King Saud University
College of Engineering
Electrical Engineering Department

EE301: Signals and System Analysis

2nd Midterm Exam

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

Date: **17/5/1429**

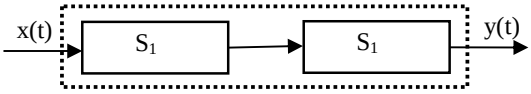
Time: **11:00-12:15 pm**

Question	Mark
1	
2	
3	
4	
Total Mark	

اسم الطالب:	
الرقم الجامعى:	
الشعبة :	
مسلسل :	

Problem 1 (10 points)

An LTI system consists of two sub systems S_1 and S_2 in cascade.



The impulse response of these systems are $h_1(t)$ and $h_2(t)$ respectively given by:

$$h_1(t) = \delta(t) - 2e^{-t}\,u(t) \quad , h_2(t) = e^{t}\,u(t)$$

i. Find the composite (overall) system impulse response h(t)
ii. Determine the response y(t) of the system when x(t)= $e^{-2t}\,u(t)$
iii. Sketch y(t)

Problem 2 (10 points)

(a) Consider the DT signal: $x[n] = \cos(n\pi/3) + 2\sin(n\pi/9)$

i. Find the fundamental period of x[n]

ii. Explicitly find the DTFS coefficients of x[n] **without** using the tables

iii. Sketch a[k]

(b) Find and sketch the cross correlation Rxy(t) of the following signals :

$$x(t) = e^{-t}u(t) \quad , \quad y(t) = e^{-2t}u(t)$$

اسم الطالب:	
الرقم الجامعى:	
الشعبة :	
مسلسل :	

Problem 3 (10 points)

Consider the following periodic signal: $x[n]=\left(\frac{1}{2}\right)^n \quad 0 \le n < 10,\ x[n+10]=x[n]$

(a) Find the Fourier series coefficients a_k of x[n]

(b) Find the dc component and 1st harmonic component of x[n]

(c) Write down the Fourier series of x[n].

(d) Find b_k , the Fourier series coefficients of $y[n]=\begin{cases} x[n/2] & \text{if n is even} \\ 0 & \text{if n is odd} \end{cases}$

Problem 4 (10 points)

(a) Let $x(t) \xleftrightarrow{\mathcal{F}} X(\omega)$. Find Fourier transform of $y(t) = x(-2t + 7)$ (**show all steps**)

(b) The impulse response of an LTI system is given by $h(t) = e^{-3t}u(t)$. Find the output of this system if the input is $x(t) = 2e^{-5t}u(t)$. You **must** do all your analysis in the **Frequency domain (using Fourier transform).**