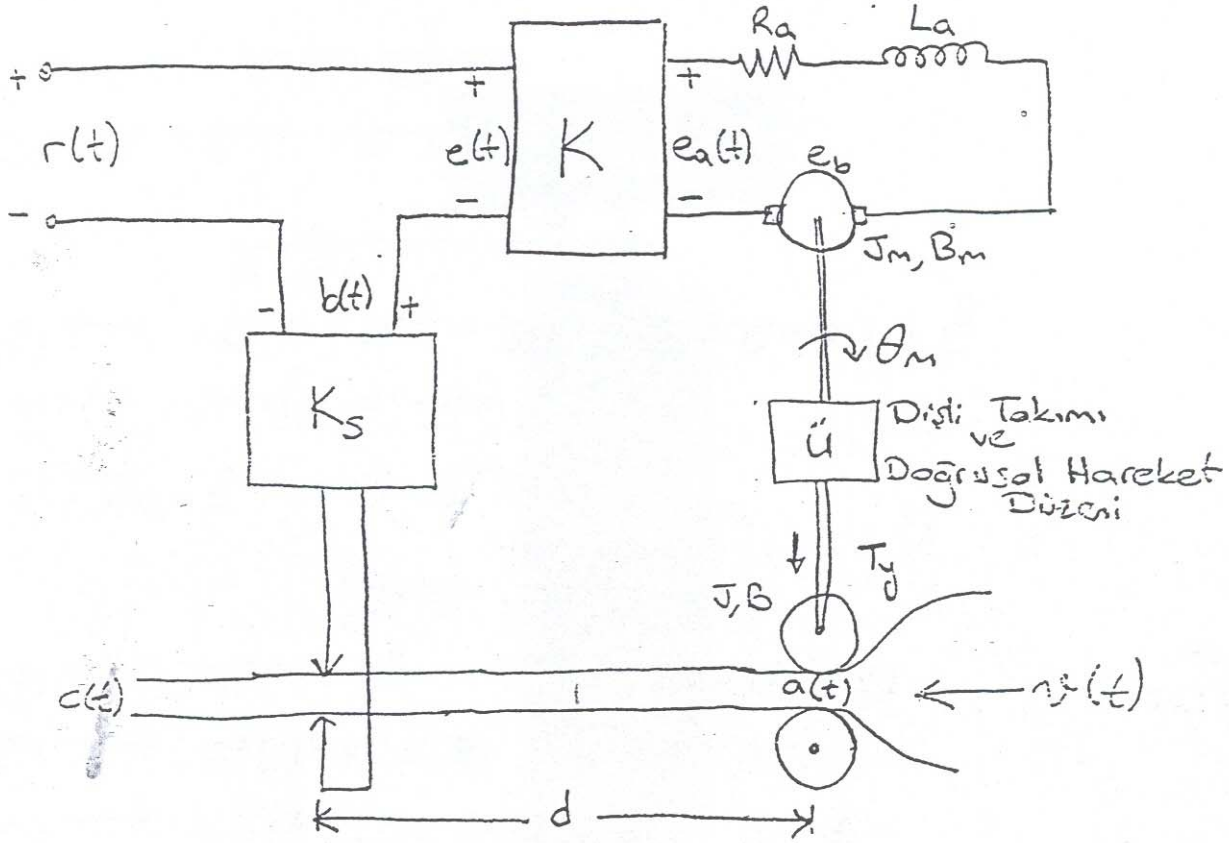
- Sac kalınlık ölçme düzenine ilişkin şematik diyagram aracılığıyla A.Ç.T.F ve K.Ç.T.F'nu elde ediniz.



$$e(t) = r(t) - b(t) \quad \text{..... ①}$$

$$e_a(t) = K \cdot e(t) \quad \text{----- ②}$$

$$e_a(t) - e_b(t) = L_a \frac{di_a}{dt} + R_a i_a(t) \quad \text{----- ③}$$

$$e_b(t) = K_b \omega_m(t) \quad \text{---- ④}$$

$$T_m(t) = K_a i_a(t) \quad \text{---- ⑤}$$

$$T_m(t) = J_{me} \frac{d\omega_m}{dt} + B_{me} \omega_m(t) + \ddot{u} T_y \quad \text{----- ⑥}$$

$$\frac{d\theta_m}{dt} = \omega_m(t) \quad \text{----} (7)$$

$$\times\ a(t) = \ddot{u}\,\theta_m(t) \quad \text{----} (8)$$

$$J_{me} = J_m + \ddot{u}^2 J \ ; \quad B_{me} = B_m + \ddot{u}^2 B \quad \text{----} (9)$$

$$c(t) = a(t-\tau) \quad \text{----} (10)$$

$$\tau = \frac{d}{v} \quad \text{---} (11)$$

$$b(t) = K_s \cdot c(t) \quad \text{---} (12)$$

① $\longrightarrow$ $E(s) = R(s) - B(s)$

② $\longrightarrow$ $E_a(s) = K \cdot E(s)$

③ $\longrightarrow$ $E_a(s) - E_b(s) = L_a \cdot s\, I_a(s) + R_a I_a(s)$

$$I_a(s) = \frac{E_a(s) - E_b(s)}{L_a \cdot s + R_a}$$

④ $\longrightarrow$ $E_b(s) = K_b \cdot \Omega_m(s)$

⑤ $\longrightarrow$ $T_m(s) = K_a \cdot I_a(s)$

⑥ $\longrightarrow$ $T_m(s) = J_{me} \cdot s\,\Omega_m(s) + B_{me}\,\Omega_m(s) + \ddot{u}\,T_y$

$$\Omega_m(s) = \frac{T_m(s) - \ddot{u}\,T_y}{s J_{me} + B_{me}}$$

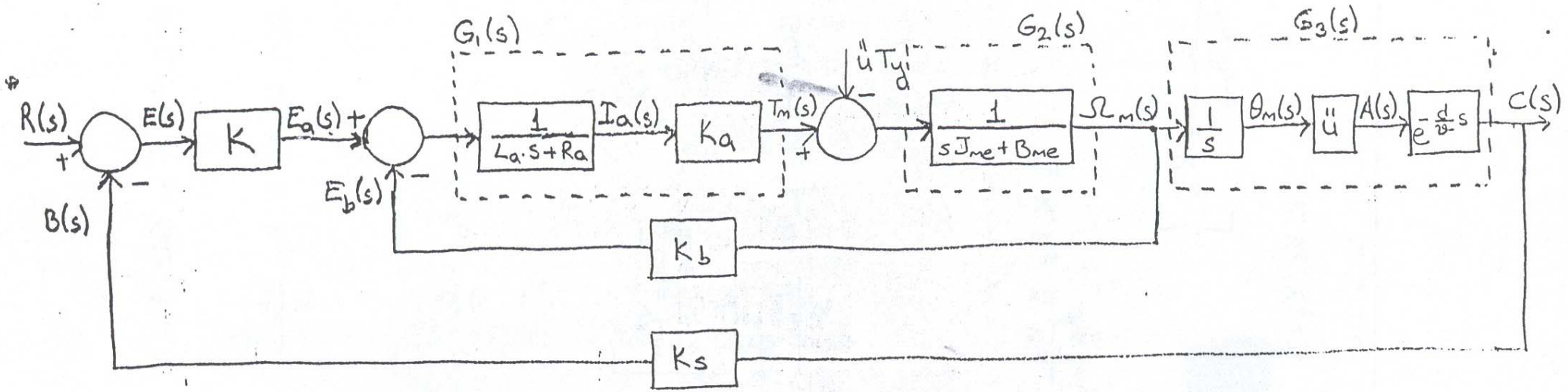
⑦ $\longrightarrow$ $s \cdot \theta_m(s) = \Omega_m(s)$

$$\theta_m(s) = \frac{\Omega_m(s)}{s}$$

⑧ $\longrightarrow$ ~~$A(s) = \ddot{u}\,\theta_m(s)$~~ $A(s) = \ddot{u}\,\theta_m(s)$

⑩ $\longrightarrow$ $C(s) = e^{-\frac{d}{v}s} A(s)$

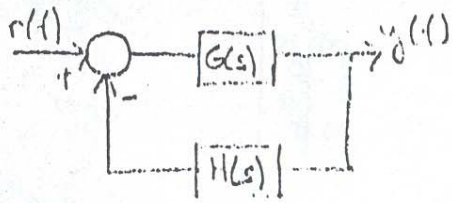
⑫ $\longrightarrow$ $B(s) = K_s \cdot C(s)$



$$G_1(s) = \frac{K_a}{L_a s + R_a} \quad ; \quad G_2(s) = \frac{1}{s J_{me} + B_{me}} \quad ; \quad G_3(s) = \frac{\ddot{u}\, e^{-\frac{d}{v}s}}{s}$$

$$H(s) = K_s$$

$$G(s) = K \cdot \frac{G_1(s)\, G_2(s)}{1 + K_b \cdot G_1(s)\, G_2(s)} \cdot G_3(s)$$



A.C.L.T. F = G(s) H(s) ; $T_y = 0$

$$G(s).H(s) = K.K_s.\frac{\ddot{u}e^{-\frac{d}{\dot{x}}s}}{s}.\frac{\frac{K_a}{(L_as+R_a)}.\frac{1}{(sJ_{me}+B_{me})}}{1+\frac{K_a.K_b}{(L_as+R_a)(sJ_{me}+B_{me})}}$$

$$= K.K_s.\frac{\ddot{u}e^{-\frac{d}{\dot{x}}s}}{s}.\frac{\frac{K_a/L_a}{\left(\frac{L_a}{R_a}s+1\right)}\;\frac{1/B_{me}}{\left(\frac{J_{me}}{B_{me}}s+1\right)}}{1+\frac{\frac{K_aK_b}{B_{me}.R_a}}{\left(\frac{L_a}{R_a}s+1\right)\left(\frac{J_{me}}{B_{me}}s+1\right)}}$$

$$\left[\frac{L_a}{R_a}=\tau_e \quad ; \quad \frac{J_{me}}{B_{me}}=\tau_m\right]$$

$$G(s).H(s) = K.K_s.\frac{\ddot{u}e^{-\frac{d}{\dot{x}}s}}{s}.\frac{\frac{K_a}{R_aB_{me}}}{(\tau_es+1)(\tau_ms+1)}\Big/1+\frac{\frac{K_aK_b}{B_{me}.R_a}}{(\tau_es+1)(\tau_ms+1)}$$

$$= K.K_s.\ddot{u}\frac{K_a}{R_aB_{me}}\;\frac{e^{-\frac{d}{\dot{x}}s}}{(\tau_es+1)(\tau_ms+1)+\frac{K_aK_b}{B_{me}R_a}}$$

$$\left[\frac{K_a}{R_aB_{me}}=K_t\right]$$

$$= K.K_s.K_t.\ddot{u}\;\frac{e^{-\frac{d}{\dot{x}}s}}{(\tau_es+1)(\tau_ms+1)+K_tK_b}$$

$$K.C.T.F \Rightarrow \quad T(s) = \frac{G(s)}{1 + G(s)\,H(s)}$$

$$T(s) = \frac{K\,K_t\,\ddot{u}\,e^{-\frac{d}{x}s}}{(\tau_e s + 1)(\tau_m s + 1) + K_t K_b + K\,K_t K_s \ddot{u}\,e^{-d_{12}s}}$$