

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

**EE301: Signals and System Analysis**

Second Midterm Exam

**Instructors:** A. Sheta & S. Aldosari

**Date:** 19/12/1427

**Time:** 5:45 -7:15 pm

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

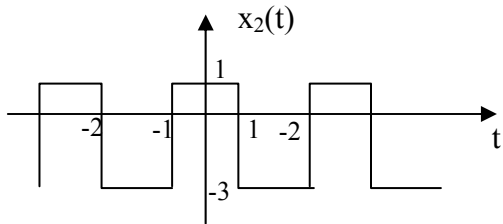
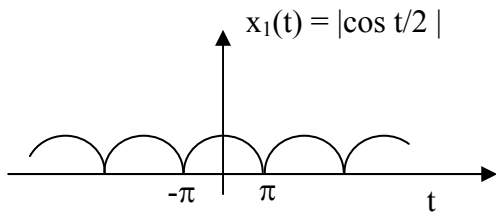
	اسم الطالب:
	الرقم الجامعي:
	الشعبة:
	مسلسل:

**Answer All Problems** (60 points)

**Problem I** (20 points)

a- For each of the following signals find:

- i. The dc components.
- ii- The fundamental and the second harmonic frequencies.
- iii- The second harmonic components.



b- Find the Fourier series representation of the signal

$$x[n] = 2 + \sin 2\pi n/3 + 2 \cos 2\pi n$$

**Problem II** (20 points)

Consider a CT signal with Fourier transform given by  $X(j\omega) = \frac{1}{(j\omega)^2 + 7(j\omega) + 12}$

(a) Find  $x(t)$ . (10 points)

(b) Let  $y(t) = tx(t) + x(t/3)$ . Find  $Y(j\omega)$  (the Fourier transform of  $y(t)$ ). (10 points)

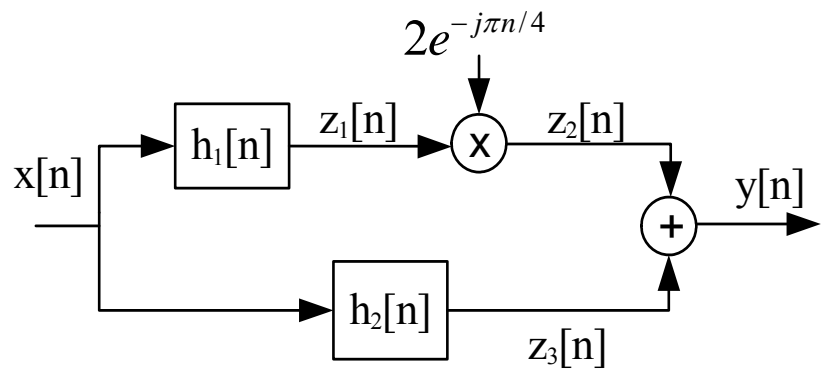
**Problem III** (20 points)

The following figure shows a DT linear time invariant system where:

$$H_1(e^{j\omega}) = \begin{cases} 1 & |\omega| < \pi/4 \\ 0 & \text{otherwise} \end{cases}$$

$$H_2(e^{j\omega}) = \begin{cases} 1 & \pi/2 < |\omega| < \pi \\ 0 & \text{otherwise} \end{cases}$$

$$X(e^{j\omega}) = |\omega| \quad -\pi < \omega < \pi$$



- (a) Find the odd part of  $x[n]$ . (4 points)
- (b) Sketch  $H_1(e^{j\omega})$ ,  $H_2(e^{j\omega})$ , and  $X(e^{j\omega})$ . (4 points)
- (c) Find and sketch  $Z_1(e^{j\omega})$ ,  $Z_2(e^{j\omega})$ ,  $Z_3(e^{j\omega})$ , and  $Y(e^{j\omega})$ . (12 points)
- Note: you MUST clearly label all your plots.