

Fourier Transform Homework 4 CENG 5431 Due February 23

Problem 1 40 Points

Fourier transform

- (a) Find the Fourier transform by hand of a pulse of width $\tau = 0.05$ microseconds and amplitude $A = 4$ volts centered at the origin. (That is one of the pulses in the previous homework from the pulse train of clock pulses. See Harman Ch 8)
- (b) Using MATLAB, plot the Fourier transform for positive frequencies for the pulse. Plot in frequency to $10/\tau$ Hertz.

Note: If you use MATLAB sinc function remember $\sin(\pi*x)/(\pi*x)$ - see help.

Problem 2**60 Points**

Consider the system described by the differential equation

$$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = P(t), \quad (1)$$

where $P(t)$ is the pulse

$$P(t) = \begin{cases} A, & 0 \leq t \leq \tau, \\ 0, & \text{elsewhere.} \end{cases}$$

- (a) Write the Fourier Transform of the Pulse. Don't forget the phase due to the shift of origin of the pulse.
- (b) Determine the transfer function $H(j\omega)$ of the system described by the differential equation 1.
- (c) Determine the result $|Y(j\omega)|$ if the input is the pulse with $A = 1$ and $\tau = 1$. What is $|Y(0)|$?