{pN}}{U_1} = \underline{2{,}4}$