JANUARY 29th 2019

PV = temperature $T_{ENVIRONMENT}$

$V_M = \omega_{MOTOR}, Flux_{TANK}, Volume_{TANK}, W_{TANK}, T_{TUBE}$

$V_C = V_{PS}$ (MOTOR) (power supply)

$$G = \frac{PV}{V_C} = \frac{T_{ENV}}{V_{PS}} = \frac{T_{ENV}}{V_M} \cdot \frac{V_M}{V_{PS}} = \frac{T_{ENV}}{T_{TUBE}} \cdot \frac{T_{TUBE}}{W_{TANK}} \cdot \frac{W_{TANK}}{V_{OL}} \cdot \frac{V_{OL}}{Flux} \cdot \frac{Flux}{\omega_{MOTOR}} \cdot \frac{\omega_{MOTOR}}{V_{PS}}$$

MOTOR $\quad \frac{\omega_{MOTOR}}{V_{PS}} = \frac{K_1}{1+S\tau_M}$

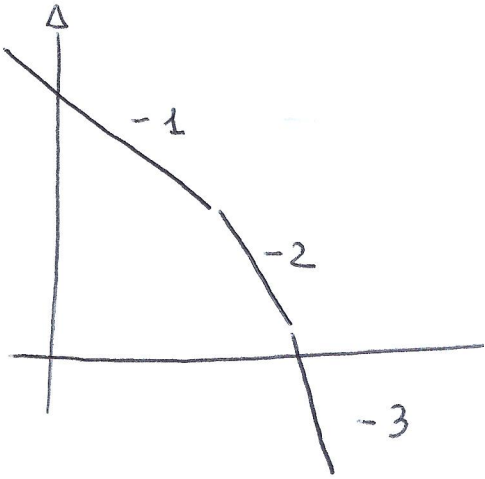
TANK $\quad \frac{Flux}{\omega_{MOTOR}} = K_2$; $VOL_{TANK} = \int Flux_{INP} - Flux_{OUT}$; $W_{TANK} = K_3 V_{OL}$

L_D disturbance $\Rightarrow$ FF

TUBE $\quad \frac{T_{TANK}}{W_{TANK}} = \frac{K_4}{1+SRC}$ but T_{TANK} ⇝ T_{TUBE} $\Rightarrow e^{-S\tau}$

TANK TUBE

ENVIRONMENT $\quad T_{TUBE} = K_5^{-1} T_{ENV}$

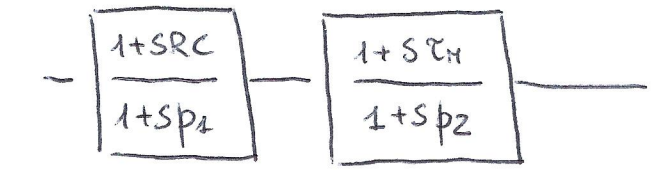


$$G = K_5 \cdot \frac{K_4}{1+SRC} e^{-S\tau} \cdot K_3 \cdot \frac{1}{S} \cdot K_2 \cdot \frac{K_1}{1+S\tau_M}$$

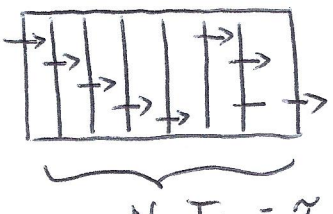
NOT STABLE

COMPENSATION $\quad \frac{(1+SRC)}{(1+Sp_1)} \cdot \frac{(1+S\tau_M)}{(1+Sp_2)}$

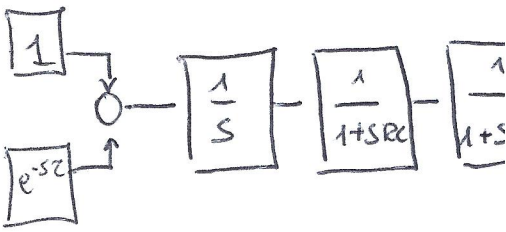
NUMERICAL IMPLEMENTATION



SMITH PREDICTOR



COMPENSATION



4) CMRR FACTOR — CONDITIONING NETWORKS — SLIDE 23 + what explained at lesson

5) CONDITIONING NETWORKS — SLIDE 25 — $t_{SEL_{MUX}} + t_{S\&H} + t_{CONV_{ADC}}$

6) ACTUATORS — SLIDE

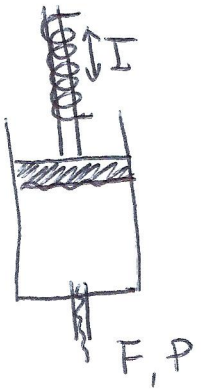
motivations: losses due to friction, inertia ... mechanical effects
phase shifts due to the inductive nature of the motor

simplified circuit

$V_{DRIVEN} =$ { $\gamma_M \gg \gamma_{EL} \Rightarrow$ neglect L
I_0 constant $\Rightarrow$ does not influence frequency answ

$I_{DRIVEN} =$ { L, I_0 neglected for the same motivations
r is in series with an ideal current generator

7) PUMP — WHAT IS THE OUTPUT ? FLUX OR PRESSURE ?



IN ELECTROMAGNETIC ACTUATOR $F = K_{ACT} I$

THE EFFECTIVE FORCE APPLIED IS = $F_{ACT} - \gamma\, vel$
DUE TO THE VISCOSITY OF THE OIL

IF OUTPUT IS PRESSURE $P \Rightarrow$ OC $F_{EFFECTIVE}$
" " IS FLUX $F \Rightarrow$ OUT VELOCITY $= K \int F_{EFFECTIVE}$

THEREFORE

$$F = \frac{1}{s}\left[kI - \gamma\, vel\right] \qquad P = kI - \gamma\, vel$$