Z1 - 2013/2014

Zadatak 1.

$p_u = 5\,bar$

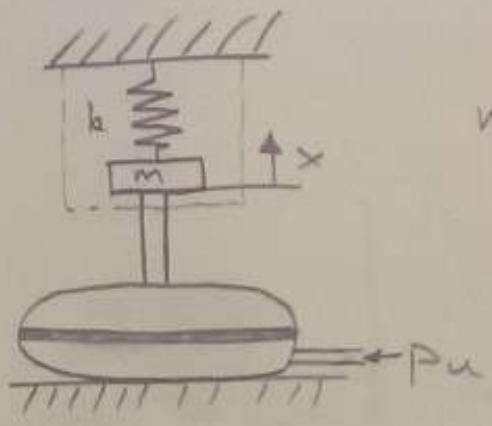
$k = 80\,\frac{N}{cm}$

$\mu = 5\,\frac{Ns}{m}$

$r = 0.01\,m$

$m = 1\,kg$

$x = ?$



Sile koje se javljaju u motoru:

$F_k \downarrow$ - sila opruge

$F_m \downarrow$ - sila mase

$F_t \downarrow$ - sila trenja

$F_u \uparrow$ - sila ulaznog klipa

$F_g \downarrow$ - sila teže

$$\Sigma F = 0$$

$$F_u - F_k - F_m - F_t - F_g = 0$$

$$F_m + F_t + F_k + F_g = F_u$$

$$m\frac{d^2x(t)}{dt^2} + \mu\frac{dx(t)}{dt} + kx(t) = \underbrace{(r^2\pi)}_{=S} \cdot p_u - mg$$

$$ms^2X(s) + \mu sX(s) + kX(s) = Sp_u - mg$$

$$X(s) = \frac{Sp_u - mg}{ms^2 + \mu s + k}$$

$$\frac{X(s)}{P_u(s)} = G(s) = \frac{Sp_u - mg}{ms^2 + \mu s + k}$$

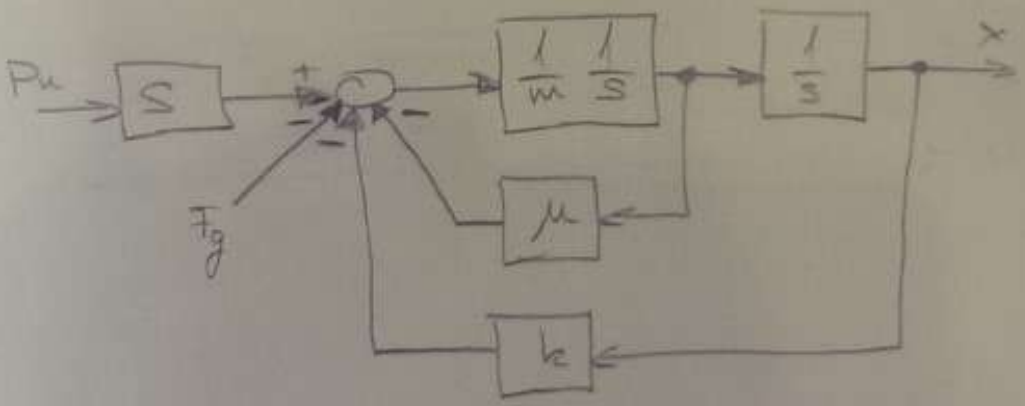
$$x(\infty) = \lim_{s\to 0} s \cdot G(s) \cdot \frac{5\cdot 10^5}{s} = \lim_{s\to 0} \frac{5\cdot 10^5 - 9{,}81}{s^2 + 5s + 80}$$

$$= \frac{(0{,}01^2 \cdot \pi)\cdot 5\cdot 10^5 - 9{,}81}{80} = 1{,}24\ \text{cm}$$

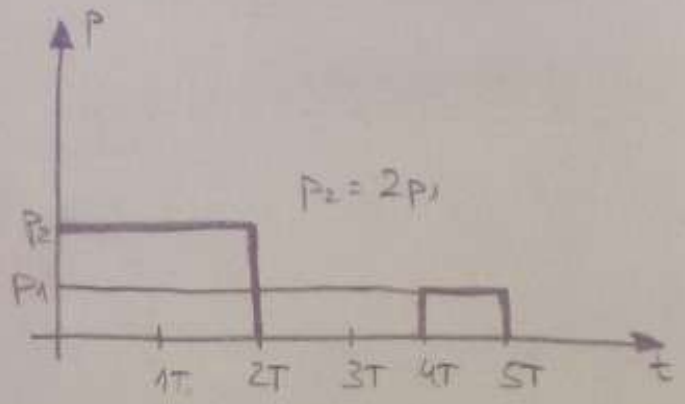
tražimo ustaljenu vrijednost

Blokovska shema:

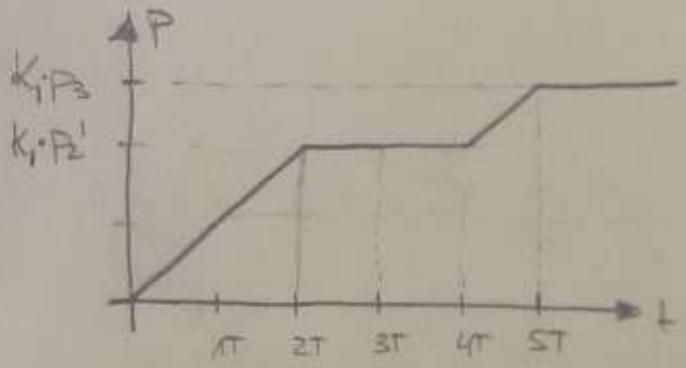
$$\frac{d^2x(t)}{dt^2} = -\frac{\mu}{m}\frac{dx(t)}{dt} - \frac{k_z}{m}x(t) + S p_u - \frac{1}{m} F_g$$



Zadatak 2.



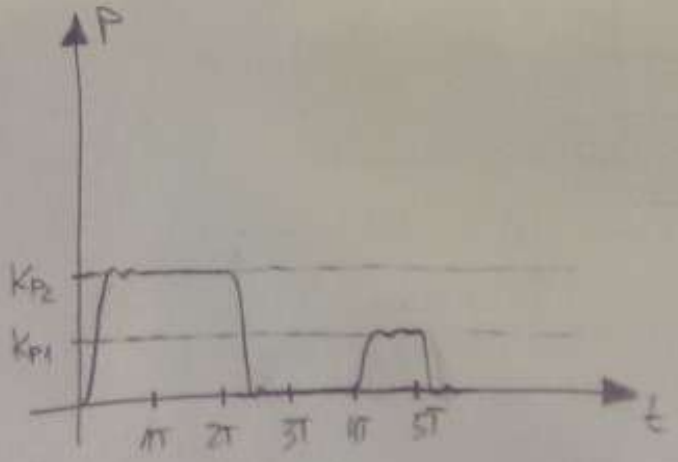
PM s I-ponašanjem:



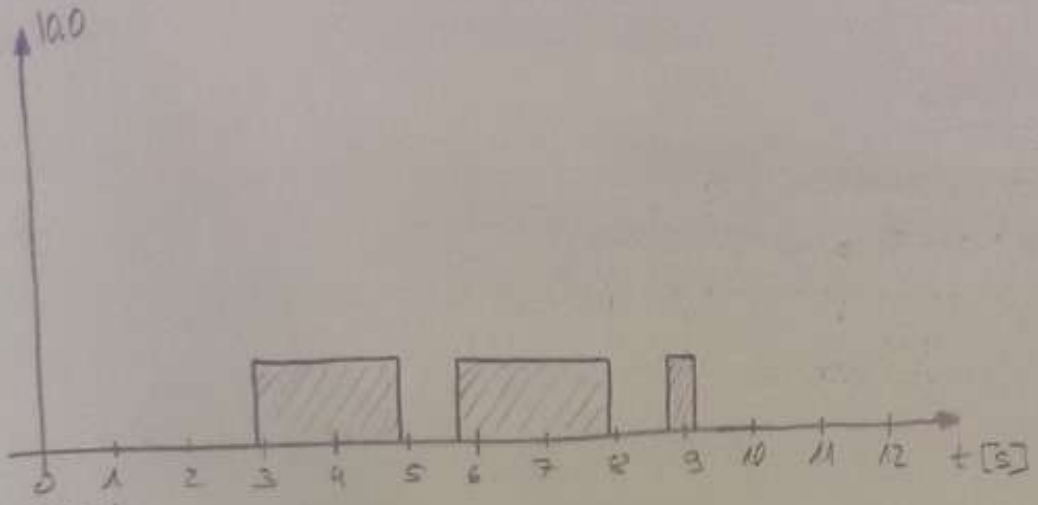
$$P_2' = \int_{0T}^{2T} P_2 dt = 2T P_2$$

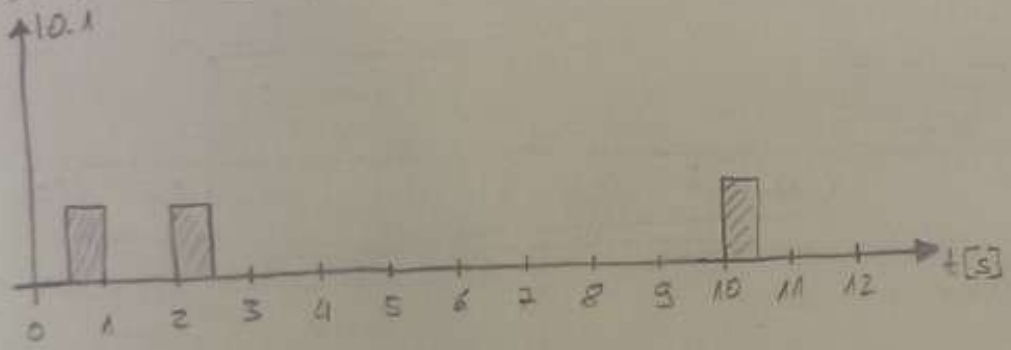
$$P_2 = \int_{4T}^{5T} P_1 dt = T P_1$$

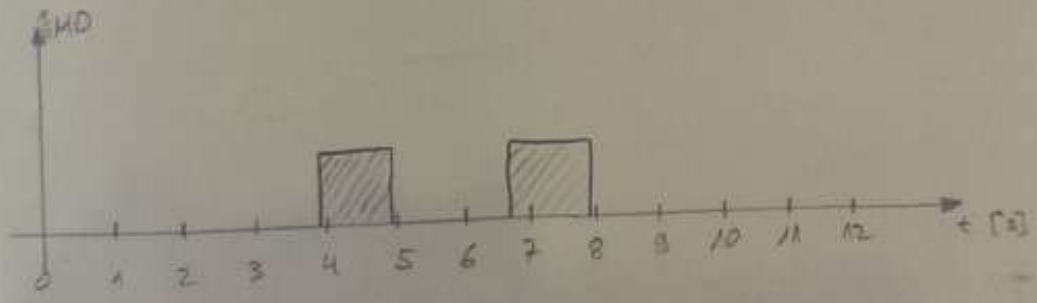
PM s P-ponašanjem:

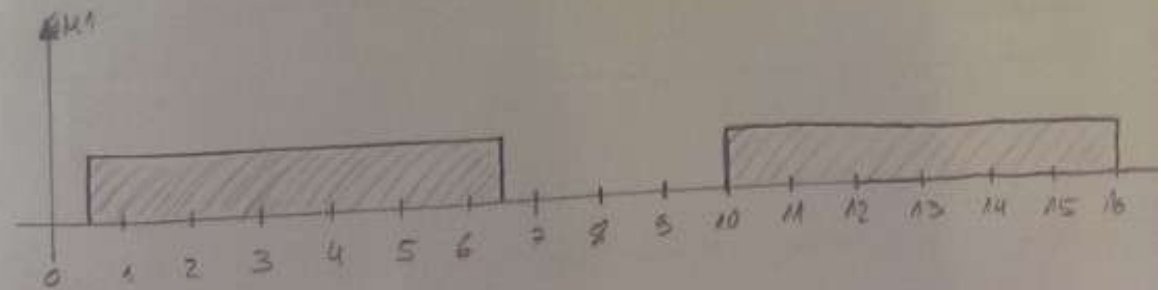


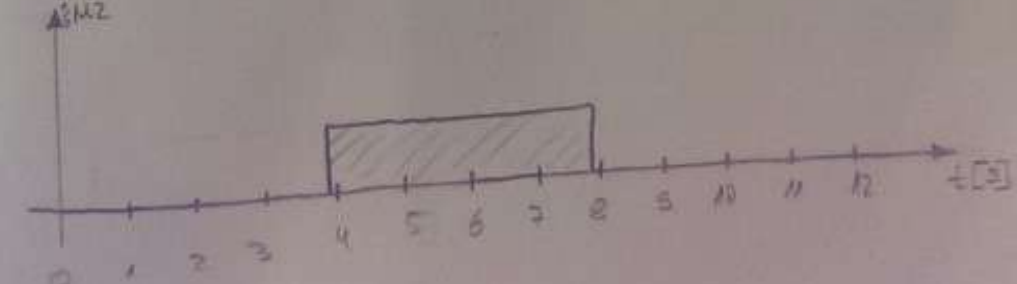
Zadatak 3.


I2.0
0 1 2 3 4 5 6 7 8 9 10 11 12 t [s]


I0.1
0 1 2 3 4 5 6 7 8 9 10 11 12 t [s]


M0
0 1 2 3 4 5 6 7 8 9 10 11 12 t [s]


M1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

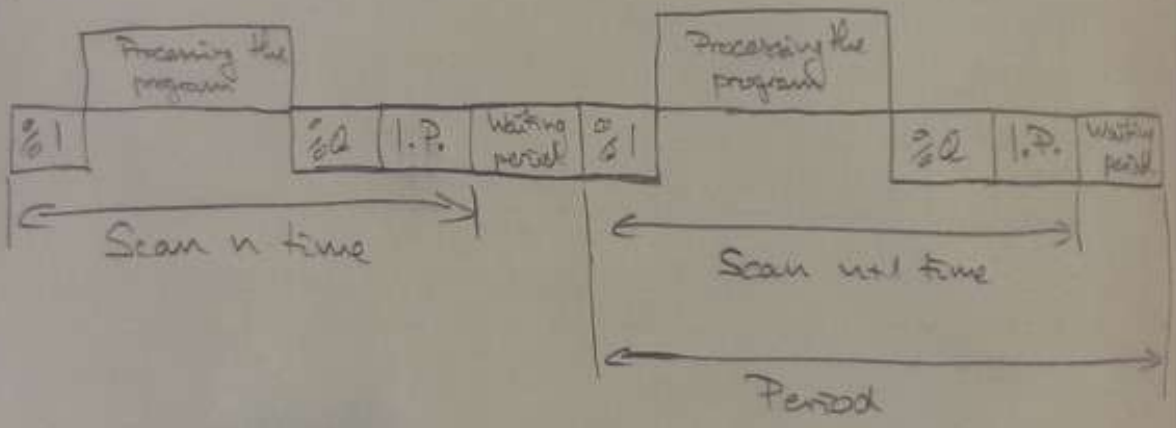

M2
0 1 2 3 4 5 6 7 8 9 10 11 12 t [s]

Zadatak 4.

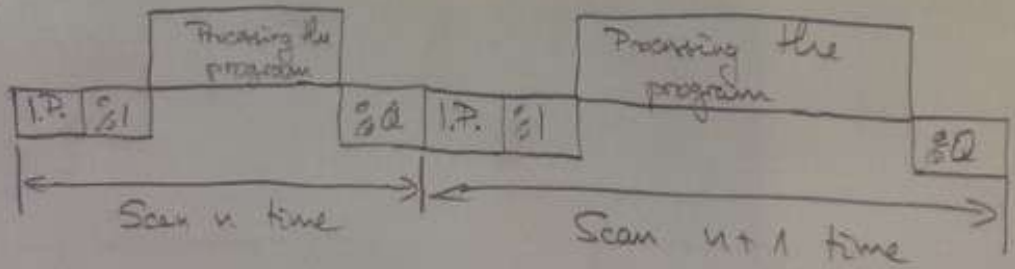
PLC - scan

1) učitavanje impulsa
2.) izvršavanje programa
3) dijagnostika / komunikacija
4.) osvježavanje izlaza

a)

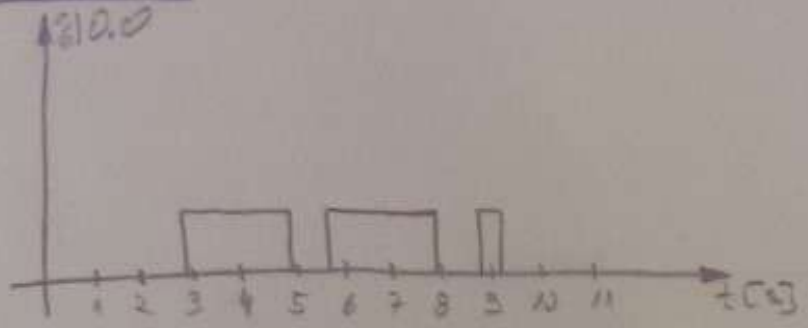


b)



Trajanje ciklusa koji nije određen od strane korisnika ovisi o broju i vrsti instrukcij.

Zadatak 5.



$S6 = 1 ⇒ vremenska baza TB = 1s

A = 0

$M0 = 0