$U_{an} := 230V$ $I_{an} := 26.1A$ $P_n := 5kW$ $\omega_n := 150 \cdot \frac{rad}{s}$

$R_a := 1.1\Omega$ $L_a := 10mH$ $J_m := 0.06kg \cdot m^2$ $T_a := \frac{L_a}{R_a} = 9.091 \cdot ms$

$D := 0.1m$ $J_b := 0.1kg \cdot m^2$ $c := 60 \frac{N \cdot m}{rad}$

Usvojimo bazne vrednosti:

$U_b := U_{an}$ $I_b := I_{an}$ $\omega_b := \omega_n$ $\Delta\theta_b := 1rad$ Osnovne bazne veličine

$R_b := \frac{U_b}{I_b}$ $M_b := \frac{U_b \cdot I_b}{\omega_b}$ $\psi_{fb} := \frac{U_b}{\omega_b}$ Izvedene bazne veličine

Normalizacija

$R_{a\_} := \frac{R_a}{R_b}$ $\psi_{fn} := \frac{U_{an} - R_a \cdot I_{an}}{\omega_n} = 1.342\,Wb$ $\psi_{fn\_} := \frac{\psi_{fn}}{\psi_{fb}}$ ili $1 - R_{a\_} = 0.875$

$T_{m1} := \frac{J_m \cdot \omega_b}{M_b} \cdot \frac{1}{s}$ $T_{m2}(M_t) := \left(J_b + \frac{M_t \cdot D^2}{4}\right) \cdot \frac{\omega_b}{M_b} \cdot \frac{1}{s}$ $c\_ := c \cdot \frac{\Delta\theta_b}{M_b} = 1.499$

$T_{m1} = 0.225$ $T_a := T_a \cdot \frac{1}{s}$ $g = 9.807 \frac{m}{s^2}$

Matrica sistema

$$A\_(M_t) := \begin{pmatrix} -\frac{1}{T_a} & -\frac{\psi_{fn\_}}{R_{a\_} \cdot T_a} & 0 & 0 \\ \frac{\psi_{fn\_}}{T_{m1}} & 0 & 0 & -\frac{c\_}{T_{m1}} \\ 0 & 0 & 0 & \frac{c\_}{T_{m2}(M_t)} \\ 0 & 1 & -1 & 0 \end{pmatrix}$$

Matrica ulaza

$$B(M_t) := \begin{pmatrix} \frac{1}{R_{a\_} \cdot T_a} & 0 \\ 0 & 0 \\ 0 & -\frac{1}{T_{m2}(M_t)} \\ 0 & 0 \end{pmatrix}$$

B) Stacionarno stanje

$u_{aB} := 0.5 \qquad i_{aB} := \frac{20A}{I_b} = 0.766$

Sistem jednačina koje treba rešiti

$U_a - \omega_1 \cdot \psi_{fn} - R_a \cdot I_a = 0$

$\psi_{fn} \cdot I_a - c \cdot \Delta\theta = 0$

$\omega_1 = \omega_2 \qquad m_m = c \cdot \Delta\theta$

$\omega_{1B} := \frac{u_{aB} - R_{a\_} \cdot i_{aB}}{\psi_{fn\_}} = 0.462 \qquad \Delta\theta_B := \frac{\psi_{fn\_} \cdot i_{aB}}{c\_} = 0.447 \qquad m_m := c\_ \cdot \Delta\theta_B = 0.671$

$M_{tB} := m_m \cdot M_b \cdot \frac{2}{g \cdot D} = 54.736\,kg$

C) promena smera - spuštanje tereta

$u_{aC} := -0.5$ Promena polariteta napona indukta

$i_{aC} := \frac{m_m}{\psi_{fn\_}} = 0.766 \qquad \omega_{1C} := \frac{u_{aC} - R_{a\_} \cdot i_{aC}}{\psi_{fn\_}} = -0.681 \qquad \Delta\theta_C := \frac{\psi_{fn\_} \cdot i_{aC}}{c\_} = 0.447$

$u_{aC2} := 0.5 \qquad \psi_{fnC} := -\psi_{fn\_}$ Promena polariteta napona pobude
tj. promena smera pobude.

$i_{aC2} := \frac{m_m}{\psi_{fnC}} = -0.766 \qquad \omega_{1C2} := \frac{u_{aC2} - R_{a\_} \cdot i_{aC2}}{\psi_{fnC}} = -0.681 \qquad \Delta\theta_{C2} := \frac{\psi_{fnC} \cdot i_{aC2}}{c\_} = 0.447$

D) vrednosti matrica

$T_{m2}(M_{tB}) \cdot s = 0.888\,s$

$A\_(M_{tB}) = \begin{pmatrix} -110 & -771.226 & 0 & 0 \\ 3.892 & 0 & 0 & -6.667 \\ 0 & 0 & 0 & 1.689 \\ 0 & 1 & -1 & 0 \end{pmatrix} \qquad B(M_{tB}) = \begin{pmatrix} 881.226 & 0 \\ 0 & 0 \\ 0 & -1.127 \\ 0 & 0 \end{pmatrix}$

$\text{eigenvals}(A\_(M_{tB})) = \begin{pmatrix} -60.4 \\ -49.354 \\ -0.123 + 1.298i \\ -0.123 - 1.298i \end{pmatrix}$