

**King Saud University
College of Engineering
Electrical Engineering Department**

EE301: Signals and System Analysis

First Midterm Exam

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Date: 20/10/1427

Time: 5:30-7:00 pm

Question	Mark
1	
2	
3	
<i>Total Mark</i>	

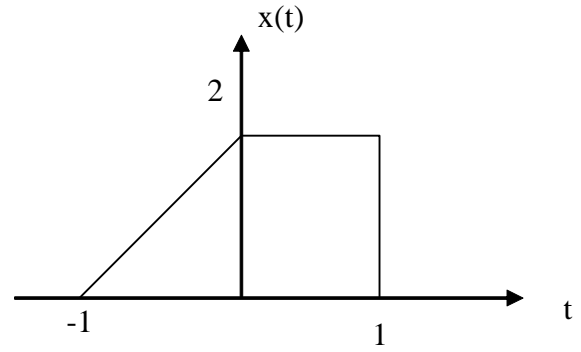
	اسم الطالب:
	الرقم الجامعي:
	الشعبة:
	مسلسل:

Answer All Problems (60 points)

Problem I (20 points)

a- Consider the signal $x(t)$ as shown in the figure.

- i- Find the energy of $x(t)$.
- ii- Sketch $x(3t-1)$.
- iii- Sketch the even and odd parts of $x(t)$.



b- Given that

$$x[n] = \begin{cases} \cos \frac{n\pi}{2} + \sin \frac{n\pi}{2} & \text{for } -5 < n < 5 \\ 0 & \text{otherwise} \end{cases}$$

- i- Sketch $x[n]$.
- ii- Is the signal periodic? Why?
- iii- Calculate the average power of $x[n]$.

- c-
- i- Explain briefly the additive and scaling properties of linear system.
 - ii- If $y(t) = x^2(t)$
Discuss if the system is: * Linear * Invertible * Causal

	Marks	
a	6	
b	6	
c	8	

Problem II (20 points)

- (a) For the DT LTI system shown in Figure 2(a):
i) Find and sketch the impulse response $h[n]$
ii) Find and sketch the unit step response $s[n]$

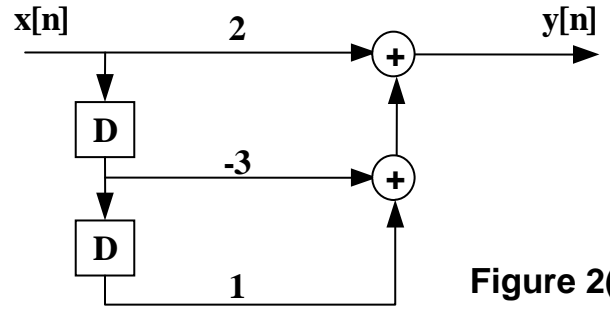


Figure 2(a)

(b) Figure 2(b) describes a CT LTI system with input $x(t)$ and output $y(t)$, where:

$$h_1(t) = 2u(t)$$

$$h_2(t) = 3\delta(t-1)$$

$$h_3(t) = -6u(t-2)$$

Find the overall impulse response $h(t)$ of the system.

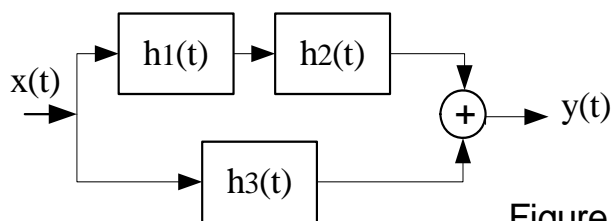


Figure 2(b)

	Answer	Marks	
a		5	
		5	
b		10	

Problem II (20 points)

(a) The impulse response for a LTI system is given by:
$$h(t) = \begin{cases} \cos(t) & 0 \leq t \leq \frac{\pi}{2} \\ 0 & \text{otherwise} \end{cases}$$

Find and sketch the output $y(t)$ of this system if the input is $x(t) = u(t) - u\left(t - \frac{\pi}{2}\right)$

(b) A DT signal $x(n)$ is given by $x[n] = 3\delta[n+2] + \delta[n+1] - \delta[n]$

i) Compute and sketch the auto-correlation function $R_{xx}(n)$ of the signal $x(n)$

ii) Using (i), find the energy of $x[n]$

iii) Using (i), find the auto-correlation $R_{yy}(n)$ of $y[n] = 3\delta[n-1] + \delta[n-2] - \delta[n-3]$

	Answer	Marks	
a		10	
b		4	
		3	
		3	