EE150 Signal and System
Homework 7

Due on 23: 59, June 12, 2024.

Note:

- Please provide enough calculation process to get full marks.
- Please submit your homework to Blackboard in PDF version.
- It's highly recommended to write every exercise on a single sheet of page.
- Late submissions will have points deducted according to the penalty policy.
- Please use English only to complete the assignment, solutions in Chinese are not allowed.
- Plagiarizer will get zero points.
- The full score of this assignment is 100 points.

Exercise 1. (25pt)

Determine the Laplace transform and the associated region of convergence and pole-zero plot for each of the following functions of time:

(a) $x(t) = e^{-2t}u(t) + e^{-3t}u(t)$

(b) $x(t) = te^{-2|t|}$

(c) $x(t) = \begin{cases} 1, & 0 \leq t \leq 1 \\ 0, & \text{elsewhere} \end{cases}$

(d) $x(t) = \delta(3t) + u(3t)$

Exercise 2. (25pt)

Determine $x(t)$ for the following conditions if $X(s)$ is given by

$$X(s) = \frac{1}{(s+1)(s+2)}$$

(a) $x(t)$ is right-sided

(b) $x(t)$ is left-sided

(c) $x(t)$ is two-sided

Exercise 3. (25pt)

An LTI system has an impulse response $h(t)$ for which the Laplace transform $H(s)$ is:

$$H(s) = \int_{-\infty}^{+\infty} h(t)e^{-st}dt = 1/(s+1), (Re(s) > -1)$$

Determine the system output $y(t)$ for all t if the input $x(t)$ is given by:

$$x(t) = e^{-t/2} + 2e^{-t/3}$$

Exercise 4. (25pt)

Determine the time-domain function $x(t)$ for each Laplace transform $X(s)$.

(a) $\frac{s}{s^2+4}, Re\{s\} > 0$

(b) $\frac{s+1}{s^2+5s+6}, Re\{s\} > -2$

(c) $\frac{s^2-s+1}{(s+1)^2}, Re\{s\} > -1$

(d) $\frac{s+1}{(s+1)^2+4}, Re\{s\} > -1$. Hint: Use the result from part(a).