

Unc für tutte trenne

$$A = E_{in} - AG_i H_i \quad \Rightarrow \quad 0 = E_{in} - AG_i H_i - A \quad \Rightarrow \quad A(G_i H_i - 1) + E_{in} = 0 \quad \Rightarrow \quad \frac{E_{in}}{G_i H_i - 1} = A$$

$$B = EG_i - DG_4 H_3$$

$$B = \frac{E_{in} G_i}{G_i H_i + 1} - DG_4 H_3$$

$$C = BG_3 + EG_7 G_8 H_3$$

$$C = \left(\frac{E_{in} G_i}{G_i H_i + 1} - DG_4 H_3 \right) G_3 + EG_7 G_8 H_3$$

$$D = C + DG_4 G_5 H_4$$

$$D = \left(\frac{E_{in} G_i}{G_i H_i + 1} - DG_4 H_3 \right) G_3 + EG_7 G_8 H_3 + DG_4 G_5 H_4 \Rightarrow D = \frac{E_{in} G_i G_3}{G_i H_i + 1} - DG_4 H_3 G_3 + EG_7 G_8 H_3 + DG_4 G_5 H_4 \Rightarrow D = D(-G_4 H_3 G_3 + G_4 G_5 H_4 - 1) + \frac{E_{in} G_i G_3}{G_i H_i + 1} + EG_7 G_8 H_3$$

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$$\frac{\frac{E_{in} G_i G_3}{G_i H_i + 1} + EG_7 G_8 H_3}{G_4 H_3 G_3 - G_4 G_5 H_4 + 1} = D$$

$$E = DG_4 G_5 G_6 - EG_7 G_8 H_5$$

$$E = \frac{\frac{E_{in} G_i G_3}{G_i H_i + 1} + EG_7 G_8 H_3}{G_4 G_5 G_6 - G_4 G_5 H_4 + 1} G_4 G_5 G_6 - EG_7 G_8 H_5 \Rightarrow 0 = \frac{E_{in} G_i G_3 G_4 G_5 G_6}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)(G_i H_i + 1)} + \frac{EG_7 G_8 H_3 G_4 G_5 G_6}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)} - EG_7 G_8 H_5 - E$$

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$$\Rightarrow 0 = \frac{E_{in} G_i G_3 G_4 G_5 G_6}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)(G_i H_i + 1)} + E \left(\frac{G_7 G_8 H_3 G_4 G_5 G_6}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)} - G_7 G_8 H_5 - 1 \right) \Rightarrow E = \frac{\frac{E_{in} G_i G_3 G_4 G_5 G_6}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)(G_i H_i + 1)}}{\left(\frac{G_7 G_8 H_3 G_4 G_5 G_6}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)} + G_7 G_8 H_5 + 1 \right)}$$

$$Y = EG_7 G_8$$

$$Y = \frac{\frac{E_{in} G_i G_3 G_4 G_5 G_6 G_7 G_8}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)(G_i H_i + 1)}}{\left(\frac{G_7 G_8 H_3 G_4 G_5 G_6}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)} + G_7 G_8 H_5 + 1 \right)} \Rightarrow \frac{Y}{E_{in}} = \frac{\frac{G_i G_3 G_4 G_5 G_6 G_7 G_8}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)(G_i H_i + 1)}}{\left(\frac{G_7 G_8 H_3 G_4 G_5 G_6}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)} + G_7 G_8 H_5 + 1 \right)} \Rightarrow \frac{Y}{E_{in}} = \frac{\frac{G_i G_3 G_4 G_5 G_6 G_7 G_8}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)(G_i H_i + 1)}}{\left(\frac{G_7 G_8 H_3 G_4 G_5 G_6}{(G_4 H_3 G_3 - G_4 G_5 H_4 + 1)} + G_7 G_8 H_5 + 1 \right)}$$

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$$\Rightarrow \frac{Y}{E_{in}} = \frac{\frac{G_i G_3 G_4 G_5 G_6 G_7 G_8}{(G_i H_i + 1)}}{-G_7 G_8 H_3 G_4 G_5 G_6 + G_7 G_8 H_5 (G_4 H_3 G_3 - G_4 G_5 H_4 + 1) + (G_4 H_3 G_3 - G_4 G_5 H_4 + 1)}$$

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$$\Rightarrow \frac{Y}{E_{in}} = \frac{\frac{G_i G_3 G_4 G_5 G_6 G_7 G_8}{(G_i H_i + 1)}}{\left(-G_7 G_8 H_3 G_4 G_5 G_6 + (G_4 H_3 G_3 - G_4 G_5 H_4 + 1)(G_7 G_8 H_5 + 1) \right) (G_i H_i + 1)}$$

$$G_1 = \frac{K}{2S} \begin{bmatrix} Lo & K_2 \\ L_2 & O \end{bmatrix}$$

$$G_2 = \frac{1}{LS+R_2} \begin{bmatrix} Lo & I_2 \\ L_2 & R_2 \end{bmatrix}$$

$$G_3 = \begin{bmatrix} K_1 \\ Lo & O \end{bmatrix}$$

$$G_4 = \frac{1}{J_{nS+B_n}} \begin{bmatrix} Lo & I_2 \\ J_{nS+B_n} & O \end{bmatrix}$$

$$G_5 = \frac{1}{S} \begin{bmatrix} I_2 \\ L_1 & O \end{bmatrix}$$

$$G_6 = \begin{bmatrix} N \\ L_2 & O \end{bmatrix}$$

$$G_7 = \frac{K_L}{J_{nS+B_L}} \begin{bmatrix} Lo & K_2 \\ L_2 & R_2 \end{bmatrix}$$

$$G_8 = \frac{1}{S} \begin{bmatrix} Lo & I_2 \\ L_1 & O \end{bmatrix}$$

$$G \cdot G_2 G_3 G_4 G_5 G_6 G_7 G_8$$

$$\left(-G_2 G_8 H_3 G_4 G_5 G_6 + (G_4 H_2 G_2 G_3 - G_4 G_2 H_4 + 1) (G_7 G_8 H_5 + 1) \right) (G, H, +1)$$

$$\frac{K}{2S} \frac{1}{LS+R_2} K_1 \frac{1}{J_{nS+B_n}} \frac{1}{S} N \frac{K_L}{J_{nS+B_L}} \frac{1}{S}$$

$$\left(-\left(\frac{K_L}{J_{nS+B_L}} \frac{1}{S} NK_L \frac{1}{J_{nS+B_n}} \frac{1}{S} N \right) + \left(\left(\frac{1}{J_{nS+B_n}} K_1 \frac{1}{LS+R_2} K_1 \right) - \left(\frac{1}{J_{nS+B_n}} \frac{1}{S} N^2 K_L \right) + 1 \right) \left(\frac{K_L}{J_{nS+B_L}} \frac{1}{S} + 1 \right) \right) \left(\frac{K}{2S} \frac{1}{K} + 1 \right)$$

$$H_1 = \frac{1}{K}$$

$$H_2 = K_2$$

$$H_3 = NK_L$$

$$H_4 = -N^2 K_L$$

$$H_5 = 1$$

$$\frac{K}{2S} \frac{1}{LS+R_2} K_1 \frac{1}{J_{nS+B_n}} \frac{1}{S} N \frac{K_L}{J_{nS+B_L}} \frac{1}{S}$$

$$\left(-\left(\frac{K_L}{J_{nS+B_L}} \frac{1}{S} NK_L \frac{1}{J_{nS+B_n}} \frac{1}{S} N \right) + \left(\left(\frac{1}{J_{nS+B_n}} K_1 \frac{1}{LS+R_2} K_1 \right) + \left(\frac{1}{J_{nS+B_n}} \frac{1}{S} N^2 K_L \right) + 1 \right) \left(\frac{K_L}{J_{nS+B_L}} \frac{1}{S} + 1 \right) \right) \left(\frac{1}{2S} + 1 \right)$$

$$\frac{K}{2S} \frac{1}{LS+R_2} K_1 \frac{1}{J_{nS+B_n}} \frac{1}{S} N \frac{K_L}{J_{nS+B_L}} \frac{1}{S}$$

$$\left(\frac{K_L^2 N^2}{(J_{nS+B_L})(S)(J_{nS+B_n})(S)} + \left(\frac{K_1 K_1}{(J_{nS+B_n})(LS+R_2)(J_{nS+B_L})(S)} + \left(\frac{N^2 K_L}{(J_{nS+B_n})(S)} + 1 \right) \left(\frac{K_L}{(J_{nS+B_L})(S)} + 1 \right) \right) \left(\frac{1}{2S} + 1 \right) \right)$$

$$\frac{K}{2S} \frac{1}{LS+R_2} K_1 \frac{1}{J_{nS+B_n}} \frac{1}{S} N \frac{K_L}{J_{nS+B_L}} \frac{1}{S}$$

$$\left(\frac{K_L^2 N^2}{(J_{nS+B_L})(S)(J_{nS+B_n})(S)} + \left(\frac{K_1 K_1 K_L}{(J_{nS+B_n})(LS+R_2)(J_{nS+B_L})(S)} + \left(\frac{N^2 K_L^2}{(J_{nS+B_n})(S)(J_{nS+B_L})(S)} + \frac{K_L}{(J_{nS+B_L})(S)} + \left(\frac{K_1 K_1}{(J_{nS+B_n})(LS+R_2)(J_{nS+B_L})(S)} + \left(\frac{N^2 K_L}{(J_{nS+B_n})(S)} + 1 \right) \left(\frac{K_L}{(J_{nS+B_L})(S)} + 1 \right) \right) \left(\frac{1}{2S} + 1 \right) \right) \right)$$

$$\frac{K}{2S} \frac{1}{LS+R_2} K_1 \frac{1}{J_{nS+B_n}} \frac{1}{S} N \frac{K_L}{J_{nS+B_L}} \frac{1}{S}$$

$$\left(\frac{K_1^2 N^2}{(J_{nS+B_L})(S)(J_{nS+B_n})(S)(2S)} + \left(\frac{K_1 K_1 K_L}{(J_{nS+B_n})(LS+R_2)(J_{nS+B_L})(S)(2S)} - \left(\frac{N^2 K_L^2}{(J_{nS+B_n})(S)(J_{nS+B_L})(S)(2S)} \right) + \frac{K_L}{(J_{nS+B_L})(S)(2S)} + \left(\frac{K_1 K_1 (2S)}{(J_{nS+B_n})(LS+R_2)(J_{nS+B_L})(S)(2S)} - \left(\frac{N^2 K_L}{(J_{nS+B_n})(S)(2S)} + 1 \right) \left(\frac{K_L}{(J_{nS+B_L})(S)(2S)} + 1 \right) \right) \left(\frac{1}{2S} + 1 \right) \right)$$

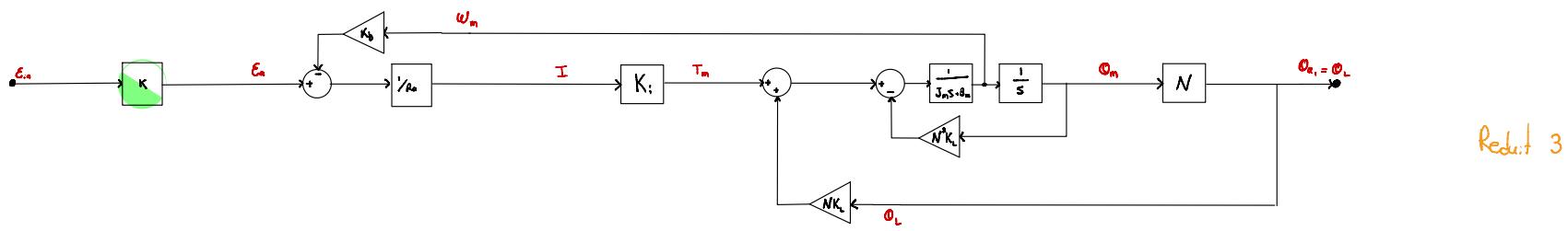
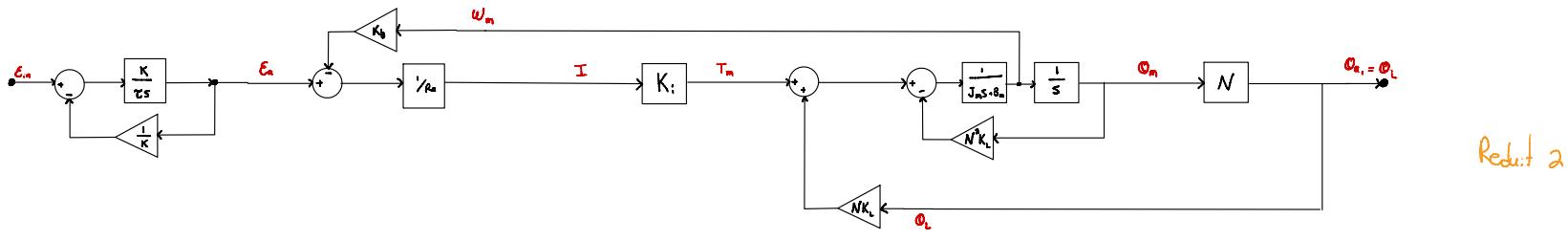
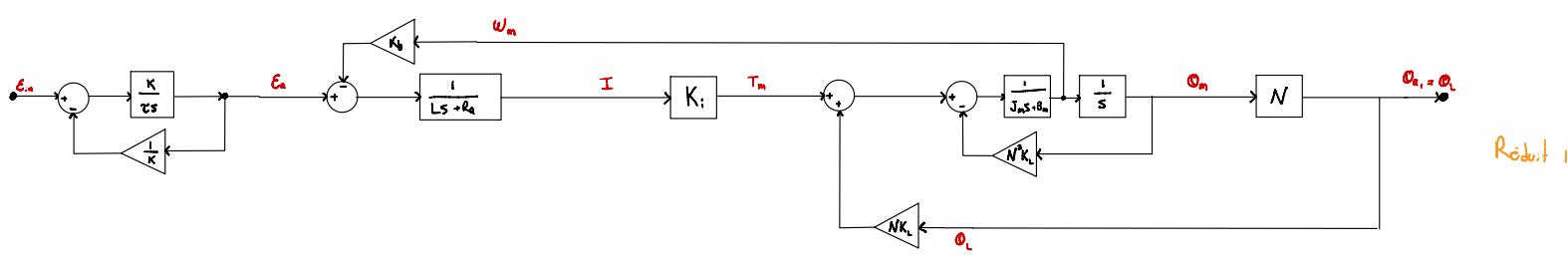
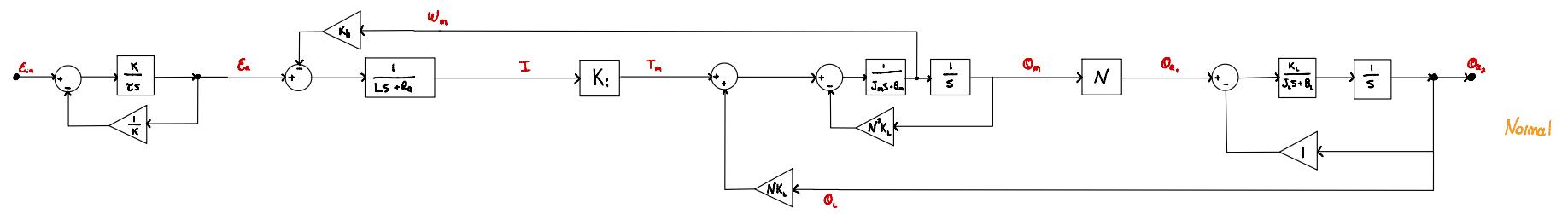
$$- \left(\frac{N^2 K_L}{(J_{nS+B_L})(S)(2S)} + \left(\frac{K_1 K_1}{(J_{nS+B_n})(LS+R_2)(J_{nS+B_L})(S)(2S)} - \left(\frac{N^2 K_L}{(J_{nS+B_n})(S)(2S)} + 1 \right) \left(\frac{K_L}{(J_{nS+B_L})(S)(2S)} + 1 \right) \right) \left(\frac{1}{2S} + 1 \right) \right)$$

$$K K_1 N K_L$$

$$(S) \left((K_1 K_1 K_1) + (K_1 (J_{nS+B_n})(LS+R_2)) + (K_1 K_1 (J_{nS+B_L})(S)) + (N^2 K_L (LS+R_2)(J_{nS+B_L})) + ((J_{nS+B_n})(LS+R_2)(J_{nS+B_L}(S))) + (K_1 K_1 K_1 (2S)) + (K_1 (J_{nS+B_n})(LS+R_2)(2S)) + (K_1 K_1 (J_{nS+B_L})(S)(2S)) + (N^2 K_L (LS+R_2)(J_{nS+B_L})(2S)) + ((J_{nS+B_n})(LS+R_2)(J_{nS+B_L})(S)(2S)) \right)$$

$$K K_1 N K_L$$

$$(1+2S) \left((K_1 K_1 K_1 (S)) + (K_1 (J_{nS+B_n})(LS+R_2)(S)) + (K_1 K_1 (J_{nS+B_L})(S)(S)) + (N^2 K_L (LS+R_2)(J_{nS+B_L})(S)(S)) + ((J_{nS+B_n})(LS+R_2)(J_{nS+B_L})(S)(S)) \right)$$



Entwickl. Tm
Ziel: \$\Theta_m\$

$$T_m = J_m \Theta_m \ddot{s} + B_m \Theta_m s + N^2 K_L \Theta_m - N K_L \Theta_{L_2}$$

$$\frac{\Theta_{L_2}}{N}$$

$$T_m = \Theta_m (J_m s^2 + B_m s)$$

$$\Theta_m (s) (J_m s + B_m)$$

$$\frac{T_m}{(s)(J_m s + B_m)} = \Theta_m$$

$$\Theta_m = \frac{1}{J_m s + B_m} \cdot \frac{1}{s} \cdot \Theta_m$$