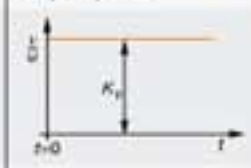
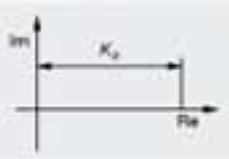
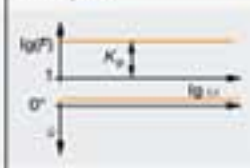
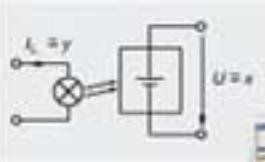
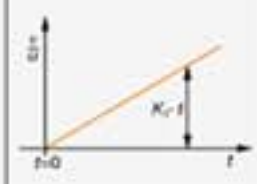
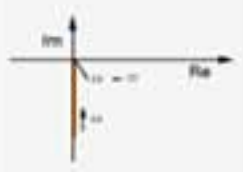
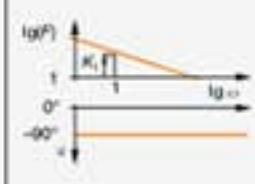
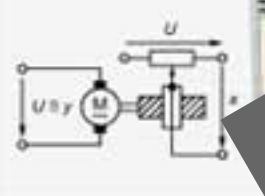
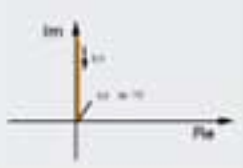
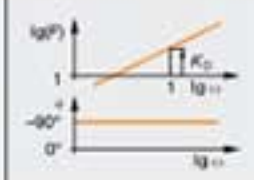
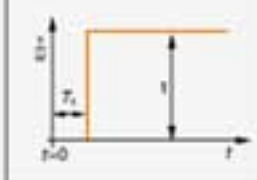
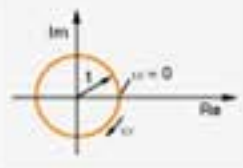
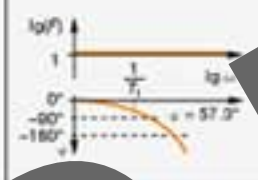
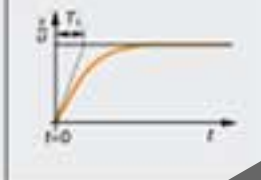
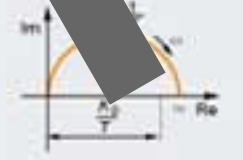
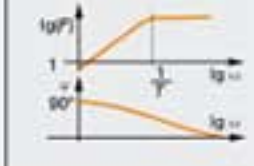
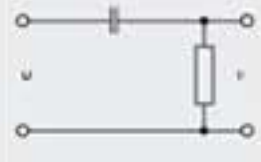
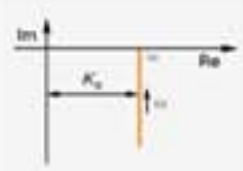
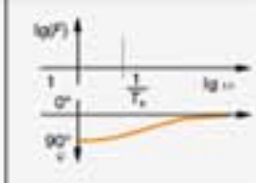
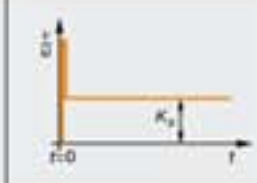
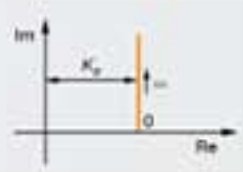
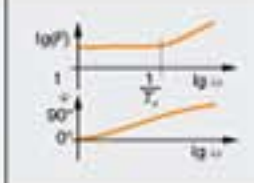
Experimenting – Learning – Understanding

Process control –
Dynamic response of typical controlled systems

Type	Freq. & diff. eqs.	Step response	Locus diagram	Bode plot	Typical example
P	$F = K_p$ $v = K_p \cdot u$				
I	$F = \frac{K_i}{p}$ $v = K_i \int u\,dt$				
D	$F = K_D \cdot p$ $v = K_D \frac{du}{dt}$				
T_1	$F = e^{-p \cdot T_t}$ $v(t) = u(t - T_t)$				
P_{T1}	$F = \frac{K_p}{1 + T_1 p}$ $v + T_1 \frac{dv}{dt} = K_p u$				
P_{T2}	$F = \frac{K_D}{1 + T_1 \cdot p + T_2^2 \cdot p^2}$ $v + T_1 \frac{dv}{dt} + T_2^2 \frac{d^2v}{dt^2} = K_p \cdot u$				
D_{T1}	$F = \frac{K_D \cdot p}{1 + T \cdot p}$ $v + T \frac{dv}{dt} = K_D \frac{du}{dt}$				
PI	$v = K_p \left(u + \frac{1}{T_n} \int u\,dt \right)$				
PD	$v = K_p \left(u + T_v \frac{du}{dt} \right)$				
PID	$F = K_p \left(1 + \frac{1}{T_n \cdot p} + T_v p \right)$ $v = K_p \left(u + \frac{1}{T_n} \int u\,dt + T_v \frac{du}{dt} \right)$				

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