Signals and Systems – Spring 2024

Problem Set 5

Issued: Avril 30th, 2024 Due: May 14th, 2024

Reading Assignment:

Chap. 3, Chap. 4

Problem 1: OWN Problem 3.23

Problem 2: OWN Problem 3.41

Problem 3: OWN Problem 3.44

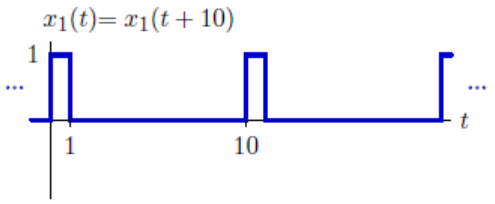
Problem 4: OWN Problem 4.12

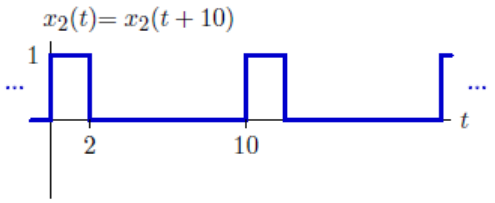
Problem 5: OWN Problem 4.24

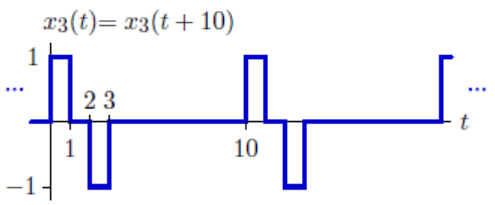
Problem 6: OWN Problem 4.33

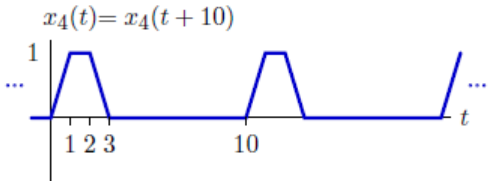
Problem 7 :

Determine the Fourier series coefficients for each of the following periodic CT signals.









Problem 8:

Find the Fourier transforms of the following signals.

a. $x_1(t) = e^{-|t|}\cos(2t)$

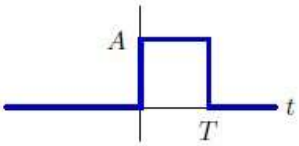
b. $x_2(t) = \dfrac{\sin(2\pi t)}{\pi(t-1)}$

c. $x_3(t) = \begin{cases} t^2 & 0 < t < 1 \\ 0 & \text{otherwise} \end{cases}$

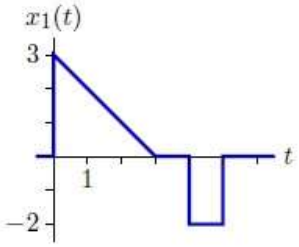
d. $x_4(t) = (1 - |t|)\, u(t+1)u(1-t)$

Problem 9 :

We are given that the impulse response of a CT LTI system is of the form



where A and T are unknown. When the system is subjected to the input



the output $y_1(t)$ is zero at $t = 5$. When the input is

$$x_2(t) = \sin\left(\frac{\pi t}{3}\right) u(t),$$

the output $y_2(t)$ is equal to 9 at $t = 9$. Determine A and T. Also determine $y_2(t)$ for all t.