King Saud University
College of Engineering
Electrical Engineering Department

EE 329

Final Exam

Instructor: **Dr. Mohammed Al Eshaikh**
Date: **27/5/1428**
Time: **8:00-11:00 am**

Question	Mark
1	
2	
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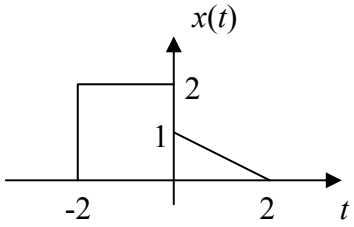
5	
Total	

اسم الطالب:	
الرقم الجامعي:	
الشعبة:	

Problem 1

a) The signal $x(t)$ is as shown



i) Find the energy and power in the signal $x(t)$**.**
ii) Sketch the signal $x(2t+1)$.
iii) Sketch the even and odd part of $x(t)$.

b) Determine whether or not each of the following signals is periodic. If the signal is periodic find the fundamental period.

i) $x_1(n) = 4\sin(\frac{4\pi}{3}n - \frac{5\pi}{3}) + e^{j(\frac{3\pi}{5}n+3\pi)}$

ii) $x_2(t) = 5\sin(\frac{3\pi}{2}t^2)$

iii) $x_3(n) = u(n) + u(-n) - \delta(n)$

Problem 2

Discuss the following properties of the given system: $y(t) = 3x^2(t+5)$
i) Memoryless ii) Causal iii) linear iv) Time invariant v) Stable. vi) Invertible.

Problem 3

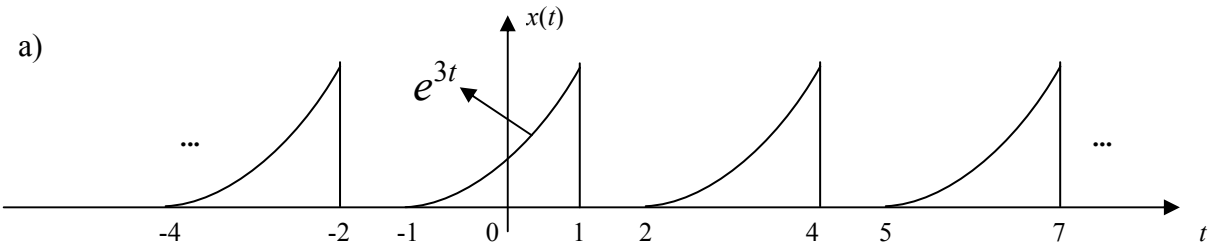
Compute and plot $y(n) = x(n) * h(n)$, where

$x(n) = u(n\text{-}2) - u(\text{n-}11)$

$h(n) = u(n+1) - u(n\text{-}4)$ (Hint: $\sum_{a}^{b} 1 = b - a + 1$)

Problem 4

a)



For the above continuous-time periodic signal:

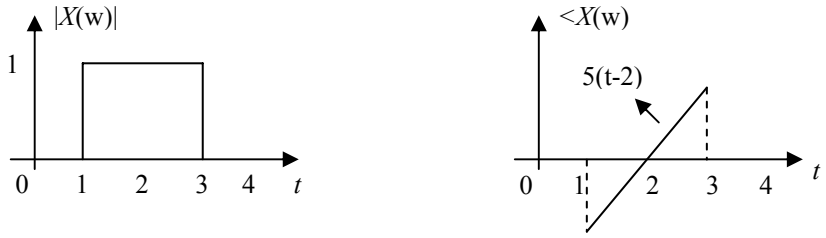
i) Find the fundamental period and the dc component of $x(t)$.
ii) Find Fourier series coefficients a_k of $x(t)$.

b) A periodic signal $x(t)$ is real valued and has a fundamental period $T = 8/3$. The nonzero Fourier series coefficients for $x(t)$ are: $a_1 = a_{-1} = 1$, $a_3 = a_{-3}^{*} = 1+j$
Express $x(t)$ in the form

$$x(t) = \sum_{k=0}^{\infty} A_k \cos(w_k t + \phi_k)$$

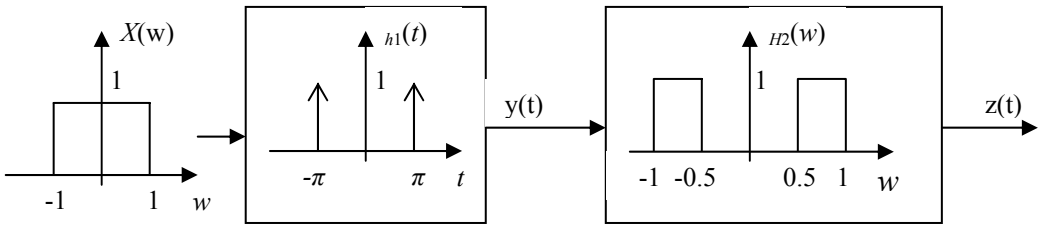
Problem 5

a)



The above Figure shows $X(w)$ as magnitude and phase, use the inverse Fourier transform to find $x(t)$.

b)



Find and sketch $Y(w)$ and $Z(w)$. (Hint: $\delta(t) \Leftrightarrow 1$)

c) Consider the Fourier transform pair: $\frac{2}{1+t^2} \Leftrightarrow 2\pi e^{-|w|}$

Determine the Fourier transform of the following signals

i) $x_1(t) = \frac{2}{1+9t^2}$ ii) $x_2(t) = \frac{2}{1+(t+2)^2}$

iii) $x_3(t) = \frac{6}{1+t^2} e^{j5t}$ iv) $x_4(t) = \frac{-4t}{(1+t^2)^2}$

d) an LTI system can be described as $\frac{d}{dt} y(t) + 3y(t) = 2x(t-1)$

i) Find the transfer function of this system

ii) Is this system stable? (Hint: $e^{-at}u(t) \Leftrightarrow \frac{1}{a+jw}$)