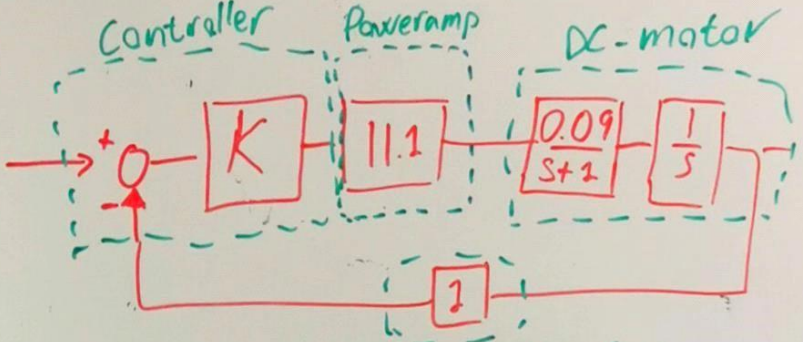
1.

a)



- Find K, overshoot (Mp) 20 %

$\zeta \approx 0.45$ se graf på slide 12

$\omega_n^2 = K \Leftrightarrow \omega_n = \sqrt{K}$ slide

$2\zeta\omega_n = 1 = 2 \cdot 0.45 \cdot \sqrt{K} = 1 \Leftrightarrow K = 1.23$

c) System type

$$K_v = \lim_{s\to 0} s \cdot G(s)$$

$$= \lim_{s\to 0} s \cdot \frac{K}{s+1} \cdot \frac{1}{s}$$

$$= K = 1.23$$

$$K_p = \lim_{s\to 0} G(s) = \lim_{s\to 0} \frac{K}{s+1} \cdot \frac{1}{s}$$

$$K_p = \infty$$

$$K_a = \lim_{s\to 0} s^2 \frac{K}{s+1} \cdot \frac{1}{s}$$

$$K_a = 0$$

System type 1

b) Rise time og settle time

$$T_r \approx \frac{1.8}{\omega_n} = \frac{1.8}{\sqrt{K}} = \frac{1.8}{\sqrt{1.23}} = 1.623 \text{ s}$$

$$T_s = \frac{-\ln(x)}{\zeta\omega_n} = \frac{-\ln(0.02)}{\sqrt{1.23} \cdot 0.45} = 7.84 \text{ s}$$

x = settle time %
= 2%