

Write in your whole sent document very-very clearly everywhere which example and which part of the example is solved!

- 1.) A continuous time system is given with its state variable description:

$$\begin{aligned} \dot{x}_1 &= -3x_1 + mx_2 + 2u; \quad \dot{x}_2 = 5x_1 - 4x_2 + 4u; \quad y = -3x_2 + 4u \end{aligned}$$

- a) For which values of the parameter „m“ is it an asymptotically stable system? Give also explanation! (3 points)

For the further examples $m = -8$.

- b) Calculate the response, if the input signal is $u(t) = -4$! (4 points)
c) Give signal flow network representation of this system! (4 points)
d) Give the transfer characteristic (frequency response) of this system! (5 points)
e) Give the response of this system if the excitation is $u(t) = 5 \cos(2t + 3,2)$! (5 Punkte)

- 2.) The impulse response of a discrete, linear, invariant systems is:

$$h[k] = \varepsilon[k] 4 (-0,5)^{k+1}$$

- a) Calculate the response, if the input signal is $u[k] = \varepsilon[k] 0,4^{k-3}$! (5 points)
b) Calculate the response, if the input signal is $u[k] = 3\delta[k-1] + \varepsilon[k] \cos(0,4\pi k)$! (8 points)
c) Find the response, if the input signal is $u[k] = 2 + 2\varepsilon[k-5]$! (7 points)

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

- 3.) The eigenvalues of second order a discrete system are $-0,1$ and -6 . Is it BIBO-stable system? Give also explanation! (2 points)
- 4.) How could you express with two words the form of the transient solution of a stable continuous system if its two eigenvalues are complex? (2 points)
- 5.) The impulse response of a discrete system is $h[k] = 7\delta[k] + \delta[k-2]$. 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 unit step response of the discrete system given with the following state variable description: $x[k+1] = 0,1x[k] + 2u[k]$; $y[k] = 6x[k] + 3u[k]$! (2 points)
- 7.) Give the impulse response of the system of the previous example! (2 points)