

Assignment 1

BRI 509 Introduction to Brain Signal Processing

2021.4.6

Name : _____

Student ID # : _____

1. Explain the following terms briefly.

(a) Sampling property of the impulse

(b) Time invariance

(c) Causality

(d) Linearity and Superposition

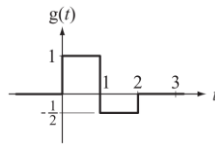
(e) Zero Input response vs zero state response

2. Solve the following simple problems.

(a) What is its fundamental period?

$$g(t) = 2\cos(300\pi t)$$

(b) Find and graph the even and odd parts of the function $x(t)$.



(c) What is the numerical value of the following accumulation?

$$\sum_{n=-5}^{10} \delta_3[n]$$

(d) Find the average signal power of the periodic signal $x(t)$ in the figure.

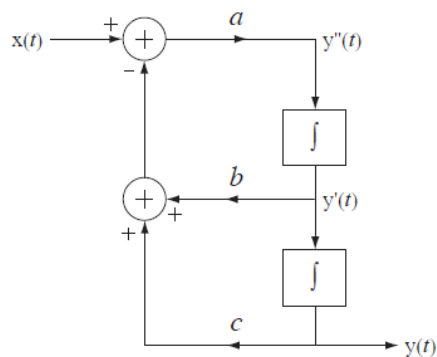
$$x(t) = A \cos(2\pi ft)$$

(e) Graph the following function.

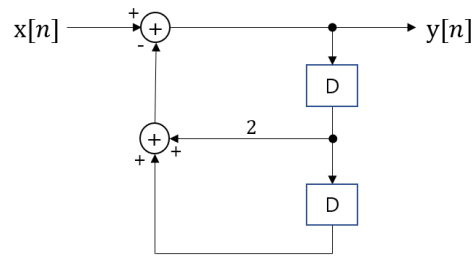
$$g[n] = 5(u[n - 1] - u[4 - n])$$

3. Solve the following problems.

- (a) Find the zero-input response of the system in the figure, the response with $x(t) = 0$, if the initial value of $y(t)$ is $y(0) = 1$, the initial rate of change of $y(t)$ is $y'(t)|_{t=0} = 0$, $a = 1$, $b = 0$ and $c = 4$.



- (b) Find the response of the system in the figure if $x[n] = u[n]$ and the system is in its zero state before time $n = 0$.



4. MATLAB coding.

(a) Graph the function combinations with MATLAB (refer example 2.1)

$$x_1(t) = e^{-t} \sin(20\pi t) + e^{-t/2} \sin(19\pi t)$$

$$x_2(t) = \text{rect}(t) \cos(20\pi t)$$

- Source Code

- Graph

(b) Make sinusoid signals whose fundamental frequencies are the normal scale, 440Hz(A4), 466.1Hz(A4#), 493.8Hz(B4), 523.25Hz(C5), 554.36Hz(C5#), 587.33Hz(D5), 622.25Hz(D5#), 659.26Hz(E5), 698.46Hz(F5), 739.99Hz(F5#), 784.00Hz(G5), 830.60Hz(G5#), 880Hz(A5).

- Source Code

- Graph

- Make an MP3 file containing the normal scale A4 ~ A5 one second each.
- Make an MP3 file containing /do/, /re/, /mi/, ... /si/,/do/.

-Thank you-