

WS 15/16

1) GM

$$a) M_N = \frac{U_A I_A \cdot 60s}{2\pi n_N} - M_{Rbg}$$

$$I_A = I_{AN} - \frac{P_E}{U_{AN}} = 2440A - 17A = 2423A$$

$$U_A = 470V - 10m\Omega \cdot 2423A - 0,8V \\ = 445V$$

$$M_N = \frac{445V \cdot 2423A \cdot 60s}{2\pi \cdot 540 \frac{1}{min}} - 100 Nm \\ = \underline{\underline{18.967,4 Nm}}$$

$$b) n_0 = \frac{U_{AN}}{U_A} \cdot n_N = \frac{470V}{445V} \cdot 540 \frac{1}{min} = \\ = \underline{\underline{570,3 \frac{1}{min}}}$$

$$c) \eta = \frac{U_A \cdot I_A - P_{Rbg}}{U_{AN} \cdot (I_{AN})} = \frac{445V \cdot 2423A - 5654,9W}{470V \cdot 2440A}$$

$$P_{Rbg} = \frac{M_{Rbg} \cdot 2\pi n}{60s} = \underline{\underline{5654,9W}}$$

$$\eta = 0,94 = 94\%$$

$$d) R_w = R_{20} (1 + \alpha_{20} (T - 20^\circ C))$$

$$R_{20} = \frac{R_w}{1 + \alpha_{20} (T - 20^\circ C)} = \frac{10m\Omega}{1 + 3,9 \cdot 10^{-3} \frac{1}{K} (105^\circ C - 20^\circ C)} \\ = 7,5 m\Omega$$

$$U_A = 470V - 7,5m\Omega \cdot 2423A - 0,8V \\ = 451V$$

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$$n_0 = \frac{U_{AN}}{U_A} \cdot n_N = \frac{470V}{451V} \cdot 540 \frac{1}{\text{min}}$$
$$= \underline{\underline{562,7 \frac{1}{\text{min}}}}$$