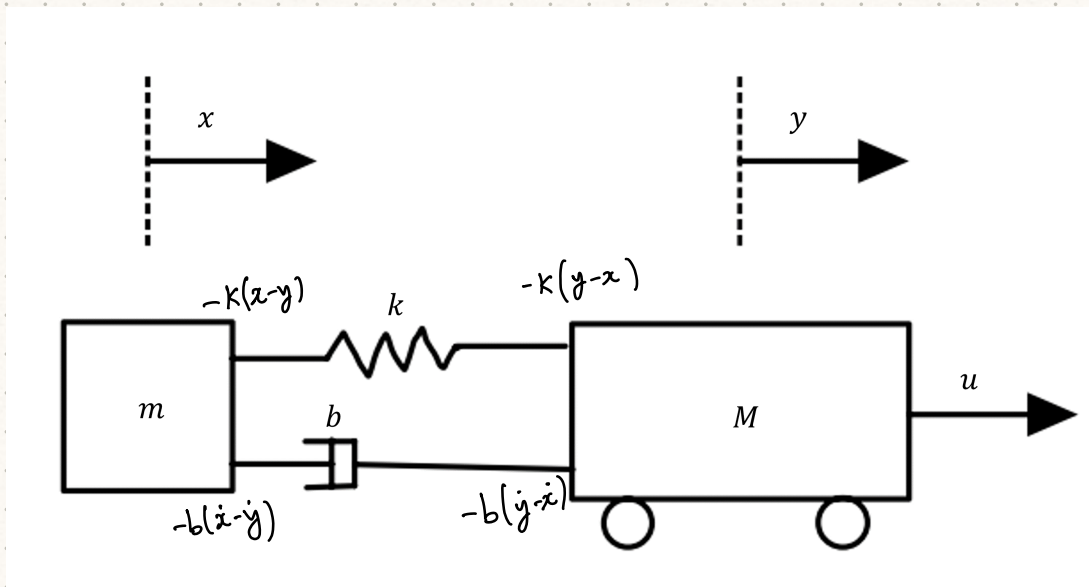


자동제어 한방에 끝내기

2. Dynamic Models



$$\sum F = ma$$

$$\text{오른쪽 } u - k(y-x) - b(\dot{y}-\dot{x}) = M\ddot{y}$$

$$\text{assume } \left. \begin{matrix} y(0), \dot{y}(0), \ddot{y}(0) \\ x(0), \dot{x}(0), \ddot{x}(0) \end{matrix} \right\} = 0$$

$$\text{왼쪽 } -k(x-y) - b(\dot{x}-\dot{y}) = m\ddot{x}$$

$$U(s) - k(Y(s) - X(s)) - b(sY(s) - sX(s)) = s^2 M Y(s)$$

$$-k(X(s) - Y(s)) - b(sX(s) - sY(s)) = s^2 m X(s)$$

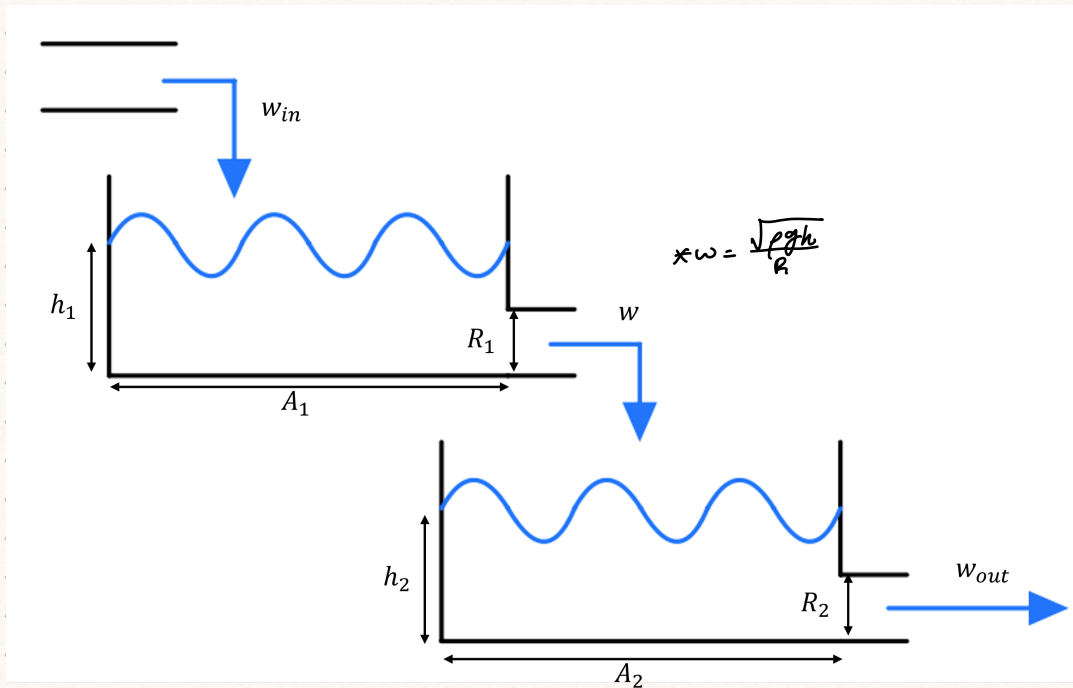
$$kY(s) + bsY(s) = s^2 m X(s) + bsX(s) + kX(s)$$

$$X(s) \{ms^2 + bs + k\} = (bs + k)Y(s) \rightarrow X(s) = \frac{bs + k}{ms^2 + bs + k} Y(s)$$

$$U(s) = (Ms^2 + bs + k)Y(s) - (bs + k)X(s)$$

$$U(s) = (Ms^2 + bs + k)Y(s) - \frac{(bs + k)^2}{ms^2 + bs + k} Y(s)$$

$$U(s) = \frac{(ms^2 + bs + k)^2 - (bs + k)^2}{(ms^2 + bs + k)} Y(s) \rightarrow \frac{Y(s)}{U(s)} = \frac{ms + bs + k}{(ms^2 + bs + k)^2 - (bs + k)^2}$$

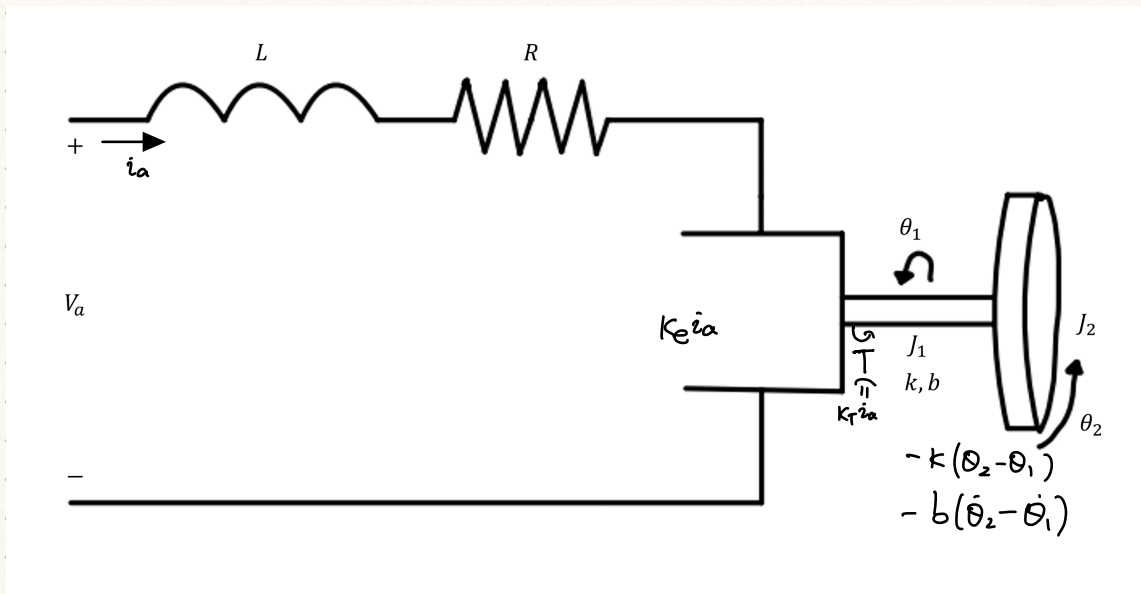


$$1^{st} \text{ eq } \rho \dot{V}_1 = \rho A_1 \dot{h}_1 = w_{in} - w = w_{in} - \frac{\sqrt{\rho g h_1}}{R_1}$$

$$2^{nd} \text{ eq } \rho \dot{V}_2 = \rho A_2 \dot{h}_2 = w - w_{out} = \frac{\sqrt{\rho g h_1}}{R_1} - \frac{\sqrt{\rho g h_2}}{R_2}$$

$$\rho A_1 \dot{h}_1 = w_{in} - \frac{\sqrt{\rho g h_1}}{R_1}$$

$$\rho A_2 \dot{h}_2 = \frac{\sqrt{\rho g h_1}}{R_1} - \frac{\sqrt{\rho g h_2}}{R_2}$$



$$\text{E}|\text{E}) \quad V_a - L \frac{di_a}{dt} - R i_a - K_e i_a = 0$$

$$\Sigma \tau = J \ddot{\theta}$$

$$\text{Disk 2) } J_2 \ddot{\theta}_2 = -k(\theta_2 - \theta_1) - b(\dot{\theta}_2 - \dot{\theta}_1)$$

$$\text{Shaft) } J_1 \ddot{\theta}_1 = T - k(\theta_1 - \theta_2) - b(\dot{\theta}_1 - \dot{\theta}_2)$$