21 2012/2013

① $P_n = 16\,kW$

$U_n = 220V$

$I_a = 80A$

$n_n = 1200\,RPM$

$R_a = 2{,}25\,\Omega$

$P_n = 22\,kW$

$n_n = 976\,RPM$

$U_n = 320V$

$I_n = 45A$

$\cos\varphi = 0{,}8$

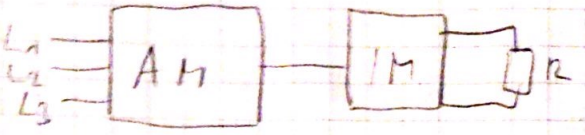
$f = 50\,Hz$

$R_a = 2\,\Omega$

$P_k = ?$

$n = ?$

$M = ?$



ISTOSMJERNI

$M_n = \frac{30 P_n}{n_n \cdot \pi} = 127.32\,Nm$

$C_e = \frac{220 - 80 \cdot 0{,}25}{1200}$

$C_e = 0{,}16667 \rightarrow (A)$

$n = \frac{U - I_a R_a}{C_e}$

$n = \frac{+ I \cdot 2{,}25}{C_e}$

$\frac{M_n}{M_t} = \frac{I_n}{I} \rightarrow I = I_n \cdot \frac{M_t}{M_n}$

$I = \frac{I_n \cdot M_t}{M_n}$

$I = 0{,}6282\,M_t \rightarrow (C)$

$n = + \frac{0{,}6282 \cdot 2{,}25}{C_e} M_t$

$n = + 8{,}48\,M_t \rightarrow (D)$

ASINKRONI

$M_n = 215.25\,Nm$

$S_n = \frac{n_s - n_n}{n_s} = 0{,}024 \rightarrow (B)$

$\frac{M_n}{S_n} = \frac{M_t}{S_t} \Rightarrow$

$S_t = M_t \cdot \frac{S_n}{M_n}$

$\frac{n_s - n}{n_s} = M_t \cdot \frac{S_n}{M_n}$

$n_s - n = M_t \cdot \frac{S_n \cdot n_s}{M_n} \cdot n_s$

$n = n_s - M_t \cdot \frac{S_n \cdot n_s}{M_n}$

$n = 1000 - 0{,}1115\,M_t$

$n = + 8{,}48\,M_t$

$n = 1000 - 0{,}1115\,M_t$ /

$0 = -1000 - 8{,}3215\,M_t$

$M_t = -119{,}5\,Nm$

$n = 988\,RPM$

$\frac{+n}{8{,}48} = \frac{1000}{0{,}1115} - \frac{n}{0{,}1115}$ /

$+0{,}1115\,n = 8480 - 7{,}489$

$8{,}592\,n = 8480$

$n = 987\,RPM$

$M_t = 116{,}4\,Nm$

$M_t = \frac{1000 - n}{0{,}1115} = 116.4\,Nm$

$\frac{M_n}{M_t} = \frac{I_n}{I} \Rightarrow I = \frac{I_n}{M_n} \cdot M_t = 73{,}14A$

$P = I^2 \cdot R = 73{,}14^2 \cdot 2 = 10698.5\,kW$

$U_n = 150V$

$I_n = 50A$

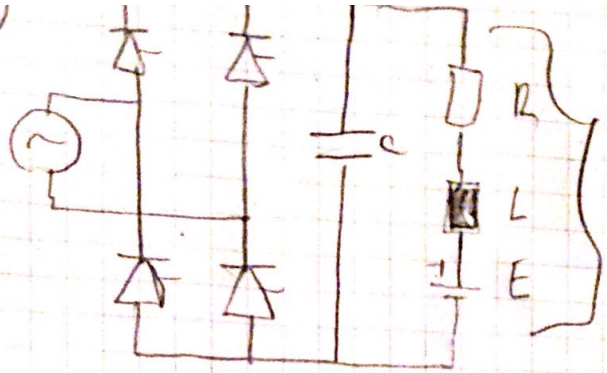
$R_a = 0.4\ \Omega$

$n_n = 1000\ RPM$

$M_t = 50\ Nm$

$U_{el} = 220V$

$f = 50\ Hz$



(b) $n = 0.8\, n_n = 800\ RPM$ $\quad Ce = 0.13$

$$n = \frac{U - E}{Ce} \Rightarrow U_d = n Ce + E$$

$$U_d = 800 \cdot 0.13 + 40.3 \cdot 0.4$$

$$\boxed{U_d = 120.12\ V}$$

$$\frac{M_n}{M_t} = \frac{I_n}{I} \qquad M_n = \frac{30\, P_n}{n_n \pi} = 62\ Nm$$

$$I = I_n \cdot \frac{M_t}{M_n} = 40.3A \qquad U_d = \frac{2 U_{s(n)}}{\pi} \cos\alpha$$

$$\alpha = \arccos\left(\frac{U_d \pi}{2 U_s \sqrt{2}}\right) = 52.67°$$

(c) $n = -0.5\, n_n = -500\ RPM$

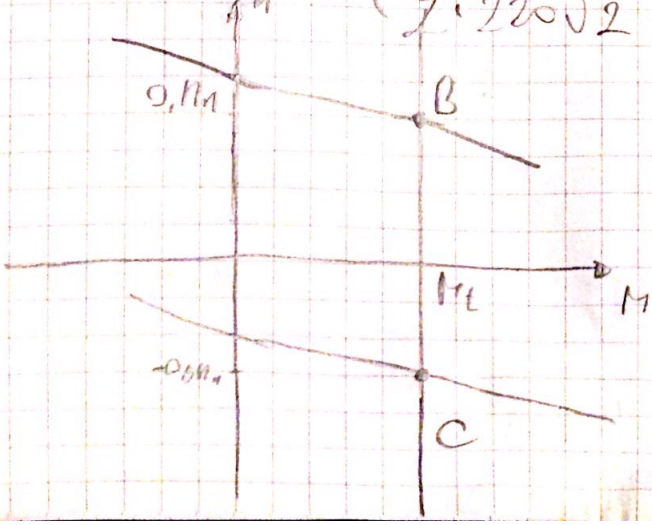
$$n = \frac{U - I_a R_a}{Ce} \qquad U = n_{ce} + I_a R_a$$

$$U = -500 \cdot 0.13 + 40.3 \cdot 0.4$$

$$U = -48.88\ V$$

$$\alpha = \arccos\left(\frac{-48.88\, \pi}{2 \cdot 220\sqrt{2}}\right) = 104.29°$$

(d)



12-IMPULSNI MOST

④ $m = 30\,kg$

$\alpha = 4°$

$U_4 = 320\,V$

$I_4 = 160\,A$

$P_4 = 68\,kW$

$\cos\varphi = 0{,}8$

$n_4 = 1465\,RPM$

$f_4 = 50\,Hz$

Prevod 6 : 1

$D_K = 0{,}65\,m$

$\mu = 0{,}012$

$U_{DC} = 600\,V$

$f_s = 2{,}5\,kHz$

$\frac{U}{f} = konst$

$S_4 = 0{,}233$

$\frac{M_4}{S_4} = \frac{M_t}{S_{tu}}$

$S_{tu} = M_t \cdot \frac{S_4}{M_4}$

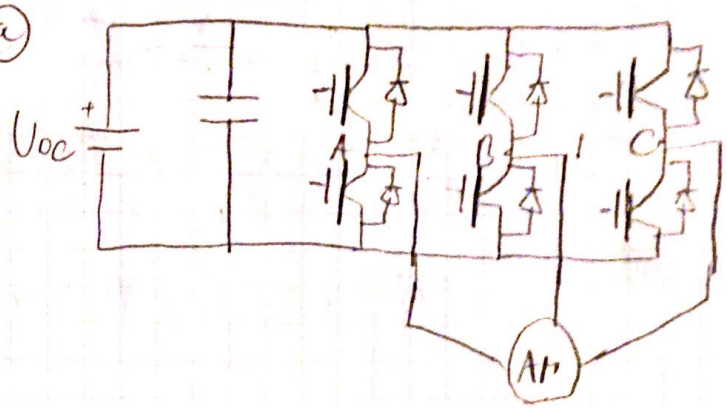
$S_{tu} = 0{,}0114$

$\frac{U_n}{f_n} = \frac{U}{f}$

$U = \frac{U_n}{f_n} \cdot f$

$U = 304{,}5\,V$

ⓐ



$F_4 = 6 \cdot \cos(\alpha)$

$F_{uk} = \mu \cdot F_4$

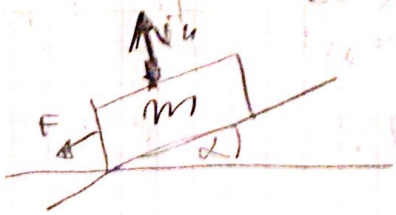
$F_{uk} = 3523\,N$

ⓑ $v = 8\,m/s$ (UZPRED)

$M_t = \frac{F_{UK} \cdot \frac{D_K}{2}}{6 \cdot 6}$

$M_t = 217{,}136\,Nm$

$n = \frac{v}{DUKTY} \cdot 60 \cdot 6 = 1910{,}4\,RPM$



$F_{UK} = m \cdot g \cdot \sin(\alpha) + F_{tr}$

$F_{UK} = 24{,}951\,N$

$m_a = \frac{2 \cdot U_d \cdot \frac{\sqrt{2}}{\sqrt{3}}}{600}$

$m_a = 0{,}829$

$M_4 = 443{,}24\,Nm$

$\Delta n = 17{,}15\,RPM$

$n_s' = 1427{,}55$

$f = \frac{n_s'}{30} = 47{,}6\,Hz$

(c) $m_a = 0,8$

$$0,8 = \frac{U_d \sqrt{2}}{300\sqrt{3}} \quad / \cdot$$

$$\frac{0,8 \cdot 300\sqrt{2}}{\sqrt{2}} = U_d$$

$$\boxed{U_d = 293\ V}$$

$$\frac{U_d}{f} = \frac{U_n}{f_n} \Rightarrow f = U_d \cdot \frac{f_n}{U_n}$$

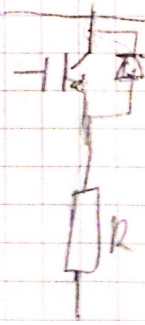
$f = 45,93\ Hz \Rightarrow n_s'' = 1377,84\ RPM$

$n_2 = n_s + \Delta n = 1395\ RPM$

$$v = \frac{1395}{6} \cdot 0,165 \cdot \pi = 474,77\ m/min$$

$v = 7,91\ m/s$

(d) PORED PODEŠENOG OTPORNIKA



OTPORNIK JE OD ŽICE, NO MANJEG

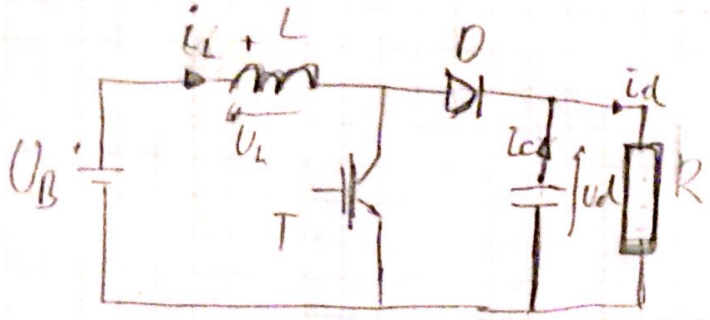
② $P_d = 1\,kW$

$U_B = 30\,V$

$f_s = 10\,kHz$

$L = 150\,\mu H$

$R = 10\,\Omega$



$P_B = P_D$

$U_B \cdot I_B = I_d \cdot U_D$

$\frac{I_d}{I_B} = \frac{U_B}{U_D} = 1-D$

$U_B \cdot D \cdot T = (U_d - U_B)(1-D)T$

$U_B D = U_D - U_B - U_D D + U_B D$

$U_B = U_D(1-D)$

$\frac{U_D}{U_B} = \frac{U_o}{U_i} = \frac{1}{1-D}$

$\frac{I_d}{I_B} = 1-D$

$I_B = \frac{I_d}{1-D} = \frac{10}{0.3} = 33.3\,A$

$P = U \cdot I = U \cdot \frac{U}{R} = \frac{U^2}{R} \Rightarrow U_d = \sqrt{P \cdot R} = 100\,V$

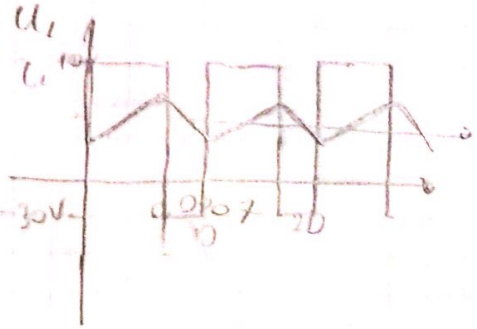
$U_d = \frac{U_s}{1-D}$

$\Rightarrow U_d - U_d D = U_s$

$D = \frac{U_d - U_s}{U_d} = 0.7$

$U = L \frac{di}{dt}$

$T = \frac{1}{10\,000}$



$T = 0,0001$

$\Delta i_L = \frac{U_B}{L} \cdot D \cdot T$

$\Delta i_L = 14\,A$

$I_{L_{SR}} = I_d = \frac{1-00}{10}$

$I_{L_{SR}} = 10\,A$

$i_{L_{max}} = \frac{\Delta i_L}{2} + I_B = 40,3\,A$

$i_{L_{MIN}} = 26,33\,A$

$i_c = i_d$