

HW Assignment 10

Due date: Thursday 2/6/2016

Question 1

Using the Laplace transform, find the state-vector $x(t)$, which solves the state equation

$$\dot{\bar{x}}(t) = \bar{A}\bar{x}(t) + \bar{B}f(t)$$

for the matrices:

$$1. \quad A = \begin{pmatrix} -5 & -6 \\ 1 & 0 \end{pmatrix} \quad B = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad X(0) = \begin{pmatrix} 5 \\ 4 \end{pmatrix} \quad f(t) = \sin 100t \quad .$$

$$2. \quad A = \begin{pmatrix} -1 & 1 \\ 0 & -2 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \quad x(0) = \begin{pmatrix} 1 \\ 2 \end{pmatrix} \quad f(t) = \begin{pmatrix} u(t) \\ \delta(t) \end{pmatrix} \quad .$$

Question 2

Solve the systems in the previous question in the time domain.

Question 3

Using the Laplace transform, find the output $y(t)$ of the system

$$\dot{x}(t) = Ax(t) + Bf(t)$$

$$y(t) = Cx(t) + Df(t)$$

for the matrices:

$$A = \begin{pmatrix} -1 & 1 \\ -1 & -1 \end{pmatrix} \quad B = \begin{pmatrix} 0 \\ 1 \end{pmatrix} \quad C = \begin{pmatrix} 1 & 1 \end{pmatrix} \quad D = (1) \quad x(0) = \begin{pmatrix} 2 \\ 1 \end{pmatrix} \quad f(t) = u(t)$$

Question 4

Solve the system in the previous question in the time domain.