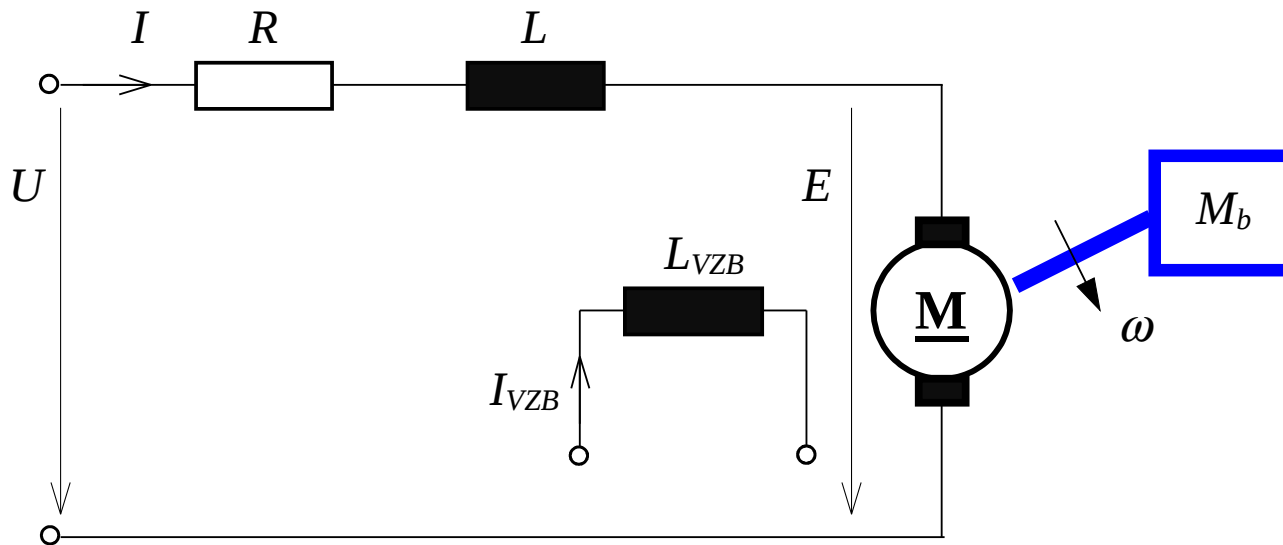




RT

◆ Prenosna funkcija tuje vzbujanega enosmernega motorja



$$F(s) = \frac{\omega(s)}{U(s)} = \frac{n(s)}{U(s)}$$

$$F_M(s) = \frac{\omega(s)}{M_b(s)}$$

RT Prenosna funkcija tuje vzbujanega enosmernega motorja

Mehanski del

$$M - M_b - M_D = 0 \quad M_D = J \frac{d\omega}{dt}$$

$$M = k\Phi I = k_1 I \quad (\Phi = \text{konst})$$

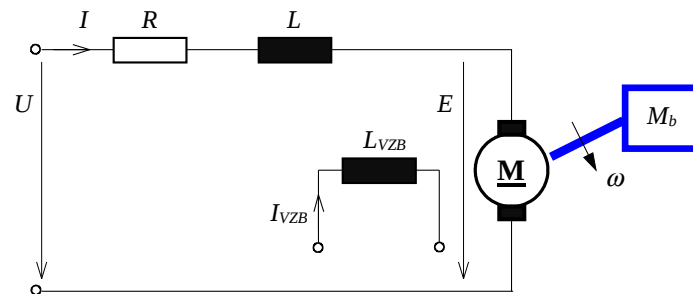
normiramo na $M_K = M_n \frac{I_K}{I_n}$ ob $I_K = \frac{U_n}{R}$

$$\frac{M_D}{M_K} = \frac{J}{M_K} \frac{d\omega}{dt} = \frac{J\omega_o}{M_K} \frac{d\frac{\omega}{\omega_o}}{dt} = T_Z \frac{d\frac{\omega}{\omega_o}}{dt} = T_Z \frac{d\frac{n}{n_o}}{dt}$$

T_Z ... zagonska časovna konstanta
 n_o ... vrtilna hitrost prostega teka

$$\frac{I}{I_K} - \frac{M_b}{M_K} - T_Z \frac{d\frac{n}{n_o}}{dt} = 0$$

linearizirana mehanska karakteristika motorja





RT Prenosna funkcija tuje vzbujanega enosmernega motorja

Mehanski del

Delovna točka:

$$I = I_o + \Delta I$$

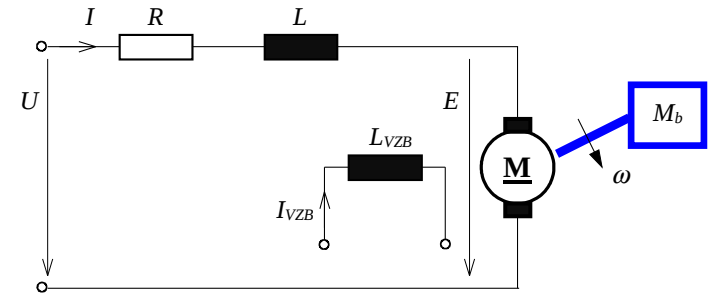
$$I_o = 0$$

$$M_b = M_{bo} + \Delta M_b$$

$$M_{bo} = 0$$

$$n = n_o + \Delta n$$

(prosti tek)



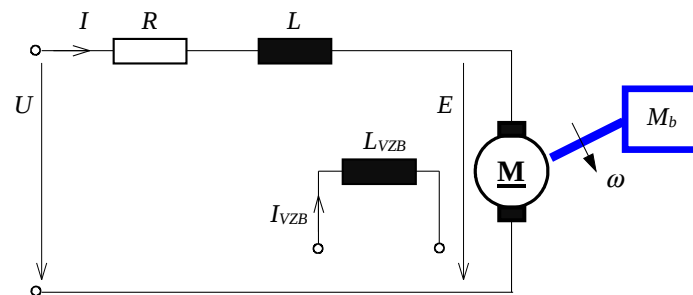
$$\frac{I}{I_K} - \frac{M_b}{M_K} - T_Z \frac{d \frac{n}{n_o}}{dt} = 0 \quad \rightarrow$$

$$\mathcal{L} \quad : \quad \frac{\Delta I}{I_K}(s) - \frac{\Delta M_b}{M_K}(s) = T_Z s \frac{\Delta n}{n_o}(s)$$

RT Prenosna funkcija tuje vzbujanega enosmernega motorja

Električni del

$$U = IR + L \frac{dI}{dt} + E \quad \text{delimo } R$$



$$\frac{U}{R} = I + \frac{L}{R} \frac{dI}{dt} + \frac{E}{R} \quad \text{normiramo na } I_K = \frac{U_n}{R}$$

$$\frac{U}{RI_K} = \frac{I}{I_K} + \frac{L}{R} \frac{d \frac{I}{I_K}}{dt} + \frac{E}{RI_K} = \frac{I}{I_K} + T_k \frac{d \frac{I}{I_K}}{dt} + \frac{E}{RI_K} \quad T_k \dots \text{ časovna konstanta kotve}$$

$$\frac{U}{U_n} = \frac{I}{I_K} + T_k \frac{d \frac{I}{I_K}}{dt} + \frac{E}{U_n} \quad E = k_2 \Phi n = k_3 n \quad (\Phi = \text{konst})$$



RT Prenosna funkcija tuje vzbujanega enosmernega motorja

Električni del

Delovna točka:

$$U = U_n + \Delta U$$

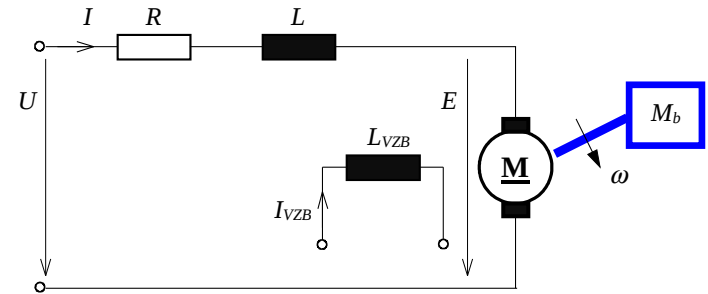
$$I = I_o + \Delta I$$

$$E = E_o + \Delta E$$

$$E_o = U_n$$

$$I_o = 0$$

(prosti tek)



$$\frac{U}{U_n} = \frac{I}{I_K} + T_k \frac{d \frac{I}{I_K}}{dt} + \frac{E}{U_n} \quad \rightarrow \quad \frac{\Delta U}{U_n} = \frac{\Delta I}{I_K} + T_k \frac{d \frac{\Delta I}{I_K}}{dt} + \frac{\Delta n}{n_o}$$

$$\mathcal{L} \quad : \quad \frac{\Delta U}{U_n}(s) = \frac{\Delta I}{I_K}(s) + T_k s \frac{\Delta I}{I_K}(s) + \frac{\Delta n}{n_o}(s)$$

RT Prenosna funkcija tuje vzbujanega enosmernega motorja

◆ Normirani zapis

$$\frac{\Delta U}{U_n}(s) = u(s)$$

$$\frac{\Delta n}{n_o}(s) = n(s)$$

$$\frac{\Delta I}{I_K}(s) = i(s)$$

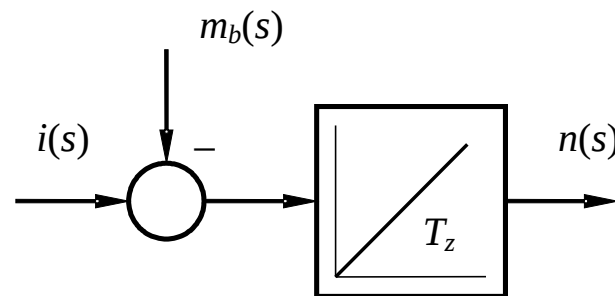
$$\frac{\Delta M_b}{M_K}(s) = m_b(s)$$

■ Mehanski del

$$\frac{\Delta I}{I_K}(s) - \frac{\Delta M_b}{M_K}(s) = T_Z s \frac{\Delta n}{n_o}(s)$$

$$i(s) - m_b(s) = T_Z s n(s)$$

$$\frac{n(s)}{i(s) - m_b(s)} = \frac{1}{sT_Z}$$



RT Prenosna funkcija tuje vzbujanega enosmernega motorja

◆ Normirani zapis

$$\frac{\Delta U}{U_n}(s) = u(s)$$

$$\frac{\Delta n}{n_o}(s) = n(s)$$

$$\frac{\Delta I}{I_K}(s) = i(s)$$

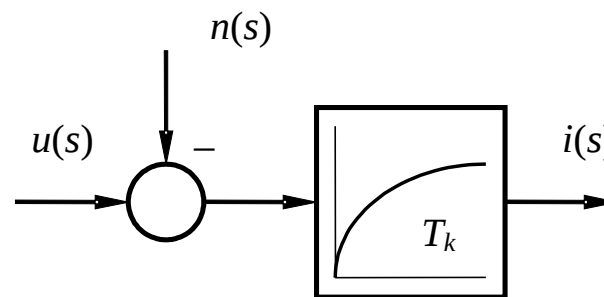
$$\frac{\Delta M_b}{M_K}(s) = m_b(s)$$

▪ Električni del

$$\frac{\Delta U}{U_n}(s) = \frac{\Delta I}{I_K}(s) + T_k s \frac{\Delta I}{I_K}(s) + \frac{\Delta n}{n_o}(s)$$

$$u(s) = i(s) + T_k s i(s) + n(s)$$

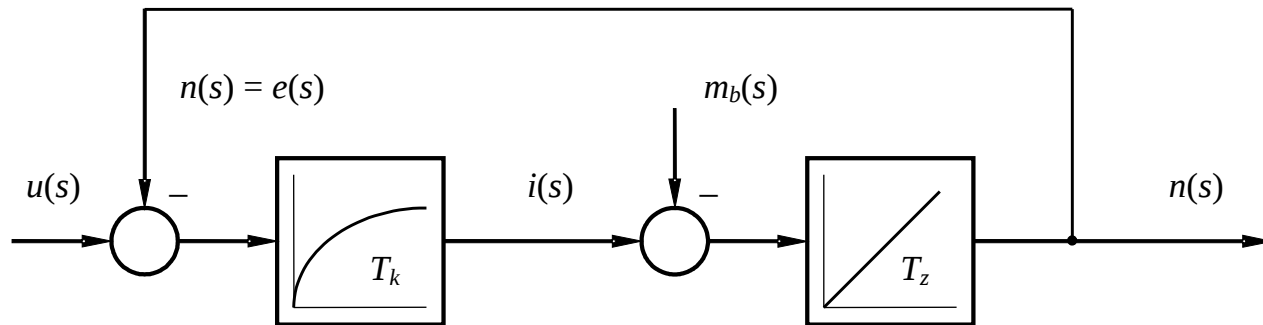
$$\frac{i(s)}{u(s) - n(s)} = \frac{1}{1 + sT_k}$$





RT Prenosna funkcija tuje vzbujanega enosmernega motorja

◆ Blokovna shema in prenosni funkciji



$$F(s) = \frac{n(s)}{u(s)} \quad F_o(s) = \frac{1}{1+sT_k} \frac{1}{sT_z} \quad \rightarrow \quad F(s) = \frac{1}{1+sT_z + s^2T_zT_k}$$

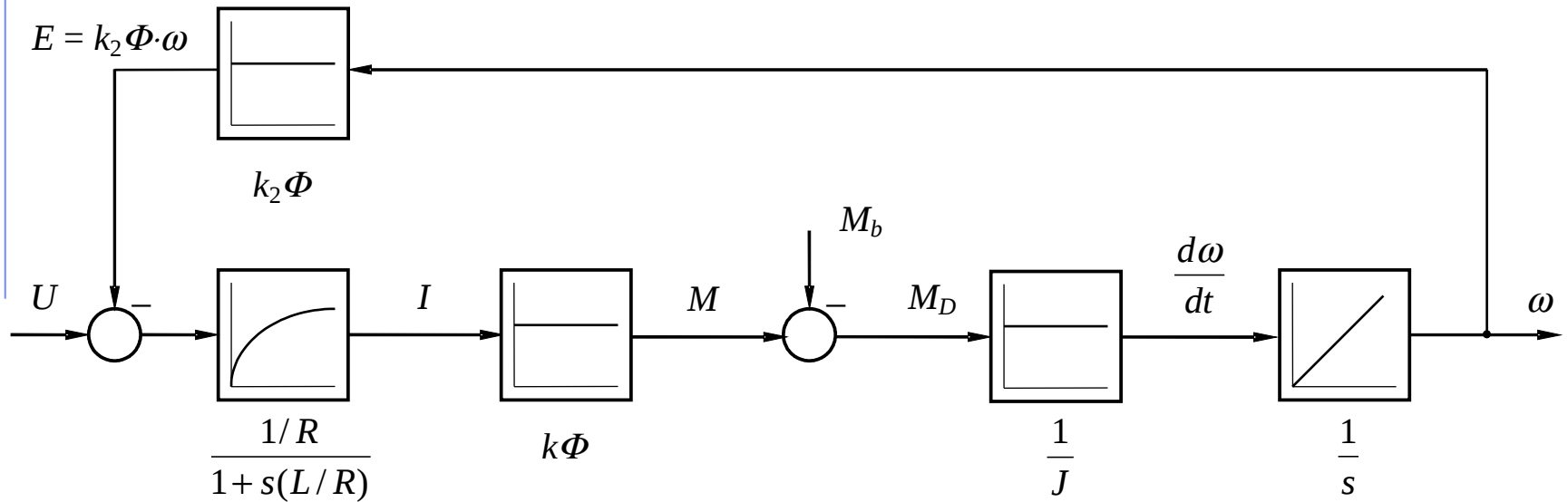
$$F_M(s) = \frac{n(s)}{m_b(s)} \quad F_M(s) = -\frac{1+sT_k}{1+sT_z + s^2T_zT_k}$$



RT

Prenosna funkcija tuje vzbujanega enosmernega motorja

◆ Blokovna shema - BREZ normiranja



$$F(s) = \frac{\omega(s)}{U(s)}$$

$$F(s) = \frac{\left(\frac{1}{k_2\Phi} \right)}{1 + s \left(\frac{RJ}{kk_2\Phi^2} \right) + s^2 \left(\frac{RJ}{kk_2\Phi^2} \frac{L}{R} \right)} = \frac{1/(k_2\Phi)}{1 + sT_Z + s^2T_ZT_k}$$

$$U_n = E_n = k_2\Phi \cdot \omega_o$$

$$M_K = k\Phi \cdot I_K = k\Phi \cdot \frac{U_n}{R} = k\Phi \cdot \frac{k_2\Phi \cdot \omega_o}{R}$$

$$T_Z = \frac{J\omega_o}{M_k} = \frac{RJ}{kk_2\Phi^2}$$

$$T_k = \frac{L}{R}$$