

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

**EE301: Signals and System Analysis**

2<sup>nd</sup> Midterm Exam

**Instructors:** R. Djemal & S. Aldosari

**Date:** 5/1/1429

**Time:** 5:45-7:00 pm

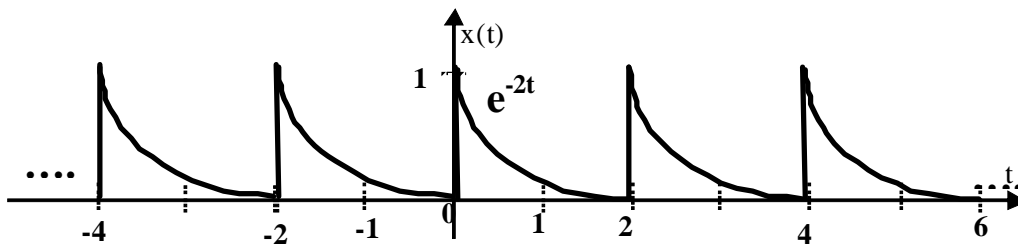
Question	Mark
1	
2	
<i>Total Mark</i>	

	اسم الطالب:
	الرقم الجامعي:
	الشعبة:
	مسلسل:

Answer All Problems (60 points)

**Problem (I – a)** (15 points)

Determine the FS coefficients for the signal  $x(t)$  related to the following Fig.



- i. Determine the period of the signal  $x(t)$
- ii. Determine the FS coefficient for the signal  $x(t)$

**Problem (I – b)** (15 points)

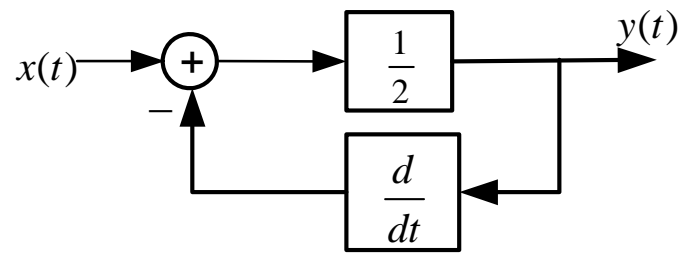
(b) For the following signal:

$$x[n] = \cos\left(\frac{\pi}{8}n + \varphi\right)$$

- i. Find the fundamental period of  $x[n]$  and the first harmonic component
- ii. Find the DTFS representation for  $x[n]$ .
- iii. Sketch the  $|a_k|$  and  $\text{Arg}(a_k)$  related to FS coefficients

**Problem (II – a)** (15 points)

i- Find the overall frequency response  $H(\omega)$  of this system.



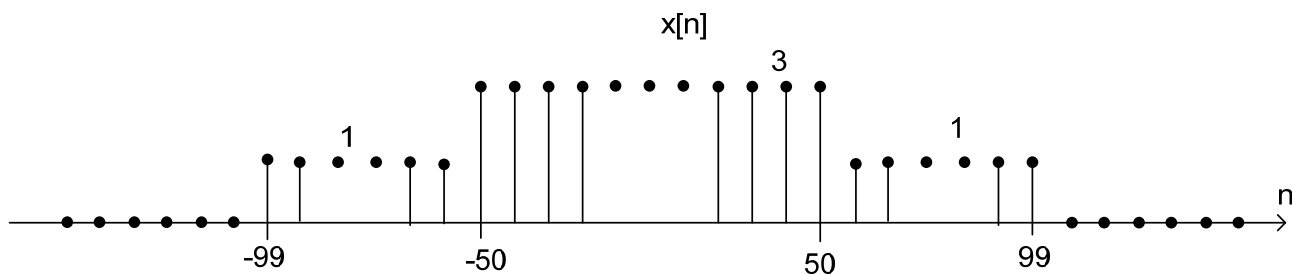
ii- Find the magnitude and phase of  $H(\omega)$ .

iii- Sketch the magnitude of  $H(\omega)$ . What type of filter is this and why?

iv- Find and sketch the overall impulse response  $h(t)$  of this system.

**Problem (II – b)** (15 points)

Use Fourier properties to find the Fourier transform  $X(e^{j\omega})$  of the following signal.



**Hints:**

$x[n] \begin{cases} 1, &  n  \leq N_1 \\ 0, &  n  > N_1 \end{cases}$	$\frac{\sin[\omega(N_1 + \frac{1}{2})]}{\sin(\omega/2)}$
$\frac{\sin Wn}{\pi n} = \frac{W}{\pi} \text{sinc} \left( \frac{Wn}{\pi} \right)$ $0 < W < \pi$	$X(e^{j\omega}) = \begin{cases} 1, & 0 \leq  \omega  \leq W \\ 0, & W <  \omega  \leq \pi \end{cases}$ $X(e^{j\omega}) \text{ periodic with period } 2\pi$