3

System Theory
1. retake Test 25. 11. 2020.

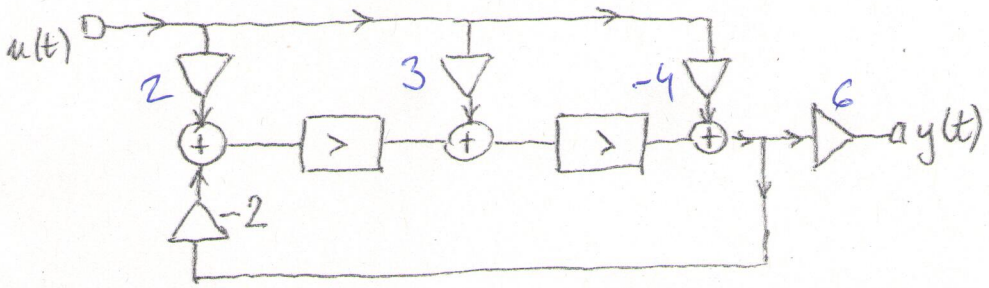
NAME:
Signature:

Neptun code:

Write in your <u>whole</u> sent document <u>very-very clearly</u> everywhere <u>which example and which part of the example is solved</u>! <u>Only time domain analysis</u> is accepted!

1.) A continous time system is given with its signal flow network representation.
a) Give the state variable description in normal form! (5 points)

b) Calculate the response, if the input signal is $u(t)= e^{4t}$! (5 points)
c) Give the transfer characteristic (frequency response) of this system! (5 points)
e) Give the response of this system if the excitation is $u(t)= 5 \sin 4\,t$! (5 Punkte)



2.) The impulse response of a discrete, linear, invariant systems is: $h[k] = \varepsilon[k]\ 3\ (-0{,}2)^{k-3}$.

a) Calculate the response, if the input signal is $u[k]= \varepsilon[k] \sin(0{,}5\,\pi\,k)$! (6 points)
b) Calculate the response, if the input signal is $u[k]=7\,\delta[k-1]+ \varepsilon[k]\ 0{,}8^{k+2}$! (6 points)
c) Calculate the response, if the input signal is $u[k]= 6 + 5(\varepsilon[k-2] - \varepsilon[k-9])$! (8 points)

In examples 3-7. give the result and only the result of the example!

3.) A continous signal x(t) is -8 in the time interval from -5 to -2, and 6 in the time interval from 3 to 9. Give this signal with formula in closed mathematical form! (2 points)

4.) What is the role of the phase of complex eigenvalues in the transient solution of a discrete system? (2 points)

5.) The impulse response of a discrete system is $h[k]= 4\,\delta[k] - \delta[k-2]$. Give signal flow network realisation of this system or explain if the example is unsolvable! (2 points)

6.) Calculate in k=0 and k=1 the impulse response of the discrete system given with the following state variable description: $x[k+1]= 3\,x[k] + 8\,u[k]$; $y[k]= 5\,x[k]+ 4\,u[k]$! (2 points)

7.) Give the response of the system of the previous example for the $u[k] = \varepsilon[k] - \varepsilon[k-1]$ excitation! (2 points)