

EX) FIND EFFECT OF TIME CONSTANT ON THE SENSITIVITY OF A CLOSED-LOOP SYSTEM FOR A 1ST ORDER SYSTEM UNDER PROP. CONTROL

Gc = Kp, Gp = 1/(Ts+1), H=1, b=T

G = Gc * Gp = Kp / (Ts+1)

CLOSED LOOP TRANSFER FUNC.

T = G / (1+G) = (Kp/Ts+1) / (1+Kp/Ts+1) = Kp / (Ts+1+Kp)

S_T = dT/dT * T

= (-Kp * s) / (Ts+1+Kp)^2 * T

= -Ts / (Ts+1+Kp)

s -> jw => S_T(jw) = -Tjw / (Tjw+1+Kp) = Ns/Ds

FOR VERY LOW FREQ (w ~ 0), S_T = 0 (T DOES NOT DEPEND ON T) => DC

FOR VERY HIGH FREQ (w ~ infinity), S_T = -1 (% INCREASE IN T RESULTS IN % DECREASE IN T)

FOR MEDIUM FREQUENCIES, INCREASING Kp, DECREASES SENSITIVITY

MAG ON MATHEAS

|S_T(jw)| = |Ns| / |Ds| = T * w / [(1+Kp)^2 + (Tw)^2]^1/2