$U_n := 230V \qquad I_n := 26.0A \qquad \omega_n := 150\frac{rad}{s} \qquad R_a := 1.1\Omega \qquad L_a := 0.01H$

$\Sigma J := 0.32kg\cdot m^2$

$U_b := U_n \qquad I_b := I_n \qquad \omega_b := \omega_n \qquad 0.667\cdot\omega_b = 100.05\cdot\frac{rad}{s} \qquad \Psi_{fn} := \frac{U_n - R_a\cdot I_n}{\omega_n}$

$\Psi_{fn} = 1.343\ Wb$

$M_{en} := \Psi_{fn}\cdot I_n = 34.909\cdot N\cdot m \qquad m_{mo} := \frac{M_{en}}{3} = 11.636\cdot N\cdot m \qquad k := 0.1\cdot\frac{M_{en}}{\omega_n} \qquad k = 0.023\frac{kg\cdot m^2}{s}$

Željeni dijagram brzine: Vreme nije normalizovano.

$$\omega(t) := \begin{cases} 0 & \text{if } t < 0s \\ \left(100\cdot\frac{rad}{s^2}t\right) & \text{if } 0s \le t < 1s \\ 100\frac{rad}{s} & \text{if } 1s \le t < 2s \\ \left[100\frac{rad}{s} - 100\cdot\frac{rad}{s^2}\cdot(t - 2s)\right] & \text{if } 2s \le t < 3s \\ 0 & \text{if } t \ge 3s \end{cases}$$

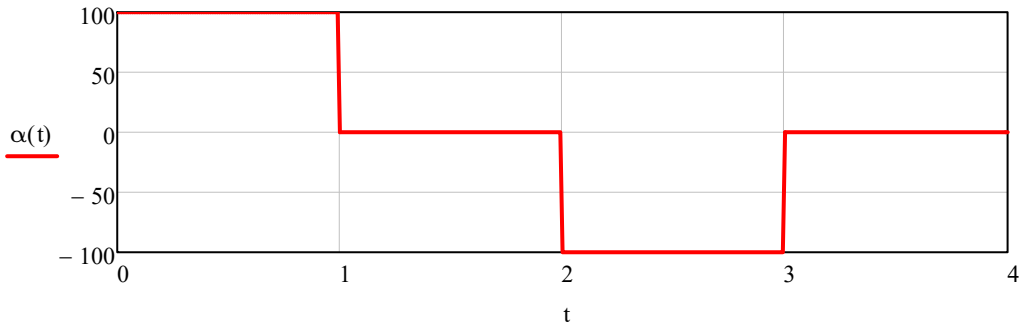
$m_m(t) := \frac{M_{en}}{3} + k\cdot\omega(t)$

$t := 0s, 0.01s .. 4s$

Moment ima statički i dinamičku komponentu. Dinamička komponenta je proporcionalna ubrzanju.

$$\alpha(t) := \begin{cases} 0 \quad \text{if } t < 0s \\ \left(100 \frac{rad}{s^2}\right) \quad \text{if } 0s \le t < 1s \\ 0 \quad \text{if } 1s \le t < 2s \\ \left(-100 \frac{rad}{s^2}\right) \quad \text{if } 2s \le t < 3s \\ 0 \quad \text{if } t \ge 3s \end{cases}$$

$$\alpha(t) := \frac{d}{dt}\omega(t)$$



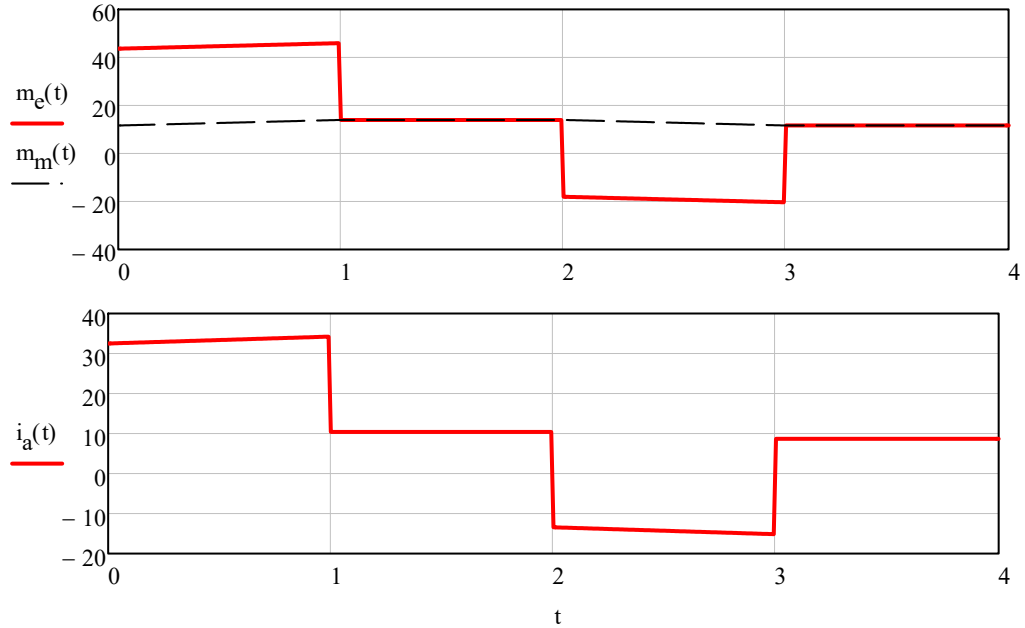
$$m_e(t) := m_m(t) + \Sigma J \cdot \alpha(t) \qquad i_a(t) := \frac{m_e(t)}{\Psi_{fn}}$$

$m_e(0 \cdot s) = 43.636 \cdot N \cdot m$ $m_e(0.99 \cdot s) = 45.94 \cdot N \cdot m$ $m_e(1 \cdot s) = 13.964 \cdot N \cdot m$ $m_e(1.99 \cdot s) = 13.964 \cdot N \cdot m$

$m_e(2 \cdot s) = -18.036 \cdot N \cdot m$ $m_e(2.99 \cdot s) = -20.34 \cdot N \cdot m$ $m_e(3 \cdot s) = 11.636 \cdot N \cdot m$ $m_e(3.99 \cdot s) = 11.636 \cdot N \cdot m$

$i_a(0 \cdot s) = 32.5 \cdot A$ $i_a(0.99 \cdot s) = 34.216 \cdot A$ $i_a(1.0 \cdot s) = 10.4 \cdot A$ $i_a(1.99 \cdot s) = 10.4 \cdot A$

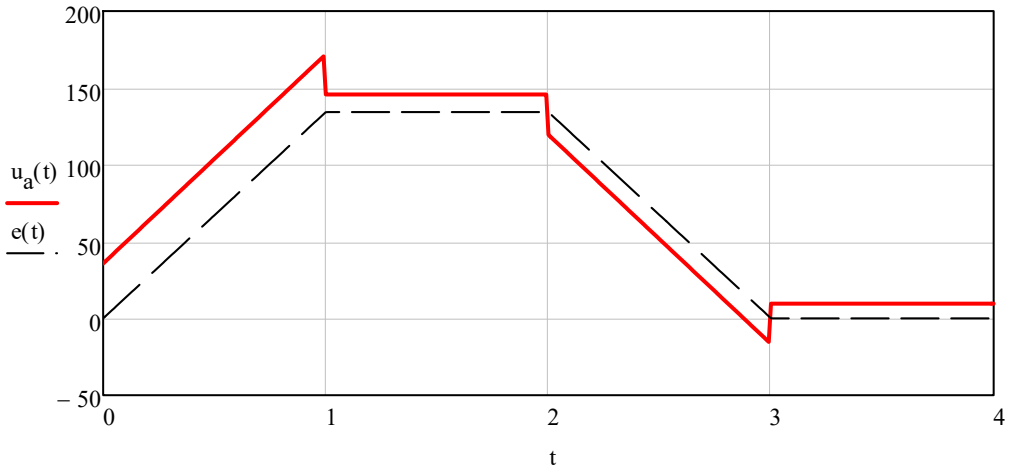
$i_a(2.0 \cdot s) = -13.433 \cdot A$ $i_a(2.99 \cdot s) = -15.149 \cdot A$ $i_a(3.0 \cdot s) = 8.667 \cdot A$ $i_a(3.99 \cdot s) = 8.667 \cdot A$



$e(t) := \omega(t) \cdot \Psi_{fn}$ $u_a(t) := \omega(t) \cdot \Psi_{fn} + R_a \cdot i_a(t)$

$u_a(0) = 35.75\ V$ $u_a(0.999 \cdot s) = 171.787\ V$ $u_a(1 \cdot s) = 145.707\ V$ $u_a(1.99 \cdot s) = 145.707\ V$

$u_a(2.0 \cdot s) = 119.49\ V$ $u_a(2.99 \cdot s) = -15.321\ V$ $u_a(3.0s) = 9.533\ V$ $u_a(3.99s) = 9.533\ V$



C) Kada se motor isključi sa napajanja u trenutku t=2s, struja indukta i moment motora postaju jednaki nuli. Kako se motor pre tog trenutka nalazio u stacionarnom stanju definisanom određenim momentom i brzinom, pod uticajem opterećenja, koje je pretežno potencijalno, počeće da usporava, sa tendencijom da počne da se obrće u suprotnu stranu velikom brzinom, koju diktira opterećenje. Zbog toga odmah treba aktivirati mehaničku kočnicu. U suprotnom, motor će se zaletati u suprotnu stranu dok se potencijalna i reaktivna komponenta opterećenja ne izjednače.

REŠENJE U RELATIVNIM JEDINICAMA

$U_n := 230V$ $I_n := 26A$ $\Omega_n := 150\,\frac{rad}{s}$ $R_a := 1.1\Omega$ $L_a := 0.01H$

$\Sigma J := 0.32kg\cdot m^2$ $\Sigma J = 0.32\,kg\cdot m^2$ $rj \equiv 1$ $T_a := \frac{L_a}{R_a}$ $T_a = 9.091 \times 10^{-3}\,s$

$U_b := U_n$ $I_b := I_n$ $\Omega_b := \Omega_n$ $\Psi_{fn} := \frac{U_n - R_a\cdot I_n}{\Omega_n}$

$M_b := \frac{U_b\cdot I_b}{\Omega_b} = 39.867\cdot N\cdot m$ $T_m := \frac{\Sigma J\cdot \Omega_b}{M_b} = 1.204s$ $R_b := \frac{U_b}{I_b} = 8.846\,\Omega$

Normalizovane vrednosti: $r_a := \frac{R_a}{R_b} = 0.124\,rj$ $\psi_{fn} := 1 - r_a = 0.876\,rj$

$m_{en} := \psi_{fn}\cdot 1rj$ $\omega_n := 1\cdot rj$

$\alpha_1 := \frac{100}{150} = 0.667$

$M_{en} := \Psi_{fn}\cdot I_n = 34.909N\cdot m$ $M_{mo} := \frac{M_{en}}{3} = 11.636N\cdot m$ $K := 0.1\cdot\frac{M_{en}}{\Omega_b}$ $K = 0.023\frac{kg\cdot m^2}{s}$

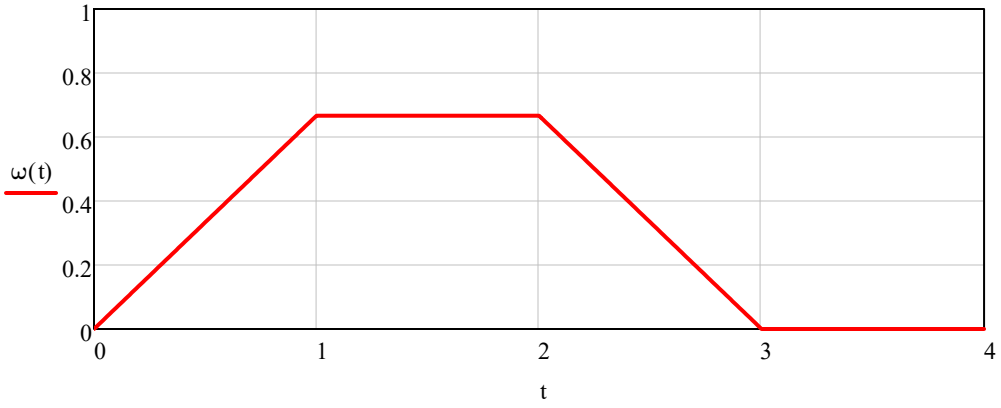
$m_{m0} := \frac{M_{mo}}{M_b}$ $m_{m0} = 0.292\,rj$ $k := 0.1\cdot\frac{m_{en}}{\omega_n}$ $k = 0.088\,rj$

Željeni dijagram brzine: Vreme nije normalizovano.

$$\omega(t) := \begin{cases} 0 \text{ if } t < 0s \\ \left(\alpha_1\cdot\frac{rj}{s}t\right) \text{ if } 0s \le t < 1s \\ \alpha_1\,rj \text{ if } 1s \le t < 2s \\ \left[\alpha_1\,rj - \alpha_1\cdot\frac{rj}{s}\cdot(t - 2s)\right] \text{ if } 2s \le t < 3s \\ 0 \text{ if } t \ge 3s \end{cases}$$

$t := 0s, 0.01s .. 4s$

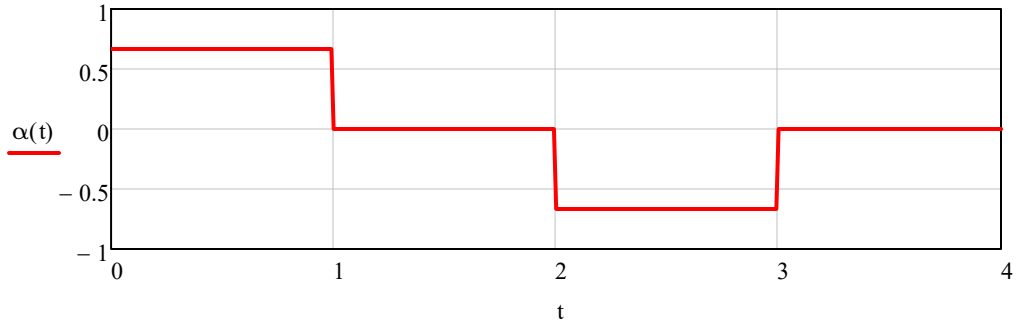
$m_m(t) := m_{m0} + k\cdot\omega(t)$



Moment ima statički i dinamičku komponentu. Dinamička komponenta je proporcionalna ubrzanju.

$$\alpha(t) := \begin{cases} 0 \ \text{if} \ t < 0s \\ \left(\alpha_1 \frac{rj}{s}\right) \ \text{if} \ 0s \le t < 1s \\ 0 \ \text{if} \ 1s \le t < 2s \\ \left(-\alpha_1 \frac{rj}{s}\right) \ \text{if} \ 2s \le t < 3s \\ 0 \ \text{if} \ t \ge 3s \end{cases}$$

$$\alpha(t) := \frac{d}{dt}\omega(t)$$



$$m_e(t) := m_m(t) + T_m \cdot \alpha(t) \qquad i_a(t) := \frac{m_e(t)}{\psi_{fn}}$$

$m_e(0s) = 1.095 \cdot rj$

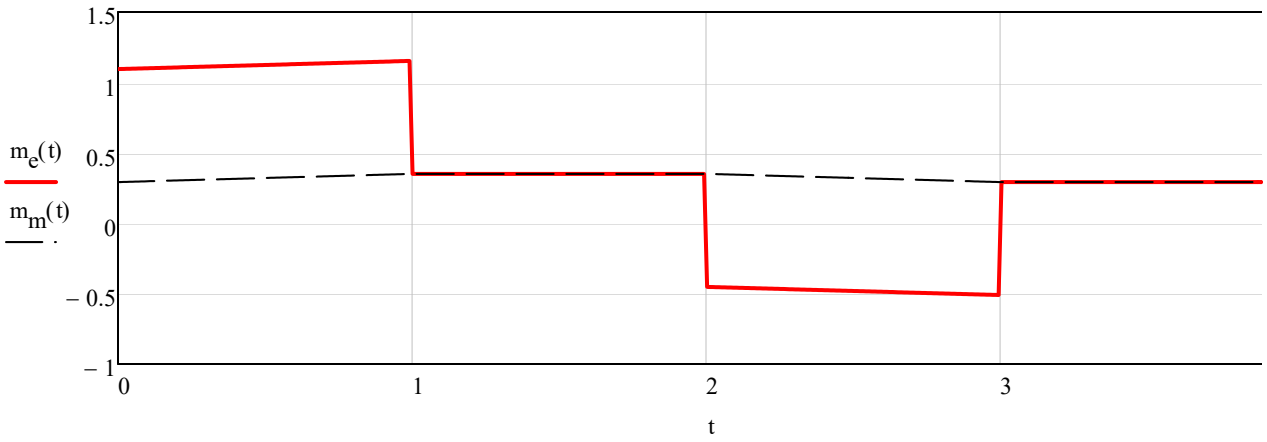
$m_e(0.99s) = 1.152 \cdot rj$

$m_e(1.0s) = 0.35 \cdot rj$

$m_e(1.99s) = 0.35 \cdot rj$

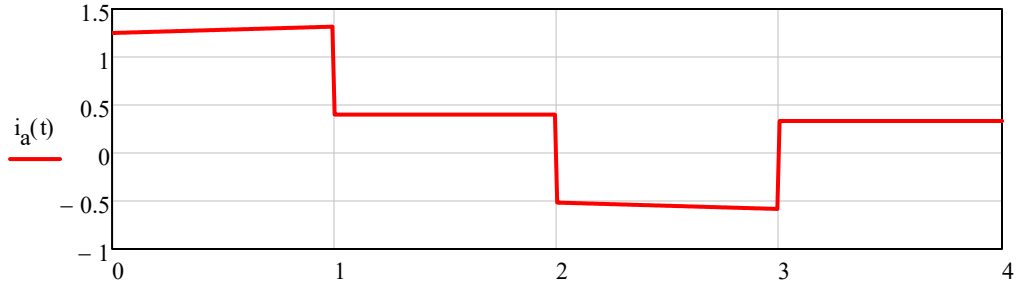
$m_e(2s) = -0.452 \cdot rj$

$m_e(2.99 \cdot s) = -0.51 \cdot rj$ $\qquad m_e(3s) = 0.292 \cdot rj$

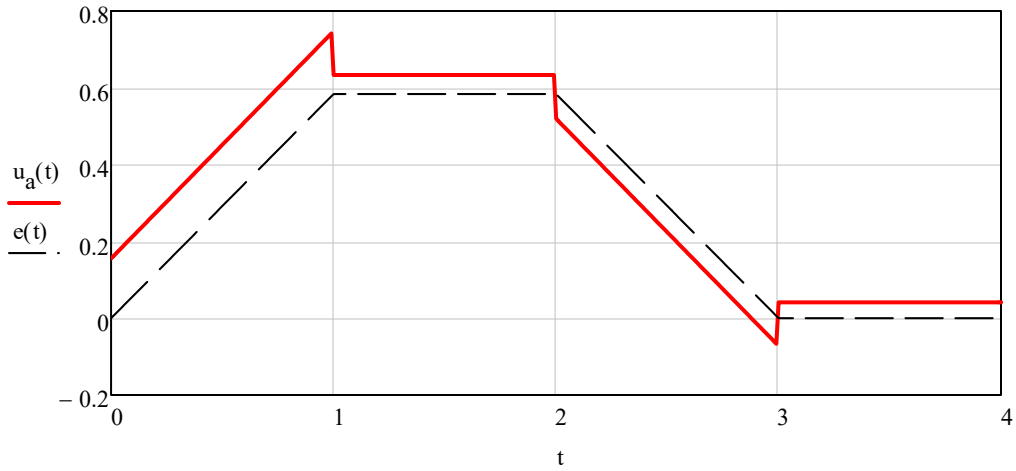


$i_a(0s) = 1.25 \cdot rj$ $i_a(0.99s) = 1.316 \cdot rj$ $i_a(1.0s) = 0.4 \cdot rj$ $i_a(1.99s) = 0.4 \cdot rj$

$i_a(2.0s) = -0.517 \cdot rj$ $i_a(2.99 \cdot s) = -0.583 \cdot rj$ $i_a(3.0s) = 0.333 \cdot rj$ $i_a(3.99s) = 0.333 \cdot rj$



$e(t) := \omega(t) \cdot \psi_{fn}$ $u_a(t) := \omega(t) \cdot \psi_{fn} + r_a \cdot i_a(t)$



$u_a(0.0s) = 0.155 \cdot rj$ $u_a(0.99s) = 0.742 \cdot rj$ $u_a(1.0s) = 0.634 \cdot rj$ $u_a(1.99s) = 0.634 \cdot rj$

$u_a(2.0s) = 0.52 \cdot rj$ $u_a(2.99s) = -0.067 \cdot rj$ $u_a(3.0s) = 0.041 \cdot rj$