

1. Metoda Dahlin:

Funcția de transfer a procesului:

$$H_{f11} = \exp(-2.5s) * \frac{4.3}{115 s^2 + 28 s + 1}$$

Funcția de transfer discretă a procesului, unde timpul de eșantionare = 0.5s

$$H_{f11_discret} = \frac{0.004489 z^{-1} + 0.004311 z^{-2}}{z^{-3} * (1 - 1.883 z^{-1} + 0.8854 z^{-2})}$$

Funcția de transfer impusă în buclă închisă:

$$H_o_discret = \frac{0.03508 z^{-1}}{z^{-3} * (1 - 0.9649 z^{-1})}$$

Funcția de transfer a regulatorului initial:

$$H_r_z = \frac{7.815 - 14.72 z^{-1} + 6.92 z^{-2}}{z^{-3} * (1 - 0.03977 z^{-1} - 0.9602 z^{-2})}$$

Funcția de transfer a regulatorului modificat:

Hr_bun =

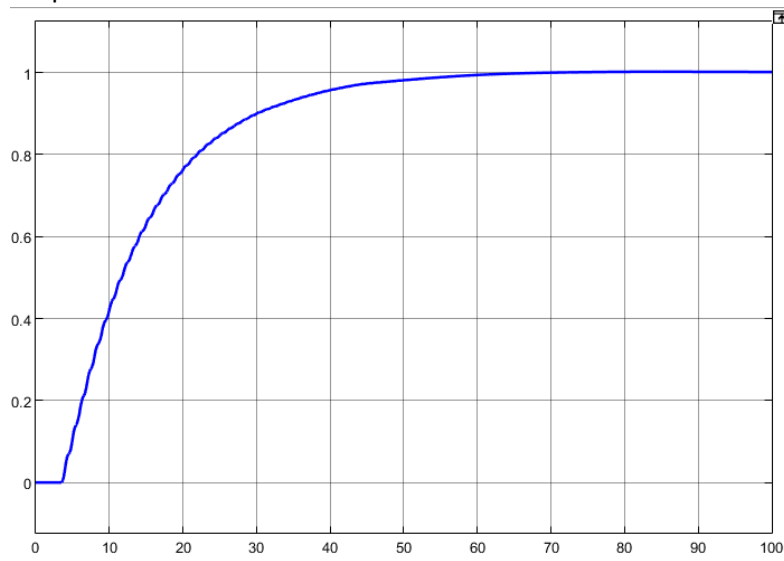
$$7.815 - 14.72 z^{-1} + 6.92 z^{-2}$$

$$1.96 - 1.96 z^{-1}$$

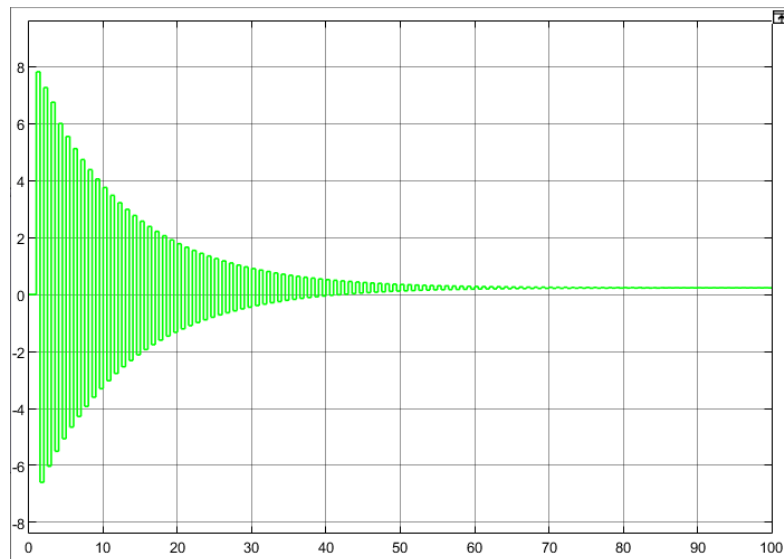
Rezultate:

a. Regulator initial:

- Răspunsul sistemului:



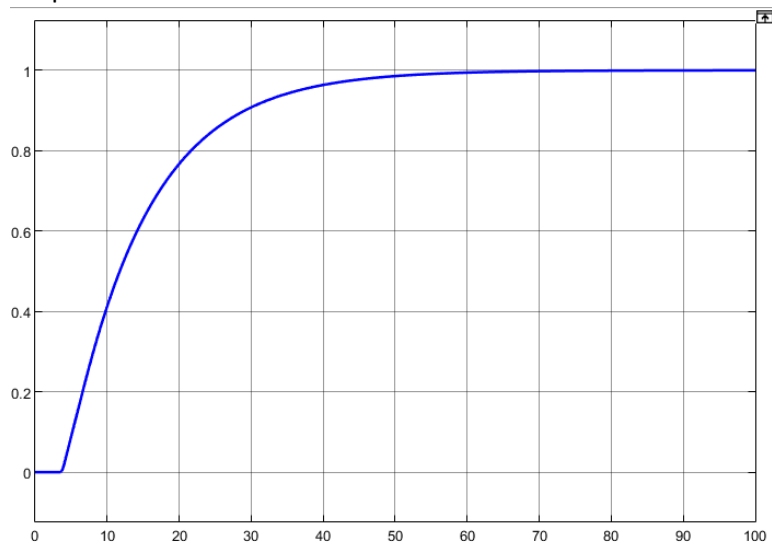
- Semnalul de comandă:



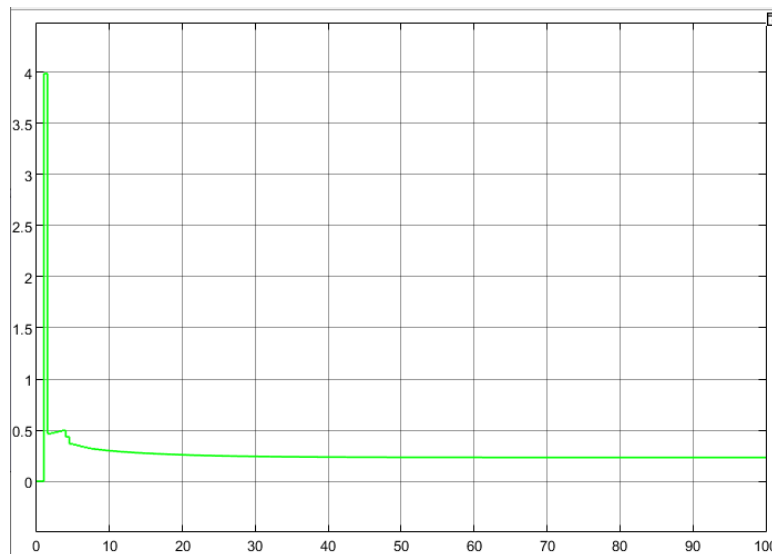
- Performante:
 - Abatare stationara la pozitie: 0
 - Suprareglaj: 0
 - Timp de raspuns: 63s
 - Domeniu de variatie a comenzii: $[-6.6, 8]$

b. Regulator modificat:

- Răspunsul sistemului:



- Semnalul de comandă:

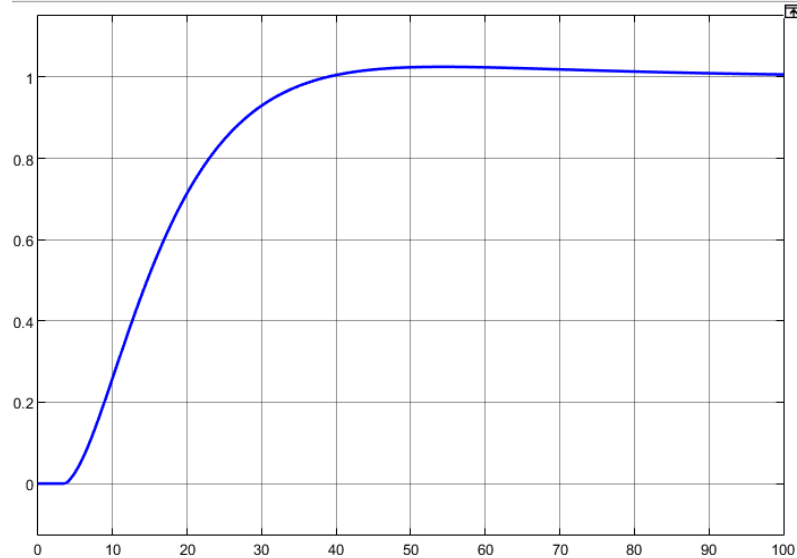


- Performante:
 - Abatare stationara la pozitie: 0
 - Suprareglaj: 0

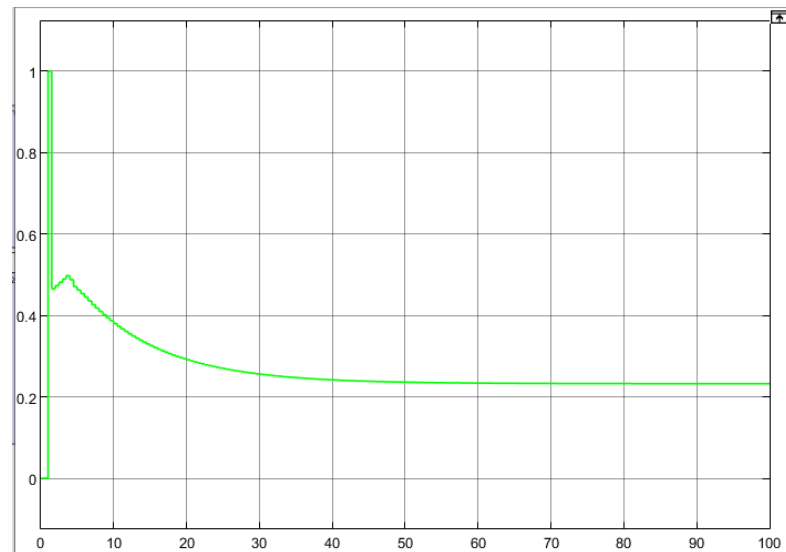
- Timp de raspuns: 63s
- Domeniu de variatie a comenzii: $[0, 4]$

c. Regulator modificat cu semnalul de comanda saturat:

- Răspunsul sistemului:



- Semnalul de comandă:



- Performante:

- Abatare stationara la pozitie: 0
- Suprareglaj: 0.25%
- Timp de raspuns: 100s
- Domeniu de variatie a comenzii: $[0, 1]$

2. Metoda Kalman:

Functia de transfer a procseului:

Hf21 =

$$\exp(-3*s) * \frac{1.25}{126 s^2 + 23 s + 1}$$

Functia de transfer discrete a procseului, unde timpul de esantionare = 0.6s

Hf21_discret =

$$z^{(-5)} * \frac{0.001722 z^{-1} + 0.00166 z^{-2}}{1 - 1.894 z^{-1} + 0.8963 z^{-2}}$$

Functia de transfer a regulatorului initial:

Hr1 =

$$\frac{295.68 (1-0.9696z^{-1}) (1-0.9244z^{-1})}{(1-z^{-1}) (1 + 1.473z^{-1} + 0.6056z^{-2}) (1 - 1.114z^{-1} + 0.9632z^{-2}) (1 + 0.6412z^{-1} + 0.8415z^{-2})}$$

Functia de transfer a regulatorului modificat:

ans =

$$\frac{96.061 (1-0.9696z^{-1}) (1-0.9244z^{-1})}{(1-z^{-1}) (1 - 1.114z^{-1} + 0.9632z^{-2}) (1 + 0.6412z^{-1} + 0.8415z^{-2})}$$

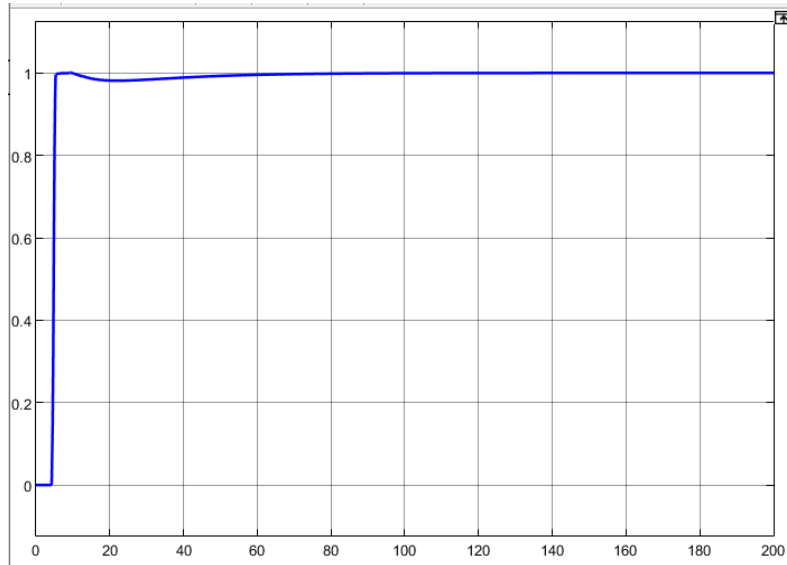
Functia de transfer a regulatorului modificat a doua oara:

$$\frac{20.05 (1-0.9696z^{-1}) (1-0.9244z^{-1})}{(1-z^{-1})}$$

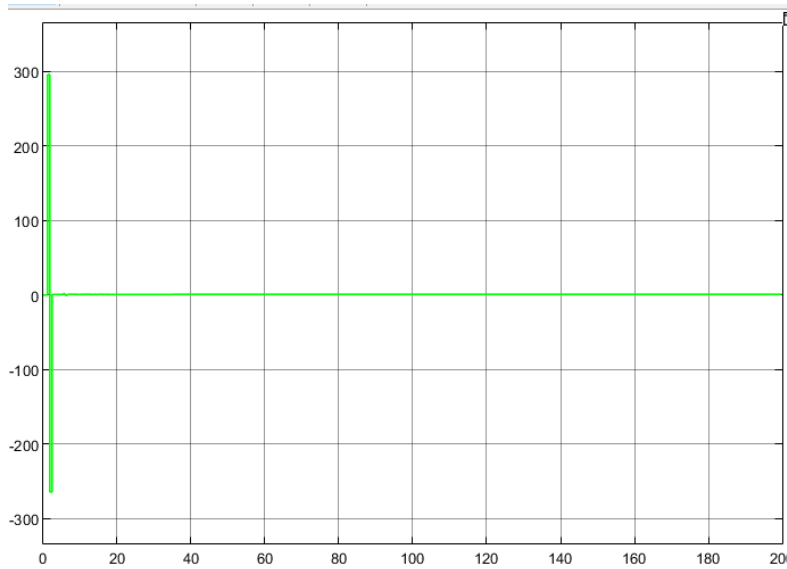
Rezultate:

a. Regulator initial:

- Raspunsul sistemului



- Semnalul de comanda

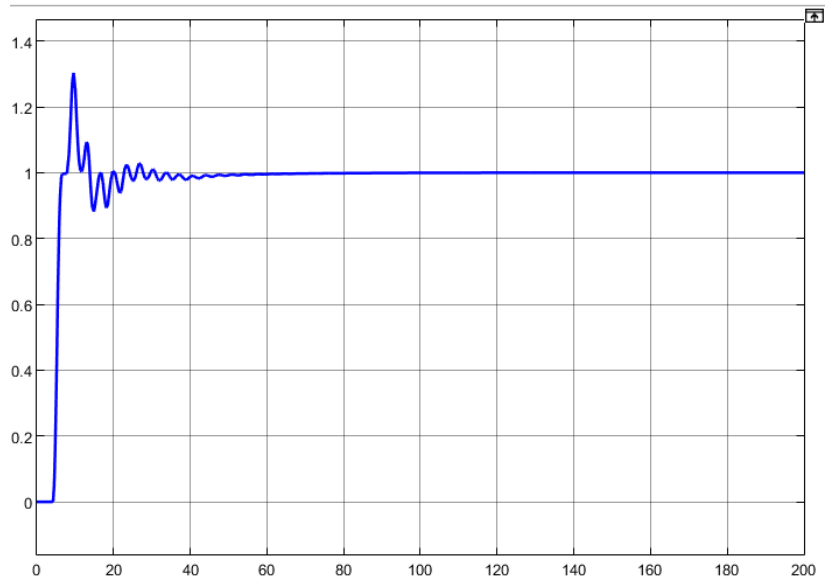


- Performante:

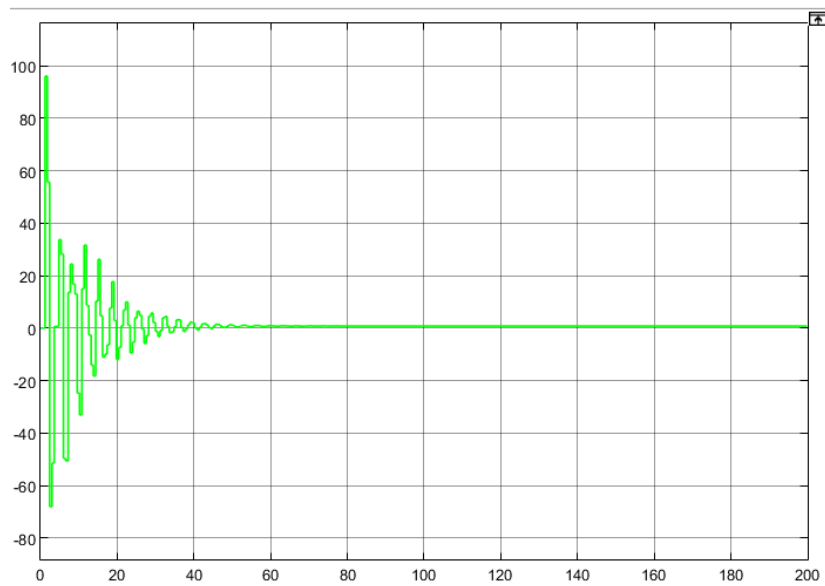
- Abatare stationara la pozitie: 0
- Undershoot: 0.2%
- Timp de raspuns: 60s
- Domeniu de variatie a comenzii: [-264 , 300]

b. Regulator modificat:

- Raspunsul sistemului



- Semnalul de comanda

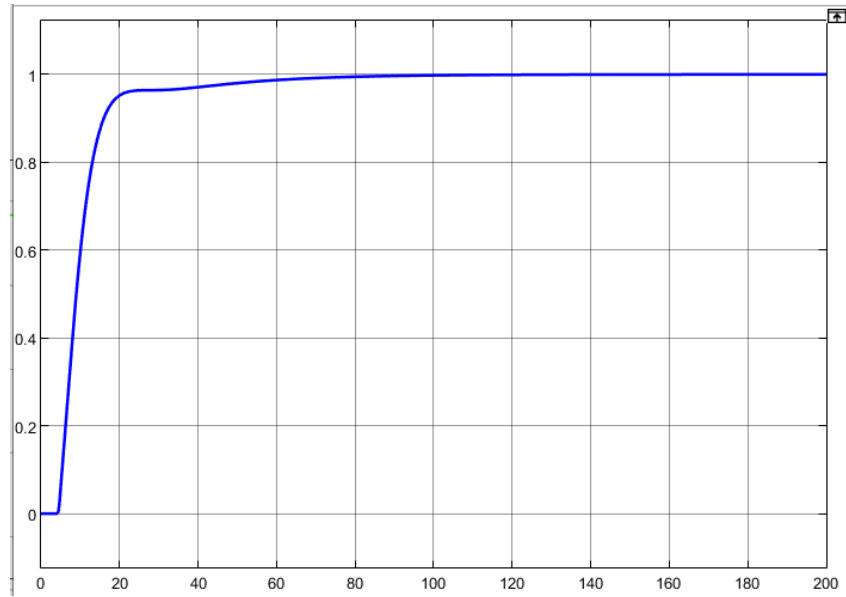


- Performante:

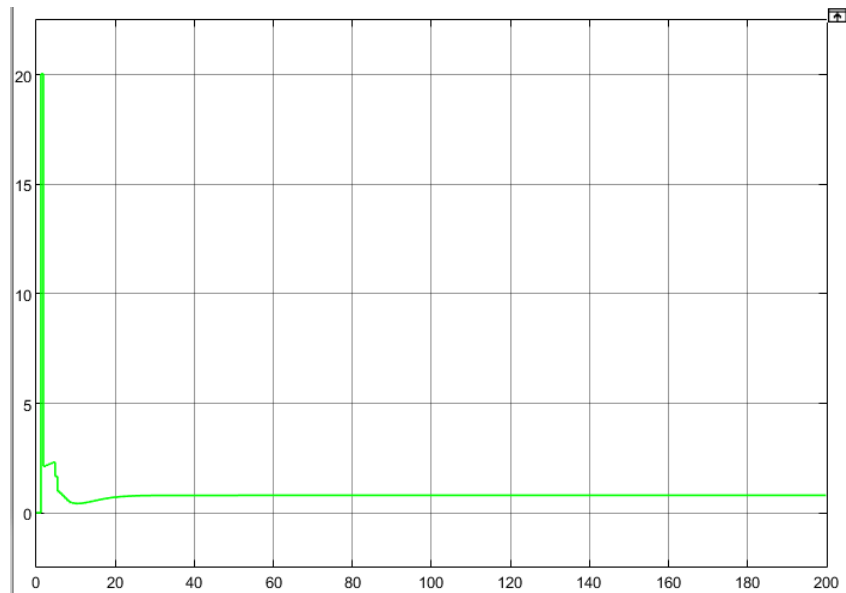
- Abatare stationara la pozitie: 0
- Suprareglaj: 3%
- Timp de raspuns: 60s
- Domeniu de variatie a comenzii: [-68, 96]

c. Regulator modificat a doua oara:

- Raspunsul sistemului



- Semnalul de comanda

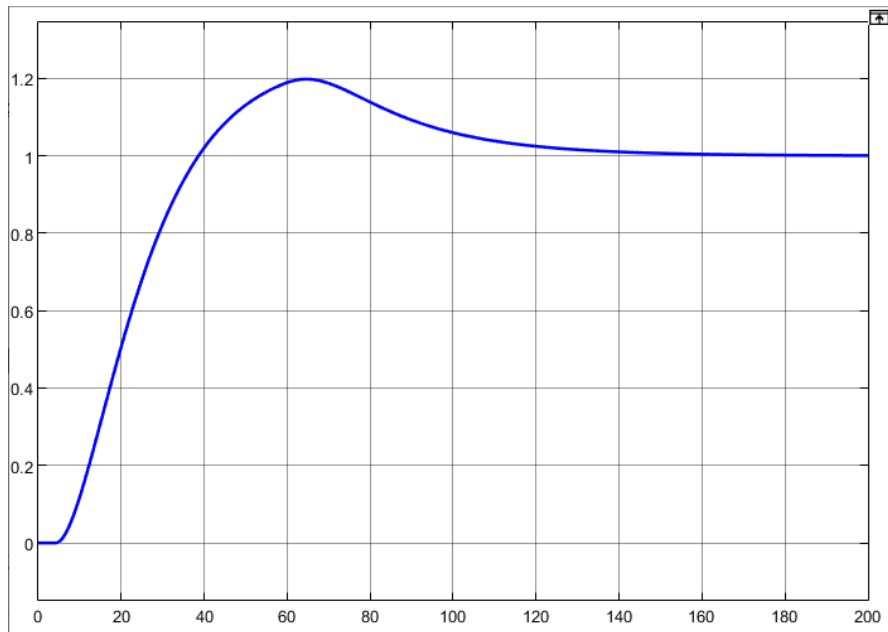


- Performante:

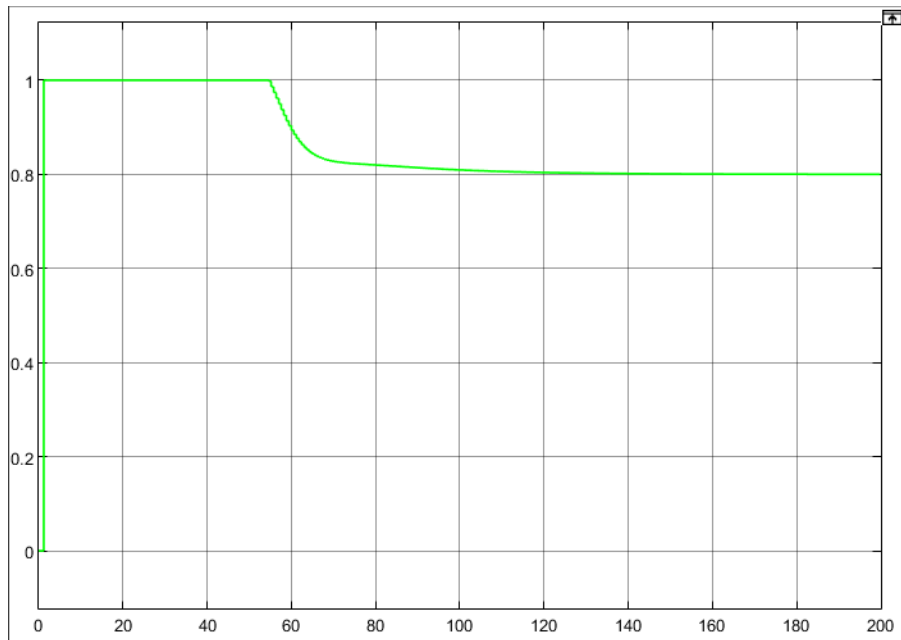
- Abatare stationara la pozitie: 0
- Suprareglaj: 0
- Timp de raspuns: 80s
- Domeniu de variatie a comenzii: $[0, 20]$

d. Regulator modificat a doua oara cu semnalul de comanda saturat:

- Raspunsul sistemului



- Semnalul de comanda



- Performante:

- Abatare stationara la pozitie: 0
- Suprareglaj: 2%
- Timp de raspuns: 160s
- Domeniu de variatie a comenzii: $[0, 1]$