

Электрический привод

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Практика 2.

Варианты - все 3. 3.18-3.22.

Задача 3.18. Вариант 3.

$$P_{\text{ном}} = 22 \text{ кВт}$$

$$2p = 8$$

$$S_{\text{ном}} = 4\%$$

$$\Gamma_2 = 0,053 \text{ Ом}$$

$$\lambda = M_{\text{max}} / M_{\text{ном}} = 2$$

$$1. n_{\text{ном}} = n_1 (1 - S_{\text{ном}}) = 750 (1 - 0,04) = 720 \text{ об/мин}$$

$$2. M_{\text{ном}} = 9,55 P_{\text{ном}} / n_{\text{ном}} = 9,55 \cdot 22000 / 720 = 292 \text{ Н.м}$$

$$3. M_2 = M_{\text{ном}} = 292 \text{ Н.м}$$

$$4. \lambda = M_1 / M_2 = 2$$

$$5. M_1 = M_2 \cdot \lambda = 594 \text{ Н.м}$$

$$6. \Gamma_{\text{доб3}} = \Gamma_2 (\lambda - 1) = 0,053 (2 - 1) = 0,053 \text{ Ом}$$

$$7. \Gamma_{\text{доб2}} = \Gamma_{\text{доб3}} \cdot 2 = 0,106 \text{ Ом}$$

$$8. \Gamma_{\text{доб1}} = \Gamma_{\text{доб2}} \cdot 2 = 0,212 \text{ Ом}$$

$$9. R_{\text{пр1}} = \Gamma_{\text{доб1}} + \Gamma_{\text{доб2}} + \Gamma_{\text{доб3}} = 0,212 + 0,106 + 0,053 = 0,371 \text{ Ом}$$

$$10. R_{\text{пр2}} = \Gamma_{\text{доб2}} + \Gamma_{\text{доб3}} = 0,159 \text{ Ом}$$

$$11. R_{\text{пр3}} = \Gamma_{\text{доб3}} = 0,053 \text{ Ом}$$

Задача 3.19, Вариант 3

$$\begin{aligned} P_{\text{ном}} &= 22000 \text{ Вт} \\ U_{1\varphi} &= 220 \text{ В} \\ 2p &= 8 \\ S_{\text{ном}} &= 0,04 \\ r_2 &= 0,053 \text{ Ом} \end{aligned}$$

Решение:

$$1. n_{\text{ном}} = n_1(1 - S_{\text{ном}}) = 720 \text{ об/мин}$$

$$2. M_{\text{ном}} = 292 \text{ Н.м}$$

$$3. M_2 / M_{\text{ном}} = S_{0,75} / S_{\text{ном}}$$

$$\begin{aligned} S_{0,75} &= (0,75 M_{\text{ном}} S_{\text{ном}}) / M_{\text{ном}} = \\ &= 0,75 \cdot S_{\text{ном}} = 0,03 \end{aligned}$$

$$4. s = (n_1 - 0,5 n_{\text{ном}}) / n_1 = 0,52$$

$$5. r_{\text{доб}} = (s - S_{0,75}) \cdot \frac{r_2}{S_{0,75}} = 0,86 \text{ Ом}$$

Задача 3.20, Вариант 3

$$\begin{aligned} P_{\text{ном}} &= 4000 \text{ Вт} \\ U_{1\varphi} &= 220 \text{ В} \\ \eta_{\text{ном}} &= 0,85 \\ \cos \varphi_{\text{ном}} &= 0,84 \\ I_{1\pi} / I_{1\text{ном}} &= 7,5 \\ M_{\pi} / M_{\text{ном}} &= 2 \\ \cos \varphi_c &= 0,85 \\ \sin \varphi_c &= 0,52 \end{aligned}$$

Решение:

$$1. I_{1\varphi} = P_{\text{ном}} / (3 U_{1\varphi} \eta_{\text{ном}} \cos \varphi_{\text{ном}}) = 8,5 \text{ А}$$

$$2. I_{1\pi\pi} = I_{1\varphi} (I_{1\pi} / I_{1\text{ном}}) = 63,75 \text{ А}$$

$$3. Z_c = U_{1\varphi} / I_{1\pi\pi} = 220 / 63,75 = 3,45 \text{ Ом}$$

$$4. r_c = Z_c \cos \varphi_c = 3,45 \cdot 0,85 = 2,93 \text{ Ом}$$

$$x_c = Z_c \sin \varphi_c = 3,45 \cdot 0,52 = 1,79 \text{ Ом}$$

$$\begin{aligned} 5. r_{\text{доб}} &= \sqrt{(k Z_c)^2 - x_c^2} - r_c = \sqrt{4 \cdot 3,45^2 - 1,79^2} - 2,93 = \\ &= 3,73 \text{ Ом} \end{aligned}$$

$$6. P_{\text{доб}} = \frac{I_{1\pi\pi}^2}{4} \cdot r_{\text{доб}} = \frac{8,5^2}{4} \cdot r_{\text{доб}} = 67,4 \text{ Вт}$$

$$7. U'_{1\varphi} = 220 - \frac{I_{1\pi\pi}}{2} \cdot r_{\text{доб}} = 204 \text{ В}$$

Задача 3.21. Вариант 3

Тип двигателя
4АНК250В8

$$P_{\text{ном}} = 45000 \text{ Вт}$$

$$\lambda_p = 8$$

$$S_{\text{ном}} = 0,04$$

$$\eta_{\text{ном}} = 0,89$$

$$\cos \varphi_{\text{ном}} = 0,82$$

$$I_{\text{а ном}} = 190 \text{ А}$$

$$E_2 = 140 \text{ В}$$

$$M_{\text{max}} / M_{\text{ном}} = 2,2 = \lambda_H$$

$$1. \quad n_{\text{ном}} = n_1 (1 - S_{\text{ном}}) = 750 (1 - 0,04) = 720 \text{ об/мин}$$

$$2. \quad M_{\text{ном}} = 9,55 P_{\text{ном}} / n_{\text{ном}} = 596 \text{ Н.м}$$

$$3. \quad M_{\text{max}} = M_{\text{ном}} \cdot \lambda_H = 596 \cdot 2,2 = 1313 \text{ Н.м}$$

$$4. \quad s_{\text{кр}} = S_{\text{ном}} (\lambda_H + \sqrt{\lambda_H^2 - 1}) = 0,04 \cdot (2,2 + \sqrt{2,2^2 - 1}) = 0,16$$

$$5. \quad r_2 = (E_2 / \sqrt{3} I_{\text{а ном}}) S_{\text{ном}} = 0,017 \text{ Ом}$$

$$6. \quad s' = 1,5 \cdot 0,04 = 0,06$$

$$7. \quad R_{\text{пр}} = (r_2 / s') - r_2 = \frac{0,017}{0,06} - 0,017 = 0,26 \text{ Ом}$$

$$8. \quad \kappa_{\text{доб}} = r_2 \left(\frac{s_{0,5}}{S_{\text{ном}}} \right) = 0,017 \cdot \frac{0,5}{0,04}$$

Задача 3.22. Вариант 3.

Тип двигателя:

4АН280М4

$$P_{\text{ном}} = 160000 \text{ Вт}$$

$$n_{\text{ном}} = 1470 \text{ об/мин}$$

$$\eta_{\text{ном}} = 0,935$$

$$\cos \varphi_{\text{ном}} = 0,9$$

$$\lambda_i = 6$$

$$\lambda_H = 1,2$$

$$\lambda_H = 2$$

Решение:

$$1. \quad M_{\text{ном}} = 9,55 P_{\text{ном}} / n_{\text{ном}} = 9,55 \cdot \frac{160000}{1470} = 1039 \text{ Н.м}$$

$$2. \quad M_H = M_{\text{ном}} \lambda_H = 1039 \cdot 1,2 = 1246 \text{ Н.м}$$

$$3. \quad M_{\text{max}} = M_{\text{ном}} \cdot \lambda_H = 1039 \cdot 2 = 2078 \text{ Н.м}$$

$$4. \quad P_{\text{ном}} = P_{\text{ном}} / \eta_{\text{ном}} = 160 / 0,935 = 171 \text{ кВт}$$

$$5. \quad I_{1\Delta} = P_{\text{ном}} / (m_1 U_{1\Delta} \cos \varphi_{\text{ном}}) = 166 \text{ А}$$

$$I_{1\Delta} = \sqrt{3} I_{1\Delta} = 298 \text{ А}$$

$$6. \quad I_{H\Delta} = I_{1\Delta} \lambda_i = 298 \cdot 6 = 1790 \text{ А}$$

$$7. \quad U_{1\Delta Y} = U_{1\Delta\Delta} / \sqrt{3} = 220 \text{ В}$$

$$I_{1\Delta Y} = I_{1\Delta\Delta} / \sqrt{3} = 166 / 1,73 = 96 \text{ А}$$

$$I_{H\Delta Y} = I_{H\Delta\Delta} / 3 = 99 \text{ А}$$

$$I_{H\Delta Y} = I_{H\Delta\Delta} / 3 = 1790 / 3 = 596 \text{ А}$$

$$8. M_Y = M_{\Delta}/3 = 346 \text{ Н.м}$$

$$M_{\Pi Y} = M_{\Pi \Delta}/3 = 1246/3 = 415 \text{ Н.м}$$

$$M_{\max Y} = M_{\max \Delta}/3 = 2078/3 = 692 \text{ Н.м}$$

$$\lambda_{\Pi Y} = \lambda_{\Pi \Delta}/3 = 0,67$$

$$9. U'_{1\omega} = U_{1P}/\sqrt{\lambda_H} = \frac{380}{\sqrt{2}} = \frac{380}{1,4} = 271,4 \text{ В}$$