NEUB Fall 2018 CSE 431: Digital Signal Processing Test 01 **Set A**

Answer all the questions. Total Mark: 10 Total Time: 25 Minutes

1. Is the system a. $y(t) = x^3(t)$ and b. $y(t) = ax(t) + 2$ Linear, Time-Invariant, Continuous-time? [3]
   a. $y(t) = x^3(t) \rightarrow$ Not linear, Time invariant, continuous
   b. $y(t) = ax(t) + 2 \rightarrow$ Not linear, Time invariant, continuous
2. Explain the difference between Even and Odd Signal. [2]

   A continuous signal is

   Even if $x(-t) = x(t)$ for all values of x

   Odd if $x(-t) = -x(t)$ for all values of x

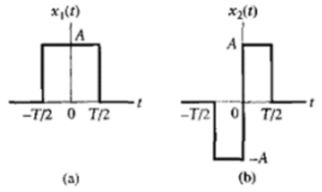
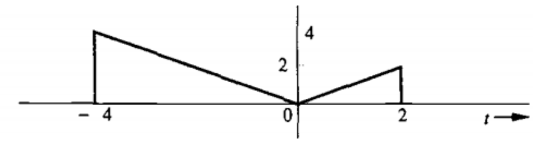
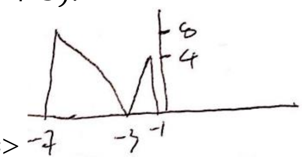


Figure 6 (a) Even Signal (b) Odd signal

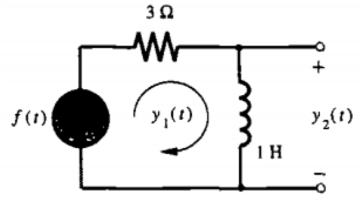
3. For the given signal x(t), plot the signal $2x(t+3)$. [2]

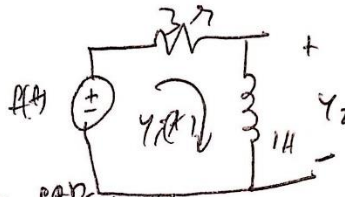


=>



4. For the circuit depicted in figure below, find the differential equations relating the outputs $y_1(t)$ and $y_2(t)$ to the input $f(t)$. [3]





$V_L = L \frac{di}{\partial t}$

$V_R = iR$

for f(t) & $y_1(t)$

$f(t) = 3y_1(t) + 1 \times \frac{\partial}{\partial t} y_1(t)$

$f(t) = 3y_1(t) + Dy_1(t)$

$f(t) = (3+D)y_1(t)$ //

here $I = y_1 t$

$V_L = y_2(t)$

So $y_2(t) = 1\frac{\partial}{\partial t} y_1(t)$

$= \frac{\partial}{\partial t} y_1(t)$

$= Dy_1(t)$

or $y_1(t) = \frac{1}{D} y_2(t)$

For f(t) & $y_2(t)$

$f(t) = 3y_1 t + \frac{\partial}{\partial t} y_1 t$

$f(t) = \frac{3}{D} y_2(t) + y_2(t)$

$D f(t) = 3y_2 t + Dy_2(t)$

$D f(t) = (3+D) y_2(t)$ //

NEUB Fall 2018 CSE 431: Digital Signal Processing Test 01 **Set B**

Answer all the questions. Total Mark: 10 Total Time: 25 Minutes

1. Is the system a. $y(t) = \sin(x(t))$ and b. $y(t) = x^2(t)$ Linear, Time-Invariant, Continuous-time? [3]
   a. $y(t) = \sin\big(x(t)\big)$ → Not linear, Time invariant, continuous
   b. $y(t) = x^2(t)$ → Not linear, Time invariant, continuous
2. Explain the difference between energy signal and power signal. [2]
   A signal with finite energy is an energy signal, and a signal with finite and nonzero power is a power signal.

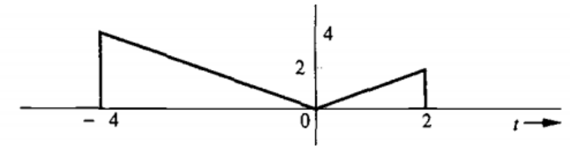
Energy of a signal can be found by the formula

$$E_f = \int_{-\infty}^{\infty} f^2(t)\,dt$$

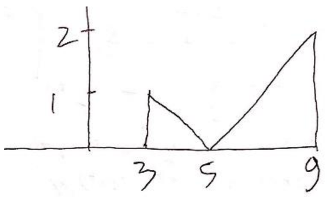
The definition can be generalized to a complex valued signal $f(t)$ as

$$E_f = \int_{-\infty}^{\infty} |f(t)|^2\,dt$$

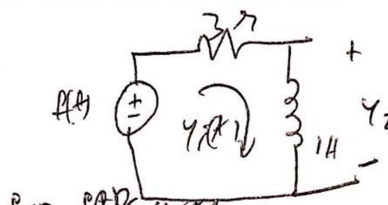
3. For the given signal x(t), plot the signal $\frac{1}{2}x(-5-t)$. [2]



=>



4. For the circuit depicted in figure below, find the differential equations relating the outputs $y_1(t)$ and $y_2(t)$ to the input $f(t)$. [3]



$V_L = L\frac{di}{dt}$

$V_R = iR$

here $I = y_1 t$

$V_L = y_2(t)$

So $y_2(t) = 1\frac{\partial}{\partial t} y_1(t)$

$= \frac{\partial}{\partial t} y_1(t)$

$= D y_1(t)$

or $y_1(t) = \frac{1}{D} y_2(t)$

for f(t) & $y_1(t)$

$f(t) = 3 y_1(t) + 1 \times \frac{\partial}{\partial t} y_1(t)$

$f(t) = 3 y_1(t) + D y_1(t)$

$f(t) = (3 + D) y_1(t)$ //

For f(t) & $y_2(t)$

$f(t) = 3 y_1 t + \frac{\partial}{\partial t} y_1 t$

$f(t) = \frac{3}{D} y_2(t) + y_2(t)$

$D f(t) = 3 y_2 t + D y_2(t)$

$D f(t) = (3 + D) y_2(t)$ //